National Institute for Health and Care Excellence

Final

Rehabilitation for chronic neurological disorders including acquired brain injury

[E] Evidence review for stability, mobility and upper limb function

NICE guideline NG252

Evidence review underpinning recommendations 1.13.3, 1.15.1, 1.15.3 to 1.15.4, 1.16.1 to 1.16.5, 1.16.7, 1.16.9 to 1.16.15, and a recommendation for research in the NICE guideline

October 2025

Final

This evidence review was developed by NICE

Disclaimer

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or service users. The recommendations in this guideline are not mandatory and the guideline does not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Local commissioners and/or providers have a responsibility to enable the guideline to be applied when individual health professionals and their patients or service users wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with compliance with those duties.

NICE guidelines cover health and care in England. Decisions on how they apply in other UK countries are made by ministers in the Welsh Government, Scottish Government, and Northern Ireland Executive. All NICE guidance is subject to regular review and may be updated or withdrawn.

Copyright

ISBN: 978-1-4731-7263-0

Contents

Stability, mobility and upper limb function

Review question

What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Introduction

Stability and functional movement enable independence in daily life, and improvements in these areas reduces barriers faced by people with chronic neurological disorders, enabling them to more easily participate within society. As such, goals relating to improving or maintaining stability and functional movement are well accepted key components of rehabilitation for those with chronic neurological disorders. However, although there are many and varied treatments in these areas of rehabilitation, there appears to be little consensus as to the most effective and cost-effective treatment approaches.

The aim of this review was to determine the effectiveness and cost-effectiveness of interventions to improve or sustain stability, mobility, and upper limb functioning in people with chronic neurological disorders.

Summary of the protocol

See Table 1 for a summary of the Population, Intervention, Comparison and Outcome (PICO) characteristics of this review.

Table 1: Summary of the protocol (PICO table)

Population	Adults and children with rehabilitation needs due to the following chronic neurological disorders: • Acquired brain injury • Acquired spinal cord injury • Acquired peripheral nerve disorders • Progressive neurological diseases • Functional neurological disorders
Intervention	**Intervention group 1 – Rehabilitation interventions to address upper limb functioning.** • Upper limb wearables • Electrical stimulation • Robotics and repetitive task training **Intervention group 2 – Rehabilitation interventions to address stability.** • Vestibular exercise, including optokinetic training • Balance exercises (such as sitting/ standing and reaching) • Perturbation training **Intervention group 3 – Rehabilitation interventions to address mobility.** • Gait training (including body-weight supported/ treadmill based and/ or robotically assisted interventions, outdoor gait training) • Backward chaining • Lower limb wearables, electrical stimulation and lower-body robotics **Intervention group 4 – Rehabilitation interventions to address stability, mobility and upper limb functioning together.**

	• Dual task training • Sensorimotor exercises • Neuromodulation (electrical/ vibratory) • Hydrotherapy • Exergaming and AR/VR • Wearable garments, technology (for example MOLLII) and exoskeletons • Individualised (tailored) exercise programmes for stability, mobility, limb functioning and coordination tasks (coordinating the body to be able to walk or be functional). • Cough augmentation techniques (manual and device assisted cough, breath stacking) and inspiratory muscle training
Comparison	Interventions compared with others in the same group or: • Placebo (placebo or sham) • Control (no intervention, waitlist, standard rehabilitation care alone, or 'usual care') • The same intervention (as listed under 'intervention') but varied in terms of: ○ Frequency ○ Intensity ○ Timing ○ Setting
Outcome	**Critical** • Gait and balance - measured using validated scales such as the Rivermead Mobility Index (RMI); Berg Balance Scale (BBS); Dynamic Gait Index or Functional Gait Assessment, Four Step Square Test; Timed "Up & Go" Test (TUG) • Exercise capacity - measured using scales such as the 6 Minute Walk Test (6MWT); Five Times Sit to Stand Test. • Limb/joint/muscle function - measured using validated scales such as the (Modified) Ashworth Spasticity Scale; Manual Muscle Test (MMT); Penn Spasm Frequency Scale • Respiratory function - measured using respiratory function outcome measures such as the Forced Expiratory Volume in 1 second (FEV1) or expiratory sounds. • Functioning - measured using validated, global scales such as the functional independence measure (FIM) and the Paediatric Evaluation of Disability Inventory (PEDICAT).

AR: augmented reality; VR: virtual reality

For further details see the review protocol in appendix A.

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document (supplementary document 1).

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Effectiveness evidence

Included studies

Seventy-eight papers were included in this review: 73 randomised controlled trials (RCTs) (Arntzen 2020, Bello 2013, Berra 2018, Berriozabalgoitia 2021, Brichetto 2013, Brichetto 2015, Bunn 2015, Cabrera-Martos 2020, Capecci 2019, Cattaneo 2018, Ciatto 2023, Clerici 2017, Conradsson 2015, Coote 2015, Coulter 2017, Curcio 2020, Donkers 2020, Esclarín-Ruz 2014, Ferri 2019, Flynn 2021, Gandolfi 2015, Gandolfi 2017, Gandolfi 2018, Gandolfi 2019, Gil-Agudo 2023, Gryfe 2022, Hind 2017, Hoang 2016, Kapadia 2014, Kleffelgaard 2019, Lam 2015, Leung 2014, Lozano-Berrio 2022, Lozano-Quilis 2014, Manzanares 2021, Maranesi 2022, Nilsagard 2013, Novotna 2019, Palamara 2017, Paul 2019, Pavlikova 2020, Pazzaglia 2020, Pelosin 2017, Picelli 2013, Piira 2019a, Piira 2019b, Pollet 2023, Pompa 2017, Pullia 2023, Raciti 2022, Renfrew 2019, Robinson 2015, Schaible 2021, Schlenstedt 2015, Solaro 2020, Song 2018, Steib 2017, Straudi 2013, Straudi 2016, Straudi 2020, Szefler-Derela 2020, Szymura 2020, Taylor 2021, Tollár 2018, Tollár 2019, Tollár 2020, Tramontano 2018, Tramontano 2020, Tramontano 2022, van den Heuvel 2014, Wirz 2017, Wroblewska 2019, Zivi 2018), 3 crossover RCTs (Forsberg 2016, Prosperini 2013, Taylor 2014), 1 secondary paper reporting additional information for Conradsson 2015 (Wallén 2018), and 1 secondary paper reporting additional information for Steib 2017 (Gasner 2019)The included studies are summarised in Table 2.

Thirty-one studies were conducted in Italy (Berra 2018, Brichetto 2013, Brichetto 2015, Capecci 2019, Cattaneo 2018, Ciatto 2023, Clerici 2017, Curcio 2020, Ferri 2019, Gandolfi 2015, Gandolfi 2017, Gandolfi 2018, Gandolfi 2019, Maranesi 2022, Palamara 2017, Pazzaglia 2020, Pelosin 2017, Picelli 2013, Pollet 2023, Pompa 2017, Prosperini 2013, Pullia 2023, Raciti 2022, Solaro 2020, Straudi 2013, Straudi 2016, Straudi 2020, Tramontano 2018, Tramontano 2020, Tramontano 2022, Zivi 2018); 8 studies were conducted in Spain (Bello 2013, Berriozabalgoitia 2021, Cabrera-Martos 2020, Esclarín-Ruz 2014, Gil-Agudo 2023, Lozano-Berrio 2022, Lozano-Quilis 2014, Manzanares 2021); 8 studies were conducted in the UK (Bunn 2015, Coulter 2017, Hind 2017, Paul 2019, Renfrew 2019, Robinson 2015, Taylor 2014, Taylor 2021); 4 studies were conducted in Australia (Flynn 2021, Hoang 2016, Leung 2014, Song 2018); 4 studies were conducted in Canada (Donkers 2020, Gryfe 2022, Kapadia 2014, Lam 2015); 4 studies were conducted in Norway (Arntzen 2020, Kleffelgaard 2019, Piira 2019a, Piira 2019b); 3 studies were conducted in Germany (Schaible 2021, Schlenstedt 2015, Steib 2017); 3 studies were conducted in Hungary (Tollár 2018, Tollár 2019, Tollár 2020); 3 studies were conducted in Poland (Szefler-Derela 2020, Szymura 2020, Wroblewska 2019); 3 studies were conducted in Sweden (Conradsson 2015, Forsberg 2016, Nilsagard 2013); 1 study was conducted in the Czech Republic (Novotna 2019); 1 study was conducted in the Czech Republic and Italy (Pavlikova 2020); 1 study was conducted in Ireland (Coote 2015); 1 study was conducted in The Netherlands (van den Heuvel 2014); and 1 study was conducted in Switzerland (Wirz 2017).

Five studies investigated interventions to address upper limb functioning:

- Three studies investigated robotics and repetitive task training compared to a control in adults with progressive neurological diseases (Gandolfi 2018, Raciti 2022, Tramontano 2020).
- One study investigated robotics and repetitive task training compared to a control in adults with acquired spinal cord injury (Lozano-Berrio 2022).
- One study investigated robotics and repetitive task training compared to a placebo in adults with progressive neurological diseases (Solaro 2020).

Twenty-six studies investigated interventions to address stability:

- Four investigated vestibular exercises (including optokinetic training) in people with chronic neurological disorders:

  - Two investigated vestibular exercises compared to a control in adults with acquired brain injury (Kleffelgaard 2019, Tramontano 2022).
  - Two investigated vestibular exercises compared to a control in adults with progressive neurological diseases (Bunn 2015, Tramontano 2018).
- Nineteen studies investigated balance exercises compared to a control, all in adults with progressive neurological diseases (Arntzen 2020, Brichetto 2013, Brichetto 2015, Cabrera-Martos 2020, Cattaneo 2018, Conradsson 2015, Forsberg 2016, Gandolfi 2015, Gandolfi 2017, Gandolfi 2019, Nilsagard 2013, Novotna 2019, Pavlikova 2020, Prosperini 2013, Robinson 2015, Schlenstedt 2015, Szymura 2020, Tollár 2020, van den Heuvel 2014).
- One study investigated perturbation training compared to a control in adults with progressive neurological diseases (Steib 2017).

Twenty-eight studies investigated interventions to address mobility:

- Twenty-two investigated gait training in people with chronic neurological disorders:
  - Fifteen investigated gait training compared to a control in adults with progressive neurological diseases (Bello 2013, Berra 2018, Berriozabalgoitia 2021, Capecci 2019, Clerici 2017, Hoang 2016, Picelli 2013, Pompa 2017, Pullia 2023, Song 2018, Straudi 2013, Straudi 2016, Straudi 2020, Szefler-Derela 2020, Wroblewska 2019).
  - Four investigated gait training compared to a control in adults with acquired spinal cord injury (Esclarín-Ruz 2014, Gil-Agudo 2023, Piira 2019a, Piira 2019b).
  - Two investigated gait training compared to the same intervention delivered at a different intensity in adults with acquired spinal cord injury (Lam 2015, Wirz 2017).
  - One study investigated gait training compared to the same intervention delivered at the different frequency in adults with progressive neurological diseases (Pelosin 2017).
- Six studies investigated lower limb wearables, electrical stimulation and lower-body robotics in people with chronic neurological disorders:
  - Four studies investigated lower limb wearables, electrical stimulation and lower-body robotics compared to a control in adults with progressive neurological diseases (Coote 2015, Renfrew 2019, Taylor 2014, Taylor 2021).
  - One study investigated lower limb wearables, electrical stimulation and lower-body robotics compared to a control in adults with acquired brain injury (Leung 2014).
  - One study investigated lower limb wearables, electrical stimulation and lower-body robotics compared to placebo in adults with progressive neurological diseases (Pollet 2023).

Eighteen studies investigated interventions to address upper limb functioning, stability and mobility together:

- One study investigated sensorimotor exercises compared to a control in adults with progressive neurological diseases (Tollár 2018).
- Four studies investigated hydrotherapy in people with chronic neurological disorders:
  - One study investigated hydrotherapy compared to a control in adults with acquired brain injury (Curcio 2020); 1 study investigated hydrotherapy compared to a control in adults with progressive neurological diseases (Palamara 2017)
  - One study investigated hydrotherapy compared to a control in children and young people with progressive neurological diseases (Hind 2017)
  - One study investigated hydrotherapy compared to a control in adults with mixed general peripheral neuropathies (Zivi 2018).
- Six studies investigated exergaming and AR (augmented reality) or VR (virtual reality) in people with chronic neurological disorders:

  - Five investigated exergaming and AR/VR compared to a control in adults with progressive neurological diseases (Lozano-Quilis 2014, Maranesi 2022, Pazzaglia 2020, Tollár 2019, Tollár 2020).
  - One study investigated exergaming and AR/VR compared to a control in adults with acquired spinal cord injury (Manzanares 2021).
- One study investigated wearable garments, technology and exoskeletons compared to a control in adults with progressive neurological diseases (Gryfe 2022).
- Six studies investigated individualised exercise programmes in people with chronic neurological disorders:
  - Four studies investigated individualised exercise programmes compared to a control in adults with progressive neurological diseases (Donkers 2020, Ferri 2019, Paul 2019, Schaible 2021).
  - One study investigated individualised exercise programmes compared to a control in adults with acquired spinal cord injury (Coulter 2017).
  - One study investigated individualised exercise programmes compared to the same intervention delivered in a different setting in adults with progressive neurological diseases (Flynn 2021).

Finally, 2 studies investigated mixed interventions:

- One study investigated balance exercises plus gait training compared to a control in adults with progressive neurological diseases (Ciatto 2023).
- One study investigated gait training plus electrical stimulation compared to a control in adults with acquired spinal cord injury (Kapadia 2014).

Data for the following outcomes were identified through analysis of the included studies:

- Gait and balance
- Exercise capacity
- Limb/joint/muscle function
- Functioning

See the literature search strategy in appendix B and study selection flow chart in appendix C.

Excluded studies

Studies not included in this review are listed, and reasons for their exclusion are provided in appendix J.

Summary of included studies

Summaries of the studies that were included in this review are presented in Table 2.

Table 2: Summary of included studies.

Study	Population	Intervention	Comparison	Outcomes
Arntzen 2020 RCT Norway	N=80 adults with multiple sclerosis • Core stability and balance programme: n=40 • Standard care: n=40	Core stability and balance programme 3x 60-minute group sessions per week in outpatient clinic; and 2x 30-minute individual sessions per week (in participant's own home) with physical therapists for 6 weeks.	Standard care 6 weeks in the community setting. Participants were encouraged to maintain regular activities for the study period and told	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	Age in years [Mean (SD)]*: • Core stability and balance programme: 52.2 (12.9) • Standard care: 48 (8.75) Sex (M/F): • Core stability and balance programme: n=12/n=27 • Standard care: n=11/n=29 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=39 for core stability and balance programme and n=40 for standard care)	Programme content comprised of 33 specific exercises (with variations) addressing dynamic core stability. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	that they could access physical therapy/health care as needed, including free state-provided physical therapy.	
Bello 2013 RCT Spain	N=22 adults with Parkinson's disease • Treadmill training: n=11 • Overground training: n=11 Age in years [Mean (SD)]: • Treadmill training: 59.45 (11.32) • Overground training: 58.00 (9.38) Sex (M/F): • Treadmill training: n=7/n=4	Treadmill training 3x per week for 5 weeks supervised by a neurologist and physical therapist. Delivery setting not reported. Treadmill walking for four rounds, each for 4-minutes, with 3-minute breaks in-between. Additional 4-minute walking rounds were added each week. Preferred walking speed established during initial session and remained constant throughout the study. Performed without	Overground training 3x per week for 5 weeks supervised by a neurologist and physical therapist. Indoor facility (60x10 metres). Identical protocol to intervention apart from walking speed controlled by audio cues. 10-metres (marked by cones at the side of the walkway) of walking between each audio cue. The pace of the audio cue was altered based on	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	• Overground training: n=6/n=5 Chronic neurological disorder category: Progressive neurological diseases.	body-weight support, with a safety harness and hands on handrails at all times. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	individual speed preferences.	
Berra 2018 RCT Italy	N=36 adults with idiopathic Parkinson's disease • Body-weight supported treadmill training plus traditional physical therapy: n=18 • Overground gait training plus traditional physical therapy: n=18 Age in years [Mean (SD)]*: • Body-weight supported treadmill training plus traditional physical therapy: 71.9 (10.2) • Overground gait training plus traditional physical therapy: 71.7 (7.5) Sex (M/F): • Bodyweight supported treadmill training plus traditional physical therapy: n=6/n=8 • Overground gait training plus traditional physical therapy: n=12/n=10 Chronic neurological disorder category: Progressive	Body-weight supported treadmill training plus traditional physical therapy 5x 60-minute daily sessions per week for 4 weeks in a neurorehabilitation unit. Practitioner was unclear during sessions. Neurologist examination at beginning and end of training. Ten-minute treadmill walking with 20% of body-weight support, 5-minute break and then 10-minute treadmill walking with 10% of body-weight support. Initial speed was 0.5 km/h, increasing by 0.5 km/h every minute until tolerated maximum speed which was retained thereafter. 40-minutes of traditional physical therapy involved passive, active and active assisted isotonic and isometric exercises for major limb and trunk muscles based on Parkinson's disease rehabilitation guidelines and literature evidence. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Overground gait training plus traditional physical therapy 5x 60-minute daily sessions per week for 4 weeks in a neurorehabilitation unit. Practitioner was unclear during sessions. Neurologist examination at beginning and end of training. Same protocol as intervention group apart from the 20-minutes involving overground gait training.	• Gait and balance • Limb/joint/muscle function • Functioning

Study	Population	Intervention	Comparison	Outcomes
	neurological diseases. *Participant characteristics reported after reassignment of 4 participants into the comparator group (n=14 for body-weight supported treadmill training plus traditional physical therapy and n=22 for overground gait training plus traditional physical therapy)			
Berriozabalgoitia 2021 RCT Spain	N=36 adults with multiple sclerosis • Robot-assisted gait training (Ekso) plus standard rehabilitation: n=18 • Standard rehabilitation: n=18 Age in years [Mean (SD)]*: • Robot-assisted gait training (Ekso) plus standard rehabilitation: 49.83 (7.26) • Standard rehabilitation: 52.00 (10.25) Sex (M/F): • Robot-assisted gait training (Ekso) plus standard rehabilitation: n=9/n=9 • Standard rehabilitation: n=10/n=4 Chronic neurological disorder category:	Robot-assisted gait training (Ekso) plus standard rehabilitation 2x sessions per week progressing to maximum 40-minutes and 1x 60-minute standard physical therapy per week for 3 months in an outpatient setting and trained by certified physical therapists. Individualised and progressive gait training through Ekso overground robotic wearable exoskeleton with actuated hips and knees to aid lower limb movement. Sessions involved 1) PreGait to exercise static balance and weight shifts and 2) ProStepPlus to train gait with steps prompted by lateral weight shift. Speed, cadence, stride and robotic assistance was tailored. Sessions stopped upon fatigue or participant request. End of session cryotherapy on knee extensors and ankle plantar flexors occurred for 10-minutes. Standard	Standard rehabilitation 1x 60-minute sessions per week for 3 months with physical therapists. Individualised sessions aimed at controlling spasticity, maintaining articular range of motion, exercise balance and gait training.	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=18 for robot-assisted gait training (Ekso) plus standard rehabilitation and n=14 for standard rehabilitation)	physical therapy sessions followed (see control group for details). Protocol intervention group: Rehabilitation interventions to address mobility – Gait training		
Brichetto 2013 RCT Italy	N=36 adults with multiple sclerosis • Exergame-based balance exercises (Nintendo Wii) n=18 • Traditional balance rehabilitation n=18 Age in years [Mean (SD)]: • Exergame-based balance exercises (Wii Balance Board): 40.7 (11.5) • Traditional balance rehabilitation: 43.2 (10.6) Sex (M/F): • Exergame-based balance exercises (Nintendo Wii) n=8/n=10 • Traditional balance rehabilitation n=6/n=12 Chronic neurological disorder category: Progressive	Exergame-based balance exercises (Nintendo Wii) 3x 60-minutes sessions per week for 4 weeks with setting and practitioner not reported. Participants were supervised using Nintendo Wii Balance Board®, using existing programmes such as 'slalom skiing', and 'tightrope walking'. These were presented randomly at each session. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Traditional balance rehabilitation 3x 60-minutes sessions per week for 4 weeks with practitioner with setting and practitioner not reported. Tailored static and dynamic exercises using both single-leg and double-leg stances, with and without an equilibrium board, and half-kneeling exercises of increasing difficulty.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	neurological diseases.			
Brichetto 2015 RCT Italy	N=32 adults with multiple sclerosis • Tailored balance exercises: n=16 • Traditional balance rehabilitation: n=16 Age in years [Mean (SD)]: • Tailored balance exercises: 50.1 (13.5) • Traditional balance rehabilitation: 51.0 (8.9) Sex (M/F): • Tailored balance exercises: n=4/n=11 • Traditional balance rehabilitation: n=5/n=12 Chronic neurological disorder category: Progressive neurological diseases.	Tailored balance exercises 3x 60-minute sessions per week for 4 weeks with setting and practitioner not reported. Rehabilitation treatments tailored to the prevalent sensory system impairments in each individual (visual, somatosensory or vestibular). Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Traditional balance rehabilitation 3x 60-minute sessions per week for 4 weeks with setting and practitioner not reported. Standardised rehabilitation treatment for balance disorders. Tailored static and dynamic exercises using both single-leg and double-leg stances, as well as half-kneeling exercises of increasing difficulty.	• Gait and balance
Bunn 2015 RCT UK	N=12 adults with Spinocerebellar ataxia type 6 pure cerebellar disease • Home-based optokinetic training n=6 • Usual care n=6 Age in years [Mean (SD)]: • Home-based optokinetic training: 60.2 (10.5) • Usual care: 58.3 (14.5) Sex (M/F):	Home-based optokinetic training 15-minutes, 5 sessions per week for 8 weeks at home with physiotherapist. Participants performed balance activities whilst looking ahead at projected images with unpredictable movements. Participants with mild-moderate disease also performed simple balance exercises independently at home.	Usual care Participants did not receive any intervention. No further details	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Home-based optokinetic training: n=3/n=3 • Usual care: n=1/n=5 Chronic neurological disorder category: Progressive neurological diseases.	Protocol intervention group: Rehabilitation interventions to address stability – Vestibular exercise, including optokinetic training		
Cabrera-Martos 2020 RCT Spain	N=44 adults with idiopathic Parkinson's disease • Core stabilisation training: n=22 • Standard rehabilitation: n=22 Age in years [Mean (SD)]: • Core stabilisation training: 77.22 (6.22) • Standard rehabilitation: 75.87 (1.19) Sex (M/F): • Core stabilisation training: n=7/n=15 • Standard rehabilitation: n=11/n=11 Chronic neurological disorder category: Progressive neurological diseases.	Core stabilisation training 3x 45-minute group sessions (5-6 participants) per week for 8 weeks. Delivered in the community at healthcare facility by a physical therapist. Programme was designed around the principles of motor relearning and skill acquisition, and included tailored functional exercises in contexts that would maximise transfer functional activity. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Standard rehabilitation 3x 45-minute group sessions (5-6 participants) per week for 8 weeks. Delivered in the community at a healthcare facility by a physical therapist. Included active joint mobilisation, muscle stretching, and motor coordination exercises. Exercises were tailored and increased in complexity.	• Gait and balance
Capecci 2019 RCT Italy	N=96 adults with idiopathic Parkinson's disease • Robotic-assisted gait training (G-EO system™): n=60 • Treadmill training: n=50	Robotic-assisted gait training (G-EO system™) 5x 45-minute sessions per week for 4 weeks in outpatient neurorehabilitation facilities with physiotherapist.	Treadmill training 5x 45-minute sessions per week for 4 weeks in outpatient neurorehabilitation facilities with physiotherapist.	• Gait and balance • Exercise capacity • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	Age in years [Mean (SD)]*: • Robotic-assisted gait training (G-EO system™): 68.1 (9.8) • Treadmill training: 67.0 (7.6) Sex (M/F): • Robotic-assisted gait training (G-EO system™): n=19/n=29 • Treadmill training: n=24/n=24 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=48 per arm)	Participants used an end-effector robotic device with robot assisted walking at different speeds with some body-weight support. Initially, 30-40% of bodyweight support was used at 1.5 km/h and gradually increased to a maximum of 2.2-2.5 km/h with bodyweight decreased up to 20% based on tolerance. Training was always performed on the "ON" phase of treatment. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Treadmill training involving walking on the treadmill without bodyweight support. Initial walking speed per session was 0.8-1 km/h and then to 2.0 km/h or greater based on tolerance. Training was always performed on the "ON" phase of treatment.	
Cattaneo 2018 RCT Czech Republic and Italy	N=119 adults with multiple sclerosis • Exercises to improve balance and mobility: n=78 • Standard balance rehabilitation: n=41 Age in years [Mean (SD)]: • Exercises to improve balance and mobility: 48.9 (11.1) • Standard balance rehabilitation: 46.7 (11.4) Sex (M/F):	Exercises to improve balance and mobility 2-3x 45-minute sessions per week for 7-10 weeks. Delivered by physical therapist with setting not reported. Balance training based on published best practice recommendations which lasted minimum 25-45 minutes. Aims were to improve postural control, and control of movements of the core during static, dynamic and transitional tasks.	Standard balance rehabilitation 2-3x 45-minute sessions per week for 7-10 weeks. Delivered by physical therapist with setting not reported. Designed to reduce body function and activity limitations. Treatment for balance disorders was a maximum of 10-minutes per session.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Exercises to improve balance and mobility: n=24/n=54 • Standard balance rehabilitation: n=12/n=29 Chronic neurological disorder category: Progressive neurological diseases.	Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises		
Ciatto 2023 RCT Italy	N=30 adults with Parkinson's disease • Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): n=15 • Standard rehabilitation: n=15 Age in years [Mean (SD)]: • Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): 68 (8.5) • Standard rehabilitation: 68 (8.5) Sex (M/F): • Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): n=10/n=5 • Standard rehabilitation: n=5/n=10	Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) 5x 40-minute sessions per week for 4 weeks at a Parkinson's disease neurorehabilitation unit with a physiotherapist. Identical training to control group with addition of the Rysen system, a 3-dimensional bodyweight support system to enhance balance reactions and maintain natural gait patterns. The system simulates terrains and real-life conditions with different exercise modes (for example, stand up, walking, and stairs). Protocol intervention group: Mixed (Rehabilitation interventions to address stability – Balance exercises; Rehabilitation interventions to address mobility – Gait training)	Standard rehabilitation 5x 40-minute sessions per week for 4 weeks at a Parkinson's disease neurorehabilitation unit with a physiotherapist. Conventional rehabilitation programme with exercises aimed to improve postural control, walking ability, and balance, tailored to individual needs.	• Gait and balance • Functioning

Study	Population	Intervention	Comparison	Outcomes
	Chronic neurological disorder category: Progressive neurological diseases.			
Clerici 2017 RCT Italy	N=24 adults with progressive supranuclear palsy • Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: n=12 • 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: n=12 Age in years [Mean (SD)]: • Robotic-assisted gait training plus multidisciplinary intensive rehabilitation: 69.9 (5.2) • 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: 72.5 (6.1) Sex (M/F): • Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: n=5/n=7 • 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: n=7/n=5 Chronic neurological disorder category:	Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation 5x 20-minutes per week for robotic-assisted gait training and 4x 60-minute intensive rehabilitation sessions over 5 days for 4 weeks in a hospital setting with physiotherapist for intervention and otherwise multidisciplinary. The intervention was Lokomat training, a driven-gait orthosis enabling gait on a treadmill. Maximum speed capped at 2.5 km/h. It was part of the second session of multidisciplinary intensive rehabilitation which was aerobic, motor-cognitive and goal based. Exercise intensity was 70-80% of heart rate. The first daily session was a one-on-one session with a physical therapist, the second session involved aerobic and repetitive activities for gait balance using the Lokomat, cycloergometer, crossover and posturographic platform with visual feedback, the third session was occupational therapy and last session was speech therapy. Protocol intervention group: Rehabilitation	'Treadmill plus' training plus multidisciplinary intensive rehabilitation 5x 20-minutes per week for 'treadmill plus' and 4x 60-minute intensive rehabilitation sessions over 5 days for 4 weeks in a hospital setting with physiotherapist for 'treadmill-plus' and otherwise multidisciplinary. 'Treadmill-plus' training with visual and auditory cues and maximum speed capped at 2.5 km/h. The participant had to reach a visual target for each stride, tailored to the individual. The multidisciplinary intensive rehabilitation was as described in intervention, except on the second daily session participants in this group used the 'treadmill-plus' instead of Lokomat.	• Gait and balance • Exercise capacity • Functioning

Study	Population	Intervention	Comparison	Outcomes
	Progressive neurological diseases.	interventions to address mobility – Gait training		
Conradsson 2015 RCT Sweden	N=100 adults with idiopathic Parkinson's disease • Hi Balance training programme: n=51 • Usual care: n=49 Age in years [Mean (SD)]*: • Hi Balance training programme: 72.9 (6.0) • Usual care: 73.6 (5.3) Sex (M/F): • Hi Balance training programme: n=28/n=19 • Usual care: n=23/n=22 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=47 for Hi Balance training programme and n=44 for usual care)	Hi Balance training programme 3x 60-minute group based (4-7 participants) sessions per week for 10 weeks at a community hospital by physiotherapists. Balance training tailored to individual and specific to Parkinson's disease based on motor-learning principles (progressive overload, and variation) with gradual introduction of cognitive and motor dual tasking exercises. Participants were advised to maintain their normal level of exercise throughout the intervention period. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Usual care Participants were encouraged to maintain normal physical activity and exercise, and were not restricted from participating in ongoing rehabilitation programs.	• Gait and balance
Coote 2015 RCT Ireland	N=37 adults with multiple sclerosis • Neuromuscular electrical stimulation plus progressive resistance training: n=19	Neuromuscular electrical stimulation plus progressive resistance training 30 sessions (2x per week for first 6 weeks and 3x per week from	Progressive resistance training 30 sessions (2x per week for first 6 weeks and 3x per week from week 7-12) over 12 weeks in	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Progressive resistance training: n=18 Age in years [Mean (SD)]*: • Neuromuscular electrical stimulation plus progressive resistance training: 51.8 (12.6) • Progressive resistance training: 51.8 (12.1) Sex (M/F): • Neuromuscular electrical stimulation plus progressive resistance training: n=4/n=11 Progressive resistance training: n=4/n=6 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only presented for participants analysed rather than randomised (n=15 for neuromuscular electrical stimulation plus progressive resistance training and n=10 for progressive resistance training)	week 7-12) over 12 weeks in the participant's home and self-directed. Participants wore the 'Kneehab' synthetic garment which consisted of 4 electrodes placed on the thigh with the aim of activating the quadriceps muscle. It was worn on the weaker leg for the quadricep exercises. Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics	the participant's home and self-directed. Six lower limb exercises using stable surfaces to reduce fall risk.	
Coulter 2017 RCT	N=24 adults with spinal cord injury • Web-based individualised physiotherapy	Web-based individualised physiotherapy programme	Waitlist control Community based setting for 8 weeks.	• Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
UK	programme: n=16 • Waitlist control: n=8 Age in years [Mean (SD)]: • Web-based individualised physiotherapy programme: 51.5 (13.0) • Waitlist control: 48.1 (10.6) Sex (M/F): • Web-based individualised physiotherapy programme: n=9/n=7 • Waitlist control: n=5/n=3 Chronic neurological disorder category: Acquired spinal cord injury.	2x 30-minute sessions per week for 8 weeks at home with a web-based physiotherapist. Physiotherapist prescribed personalised web-based exercise programs with tailored aerobic, strengthening, stretching, and balance exercises adapted for people spinal cord injury. Online content included exercise, exercise diary, advice, and education sections, with each exercise page featuring a video, a written explanation, and an audio description. Online diaries were reviewed biweekly with feedback and adjustments where needed. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes	Usual care was self-management of their condition. They were asked to continue any current exercise routines and keep an exercise diary.	
Curcio 2020 RCT Italy	N=22 adults with traumatic brain injury • Aquatic training plus multidisciplinary neurorehabilitation: n=11 • Land-based training plus multidisciplinary neurorehabilitation: n=11 Age in years [Mean (SD)]*: • Aquatic training plus multidisciplinary neurorehabilitation: 37.4 (15.3) • Land-based training plus	Aquatic training plus multidisciplinary neurorehabilitation 3x 45-minute sessions per week for 4 weeks at an inpatient neurorehabilitation hospital with physiotherapist for aquatic training, otherwise multidisciplinary. Water-based training in a rehabilitation pool focused on dynamic and postural stability. Sessions involved initial 5-minute warm up, 20-minute repetitive exercises and 20-minutes of gait step	Land-based training plus multidisciplinary neurorehabilitation 3x 45-minute per week for 4 weeks at an inpatient neurorehabilitation hospital with practitioner unspecified for conventional training, otherwise multidisciplinary. Standard land-based therapy with individualised exercises to improve static and dynamic postural stability. Exercises involved active-assisted	• Gait and balance • Limb/joint/muscle function • Functioning

Study	Population	Intervention	Comparison	Outcomes
	multidisciplinary neurorehabilitation: 43.0 (14.1) Sex (M/F): • Aquatic training plus multidisciplinary neurorehabilitation: n=4/n=6 • Land-based training plus multidisciplinary neurorehabilitation: n=5/n=5 Chronic neurological disorder category: Acquired brain injury. *Participant characteristics only presented for participants receiving the intervention rather than randomised (n=10 for both arms)	exercises. Gait exercises utilised upper limbs which were placed on two floating aids and then a dual-motor task. Immersion varied by participant based on height and exercise challenges. Participants also received multidisciplinary neurorehabilitation exercises involving speech and cognitive therapy, swallowing and respiratory rehabilitation, and occupational therapy. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy	mobilisation, muscle stretching postural transition, balance, and gait training. This was in addition to multidisciplinary neurorehabilitation as described in intervention.	
Donkers 2020 RCT Canada	N=48 adults with multiple sclerosis • Web-based tailored physiotherapy programme: n=32 • Standardised physiotherapy programme: n=16 Age in years [Mean (SD)]: • Web-based tailored physiotherapy programme: 54.6 (11.9) • Standardised physiotherapy programme: 53.8 (12.2) Sex (M/F):	Web-based tailored physiotherapy programme 2x sessions per week (duration not reported) for 26 weeks. Web-based physiotherapist delivered at home. Physiotherapist prescribed personalised web-based exercise programs with videos, text, and audio descriptions. Online diaries were reviewed and adjusted by the physiotherapist every 2-weeks. Expertly-informed additional exercises for more advanced disabilities were available.	Standardised physiotherapy programme Home-based for 26 weeks with number/frequency of sessions not reported and delivered by physiotherapists. Participants received a written, home-based exercise programme aligned with standard outpatient physiotherapy practices. They kept a paper exercise diary. Physiotherapists did not review these diaries, but would adjust programmes via email if needed.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Web-based tailored physiotherapy programme: n=12/n=20 • Standardised physiotherapy programme: n=5/n=11 Chronic neurological disorder category: Progressive neurological diseases.	Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes		

Esclarín-Ruz 2014
 	
RCT
 	
Spain
	N=88 adults with spinal cord injury (lower motor neuron or upper motor neuron injuries)
	• Robotic-assisted gait training (Lokomat) plus standard physical treatment: n=44
	  ○ Lower motor neuron injuries: n=22
	  ○ Upper motor neuron injuries: n=22
	• Conventional overground gait training plus standard physical treatment
	  ○ Lower motor neuron injuries: n=22
	  ○ Upper motor neuron injuries: n=22
	
	Age in years [Mean (SD)]*:
	• Robotic-assisted gait training (Lokomat) plus standard physical treatment:
		Robotic-assisted gait training (Lokomat) plus standard physical treatment
		
		60-minute sessions (30-minutes robotic-assisted gait training and 30-minutes standard physical treatment), 5 days per week for 8 weeks at a specialist spinal cord injury hospital with physiotherapist.
		
		30-minutes of training on a treadmill at a comfortable speed with Lokomat, a robotic-driven gait orthosis and partial bodyweight. Orthoses were individualised to injury level and motor function ability. Body-weight support was 60% and reduced based on load tolerance to minimum 25%. Participants also received 30-minutes of standard physical treatment, including joint mobilisation below the spinal injury area, strengthening, muscle stretching, postural relaxation techniques, trunk stabilisation, rotation work and self-care skill training.
			Conventional overground gait training plus standard physical treatment
			
			60-minute sessions (30-minutes conventional overground training and 30-minutes standard physical treatment), 5 days per week for 8 weeks at a specialist spinal cord injury hospital with physiotherapist.
			
			Participants underwent 30-minutes of standard physical treatment (as described in intervention) and 30-minutes of overground walking gait training.
				• Gait and balance
				• Exercise capacity
				• Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	○ Lower motor neuron injuries 36.4 (12) ○ Upper motor neuron injuries 43.6 (12) • Conventional overground gait training plus standard physical treatment: ○ Lower motor neuron injuries 42.7 (18) ○ Upper motor neuron injuries 44.9 (7) Sex (M/F): • Robotic-assisted gait training (Lokomat) plus standard physical treatment: ○ Lower motor neuron injuries: n=14/n=6 ○ Upper motor neuron injuries: n=15/n=6 • Conventional overground gait training plus standard physical treatment ○ Lower motor neuron injuries: n=17/n=4 ○ Upper motor neuron injuries: n=13/n=8 Chronic neurological disorder category: Acquired spinal cord injury. *Participant characteristics only reported for participants analysed rather than randomised	Protocol intervention group: Rehabilitation interventions to address mobility – Gait training		

Study	Population	Intervention	Comparison	Outcomes
	(n=21 for each subgroup arm apart from robotic-assisted gait training (Lokomat) plus standard physical treatment (lower motor neuron injuries) where n=20)			
Ferri 2019 RCT Italy	N=16 adults with amyotrophic lateral sclerosis • Tailored exercise programme: n=8 • Usual care: n=8 Age in years [Mean (SD)]: Not reported, [Mean (SE)]: • Tailored exercise programme: 50.7 (3.3) • Usual care: 55.5 (5.95) Sex (M/F): • Tailored exercise programme: n=6/n=2 • Usual care: n=6/n=2 Chronic neurological disorder category: Progressive neurological diseases.	Tailored exercise programme 3x 60-minute sessions per week for 12 weeks in a rehabilitation and physical therapy clinic gym with sport scientists, a medical doctor, and a medical student. Individual training sessions of moderate-intensity, aerobic and strength training programme. This involved 15-minutes of moderate-intensity cycling, 25-minutes of weekly alternating strength exercises, 10-minutes of proprioceptive exercises and 10-minutes of upper and lower extremity stretching. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes	Usual care Participants maintained their usual daily activities, passive manual therapy and received the same supplement as the intervention group 3 times a week for 12 weeks.	• Gait and balance • Exercise capacity • Functioning
Flynn 2021 RCT Australia	N=40 adults with Parkinson's disease • Home-based and centre-based individualised exercise programme: n=20 • Centre-based individualised	Home-based and centre-based individualised exercise programme 3x 60-minute sessions per week for 10 weeks at a university physiotherapy clinic with physiotherapist and at home.	Centre-based individualised exercise programme 3x 60-minute sessions per week for 10 weeks at a university physiotherapy clinic with physiotherapist.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	exercise programme: n=20 Age in years [Mean (SD)]: • Home-based and centre-based individualised exercise programme: 72 (7.3) • Centre-based individualised exercise programme: 71 (6.6) Sex (M/F): • Home-based and centre-based individualised exercise programme: n=15/n=5 • Centre-based individualised exercise programme: n=15/n=5 Chronic neurological disorder category: Progressive neurological diseases.	Individualised tailored physiotherapist prescribed exercise programmes focusing on balance, gait, hypokinesia, bradykinesia, and postural instability. Exercises were completed during the 'ON' phase of medication. Weeks 1-5 (Block 1) involved 2 sessions at a university clinic and 1 session at home with 45-minutes of individually prescribed exercises and an additional 15-minute self-management programme to enhance exercise self-efficacy and management skills. Weeks 6-10 (Block 2) involved similar independent home-based exercises monitored via telehealth. Physiotherapists monitored progress by telephone in weeks 7 and 9. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes	Participants followed the same pre-block and Block 1 programme as those in the intervention arm. In Block 2 (weeks 6-10), participants continue the centre-based exercise programme. Exercises were completed during the 'ON' phase of medication.	
Forsberg 2016 Crossover RCT Sweden	N=87 adults with multiple sclerosis • Balance exercise programme (CoDuSe): n=44 • Waitlist control: n=43 Age in years [Mean (SD)]*: • Balance exercise programme (CoDuSe): 52 (10)	CoDuSe balance exercise programme 2x 35-45-minute group sessions (4-7 participants) per week for 7 weeks with physical therapist. Setting not reported. The intervention targeted visual, somatosensory, and vestibular aspects of	Waitlist control Participants were under waitlist control until they crossed over into the intervention arm (not considered in this review).	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	• Waitlist control: 56.3 (11) Sex (M/F): • Balance exercise programme (CoDuSe): n=7/n=28 • Waitlist control: n=7/n=31 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=35 in CoDuSe balance exercise programme and n=38 for waitlist control)	balance. Sessions involved 20-minutes of core stability exercises, 15-20 minutes each of dual-task exercises and exercises challenging different sensory strategies, and 5-minutes of stretching or relaxing. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises		
Gandolfi 2015 RCT Italy	N=80 adults with relapsing-remitting multiple sclerosis • Sensory integration balance training: n=39 • Conventional rehabilitation: n=41 Age in years [Mean (SD)]: • Sensory integration balance training: 47.21 (6.9) • Conventional rehabilitation: 49.56 (6.85) Sex (M/F): • Sensory integration balance training: n=11/n=28	Sensory integration balance training 3x 50-minute sessions per week for 5 weeks in an outpatient rehabilitation unit with a physical therapist. The programme addressed proprioceptive and central processing deficits. Each session consisted of tailored graded exercises in static and dynamic positions with 3 levels of sensory input (free vision, blindfolded, or wearing a visual-conflict dome). Complexity increased as condition improved.. Protocol intervention group: Rehabilitation interventions to address	Conventional rehabilitation 3x 50-minute sessions per week for 5 weeks in an outpatient rehabilitation unit with a physical therapist. Tailored passive and active lower limb joint mobilisation, muscle stretching, and strengthening exercises according to multiple sclerosis specific rehabilitation guidelines. Complexity increased as condition improved. Each session included the same frequency and duration of exercises	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Conventional rehabilitation: n=10/n=31 Chronic neurological disorder category: Progressive neurological diseases.	stability – Balance exercises	as the intervention group.	
Gandolfi 2017 RCT Italy	N=76 adults with Parkinson's disease • Virtual reality-based balance training: n=38 • Sensory integration balance training: n=38 Age in years [Mean (SD)]: • Virtual reality-based balance training: 67.45 (7.18) • Sensory integration balance training: 69.84 (9.41) Sex (M/F): • Virtual reality-based balance training: n=23/n=15 • Sensory integration balance training: n=28/n=10 Chronic neurological disorder category: Progressive neurological diseases.	Virtual reality-based balance training (Nintendo Wii) 3x 50-minute sessions per week for 7 weeks at home with physiotherapist supervising 2 participants at once. Sessions consisted of warm up and stretching and Nintendo Wii Fit® system (TeleWii) with Nintendo Wii Balance Board® based exercises such as table tilt and skateboarding. Games were selected by the physiotherapist based on the participant's condition and improvements. Participants were asked to train during the "ON" stage of medication. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Sensory integration balance training 3x 50-minute sessions per week for 7 weeks in an outpatient rehabilitation unit with physiotherapist. Sessions consisted of warm up and stretching, static and dynamic balance exercises under different sensory conditions (for example, blindfolded), and destabilisation exercises on a progressive basis according to ability. Participants were asked to train during the "ON" stage of medication.	• Gait and balance
Gandolfi 2018 RCT Italy	N=44 adults with multiple sclerosis • Robot-assisted hand training: n=23 • Non-robotic hand training: n=21	Robot-assisted hand training 2x 50-minute sessions per week for 5 weeks at an outpatient neurorehabilitation unit with a physiotherapist.	Non-robotic hand training 2x 50-minute sessions per week for 5 weeks at an outpatient neurorehabilitation	• Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	Age in years [Mean (SD)]: • Robot-assisted hand training: 51.96 (10.87) • Non-robotic hand training: 50.67 (10.80) Sex (M/F): • Robot-assisted hand training: n=10/n=13 • Non-robotic hand training: Unclear, reported incorrectly in paper Chronic neurological disorder category: Progressive neurological diseases.	The participant was seated with their arm strapped into a stabilizing splint attached to a robotic device. Three training modes were used for 10-minutes each: 1) Continuous passive motion for finger flexion and extension. 2) Assistive therapy, actively training the hand at performance limit. 3) Interactive virtual-reality therapy, using virtual therapy games where the participant exerted isometric force in flexion or extension. Task difficulty was adjusted by the physiotherapist based on performance. Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training	unit with a physiotherapist. Upper limb rehabilitation protocol, based on the neurodevelopmental technique, included limb mobilisation of the shoulder girdle, elbow, wrist, and fingers joints, movement facilitation, and active tasks selected from 15 challenging exercises. The focus was on improving muscle strength, dexterity, and motor control.	
Gandolfi 2019 RCT Italy	N=37 adults with Parkinson's disease • Trunk-specific exercise programme: n=19 • Standard rehabilitation: n=18 Age in years [Mean (SD)]: • Trunk-specific exercise programme: 72.42 (6.40) • Standard rehabilitation: 70.72 (6.60) Sex (M/F): • Trunk-specific exercise	Trunk-specific exercise programme 2x 60-minute sessions per week for 4 weeks with a physiotherapist in an outpatient neurorehabilitation unit and 3 sessions at home ('self-practice', including telephone contact with physiotherapist). Each session comprised three parts: 1) Active self-correction exercises (20-minutes) - graded exercises repeated under different sensory conditions with visual feedback (mirror), proprioceptive feedback (electromyography), or no feedback.	Standard rehabilitation 2x 60-minute sessions per week for 4 weeks with a physiotherapist in an outpatient neurorehabilitation unit and 3 sessions at home ('self-practice', including telephone contact with physiotherapist). Sessions involved 20-minutes each of joint mobilisation, muscle strengthening and stretching, and gait training and balance exercises.	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	programme: n=9/ n=10 • Standard rehabilitation: n=15/n=3 Chronic neurological disorder category: Progressive neurological diseases.	2) Trunk stabilisation exercises (20-minutes) aimed at strengthening the trunk muscles and stability and improvement of muscle coordination. 3) Functional tasks used as a 'distraction' (through dual-task exercises) to engage attention, foster self-correction, and promote trunk stabilisation. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises		
Gasner 2019 RCT Germany	N=43 adults with multiple sclerosis • Perturbation treadmill training: n=21 • Conventional treadmill training: n=22 Age in years: See Steib 2017 Sex: See Steib 2017 Chronic neurological disorder category: Progressive neurological diseases.	Perturbation treadmill training See Steib 2017 Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Conventional treadmill training See Steib 2017	• Limb/joint/muscle function
Gil-Agudo 2023 RCT Spain	N=23 adults with complete spinal cord injury • Robot-assisted gait training (HANK): n=12 • Conventional gait training: n=11 Age in years [Mean (SD)]*: • Robot-assisted gait training	Robot-assisted gait training (HANK) 3x 60-minute sessions per week over 5 weeks, with a physiotherapist. Each session involved 20-minutes for setting up, 30-minutes of robotic ambulatory gait training with lower limb exoskeleton "HANK", and 5-minutes each for rest and registering	Conventional gait training 3x 30-minute sessions per week over 5 weeks. Each rehabilitation session comprised traditional gait training with analytical mobilisation, strengthening for the lower limb and gait	• Gait and balance • Exercise capacity • Limb/joint/muscle function • Functioning

Study	Population	Intervention	Comparison	Outcomes
	(HANK): 41 (12.39) • Conventional gait training: 51.8 (11.93) Sex (M/F): • Robot-assisted gait training (HANK): n=7/n=4 • Conventional gait training: n=8/n=2 Chronic neurological disorder category: Acquired spinal cord injury. *Participant characteristics only reported for participants analysed rather than randomised (n=11 for robot-assisted gait training (HANK) and n=10 for conventional gait training)	variables assessed. There was access to external support if needed (therapist or walking aid). Physiotherapist feedback was provided during and after each session on walking pace and distance. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	re-education if possible.	
Gryfe 2022 RCT Canada	N=41 adults with Parkinson's disease • Exercise programme with exoskeleton: n=13 • Exercise programme without exoskeleton: n=15 • Waitlist control: n=13 Age in years [Mean (SD)]*: • Exercise programme with exoskeleton: 67.6 (5.9) • Exercise programme without	Exercise programme with exoskeleton 2x 60-minute sessions per week for 8 weeks at outpatient clinics with trained physiotherapy research assistants. Sessions included a walking warm-up, core strength exercises, aerobic walking, functional mobility tasks, ankle strength exercises, and balance/posture activities. Repetitions increased until week 5 and then maintained. The exoskeleton was used during all sessions.	1. Exercise programme without exoskeleton 2x 60-minute sessions per week for 8 weeks at outpatient clinics with trained physiotherapy research assistants. Participants completed the same programme as the intervention without using the exoskeleton device during sessions. 2. Waitlist control Participants underwent baseline and 8-week post-	• Gait and balance • Exercise capacity • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	exoskeleton: 70.7 (7.3) • Waitlist control: 69.3 (8.0) Sex (M/F): • Exercise programme with exoskeleton: n=4/n=9 • Exercise programme without exoskeleton: n=7/n=7 • Waitlist control: n=10/n=3 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=13 for exercise programme with exoskeleton, n=14 for exercise programme without exoskeleton, and n=13 for waitlist control)	Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Wearable garments, technology and exoskeletons	intervention assessments and received weekly calls but did not take part in the exercise interventions.	
Hind 2017 RCT UK	N=12 children and young people with Duchenne muscular dystrophy • Aquatic therapy and land-based training: n=8 • Land-based training: n=4 Age in years [Mean (SD)]: • Aquatic therapy and land-based training: 8.0 (0.9)	Aquatic therapy and land-based training 2x 30-minute sessions per week (up to 52 sessions) for 6 months in a hydrotherapy pool with physiotherapist trained in hydrotherapy. Tailored aquatic therapy involving active assisted or passive stretching targeting main muscle groups, simulated or real functional activities. Initial appointment	Land-based training 6 days per week for 6 months using local services and physiotherapists. Land based training based upon usual individualised physiotherapy intervention. This typically included regular stretching targeting main muscle groups, and advice towards	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	• Land-based training: 9.8 (2.5) Sex (M/F): • Aquatic therapy and land-based training: n=8/n=0 • Land-based training: n=4/n=0 Chronic neurological disorder category: Progressive neurological diseases.	included standard land-based therapy stretches and exercises with specialist physiotherapist and participants were asked to undertake land-based therapy on four of the other 5 days of the week. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy	directed exercise or regular activity. Prescription towards therapy was usually adjusted every 2-3 months based on progress.	
Hoang 2016 RCT Australia	N=50 adults with multiple sclerosis • Virtual reality-based step training: n=28 • Usual care: n=22 Age in years [Mean (SD)]: • Virtual reality-based step training: 53.4 (10.6) • Usual care: 51.4 (12.8) Sex (M/F): • Virtual reality-based step training: n=7/n=21 • Usual care: n=5/n=17 Chronic neurological disorder category: Progressive neurological diseases.	Virtual reality-based step training Minimum 2x per week at home for 12 weeks with exercise therapist. Two interactive exergames performed at home via a 6 panel stepping mat wirelessly connected to a television: 1) Stepmania, a rhythm video game requiring matching step direction and timing. 2) Choice stepping reaction time training requiring participants to quickly match the step direction displayed on screen. Follow-up check-in phone call occurred in the first 2 weeks. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Usual care Community setting for 12 weeks. Usual physical activity and assessments were performed in a gym setting.	• Gait and balance • Exercise capacity • Functioning
Kapadia 2014 RCT Canada	N=34 adults with traumatic incomplete spinal cord injury • Functional electrical stimulation plus bodyweight	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) 3x 45-minute sessions per week for 16 weeks	Resistance and aerobic exercise programme 3x 45-minute sessions per week for 16 weeks in an outpatient spinal	• Gait and balance • Exercise capacity • Functioning

Study	Population	Intervention	Comparison	Outcomes
	supported treadmill training: n=17 • Resistance and aerobic exercise programme: n=17 Age in years [Mean (SD)]: • Functional electrical stimulation plus bodyweight supported treadmill training: 56.59 (14.00) • Resistance and aerobic exercise programme: 54.06 (16.45) Sex (M/F): • Functional electrical stimulation plus bodyweight supported treadmill training: n=14/n=3 • Resistance and aerobic exercise programme: n=12/n=5 Chronic neurological disorder category: Acquired spinal cord injury.	in an outpatient spinal cord injury rehabilitation hospital with physiotherapist. Functional electrical stimulation targeting key lower limb muscles while walking on a bodyweight support treadmill with a harness system. Initially, 2 physiotherapists controlled each leg's stimulation via push buttons, progressing to participant-controlled gait. Sessions included multiple 4-5 minute walking bouts with rest intervals. Walking exercises had minimal bodyweight support, adjusting the speed for natural walking. Manual assistance was provided as needed for physiological movements. Protocol intervention group: Mixed (Rehabilitation interventions to mobility – Gait training: Rehabilitation interventions to address mobility: Lower limb wearables, electrical stimulation and lower-body robotics)	cord injury rehabilitation hospital with physiotherapist. Tailored exercise programme including 20-25 minutes of resistance training and 20-25 minutes of moderate intensity aerobic training (arm and leg cycling, walking on a treadmill or in parallel bars). Participants were given the option to use the treadmill if they could walk unassisted.	
Kleffelgaard 2019 RCT Norway	N=65 adults with traumatic brain injury • Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: n=33 • Multidisciplinary outpatient rehabilitation: n=32	Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation 2x group sessions (2-5 participants) totalling 150-minutes per week for 8 weeks at an outpatient rehabilitation clinic and with physiotherapist, psychiatrist and multidisciplinary team. Group sessions with, individually modified	Multidisciplinary outpatient rehabilitation Number and frequency of sessions not reported. Delivered at an outpatient rehabilitation clinic over 8 weeks with physiotherapist, psychiatrist and multidisciplinary team.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	Age in years [Mean (SD)]*: • Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: 37.6 (12.3) • Multidisciplinary outpatient rehabilitation: 41.2 (13.6) Sex (M/F): • Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: n=10/n=23 • Multidisciplinary outpatient rehabilitation: n=10/n=22 Chronic neurological disorder category: Acquired brain injury. *Participant characteristics only reported for participants analysed at first follow-up rather than randomised (n=33 for vestibular rehabilitation plus multidisciplinary outpatient rehabilitation and n=31 for multidisciplinary outpatient rehabilitation)	vestibular rehabilitation exercises, a tailored home exercise program, guidance sessions (reflections, confidence building, education, peer support) and an exercise diary. Session 1 featured individually modified vestibular rehabilitation exercises, while session 2 emphasised muscle conditioning and group interactions. Participants were also offered usual outpatient multidisciplinary rehabilitation with aim to assist participation in daily activities and return to work. Protocol intervention group: Rehabilitation interventions to address stability – Vestibular exercise, including optokinetic training	The control only received usual multidisciplinary outpatient rehabilitation as described in the intervention arm,.	
Lam 2015 RCT Canada	N=15 adults with motor-incomplete spinal cord injury • Robot-resisted treadmill training (Lokomat): n=8	Robot-resisted treadmill training (Lokomat) 3x 45-minutes per week for 3 months.	Robot-assisted treadmill training (Lokomat) 3x 45-minutes per week for 3 months.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	• Robot-assisted treadmill training (Lokomat): n=7 Age in years [Mean (SD)]: • Robot-resisted treadmill training (Lokomat): 40.3 (14.1) • Robot-assisted treadmill training (Lokomat): 50 (14.3) Sex (M/F): • Robot-resisted treadmill training (Lokomat): n=6/n=2 • Robot-assisted treadmill training (Lokomat): n=3/n=4 Chronic neurological disorder category: Acquired spinal cord injury.	Lokomat-based training using custom software to add resistance to hip and knee joints. Resistance level was individualised and force level was reassessed every 4-6 training sessions. Body- weight support was based on minimum tolerance levels and speed was initially 1.0 km/h, increasing by 0.1 km/h when speed could be maintained for at least 5-minutes. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Conventional Lokomat-based training assisting hip and knee joints to aid movement of the participants' legs. Body-weight support and speed of the treadmill was the same as for the intervention group.	
Leung 2014 RCT Australia	N=36 adults with traumatic brain injury • Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: n=18 • Tilt table standing plus multidisciplinary rehabilitation: n=18 Age in years [Mean (SD)]*: Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: 38 (14)	Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation 5x 30-minute sessions per week of tilt table standing with electrical stimulation, and ankle splinting for 5 days per week for 12 hours. Intervention lasted 6 weeks with physiotherapists, nursing staff and physiotherapy assistants in an inpatient rehabilitation unit. Participants underwent tilt table standing with wedge while electrical stimulation was applied to the ankle dorsiflexor muscles by	Tilt table standing plus multidisciplinary rehabilitation 3x 30-minute sessions per week for 6 weeks, delivered by physiotherapists. Participants underwent tilt table standing and received usual multidisciplinary rehabilitation as appropriate (no further details reported).	• Limb/joint/muscle functioning

Study	Population	Intervention	Comparison	Outcomes
	Tilt table standing plus multidisciplinary rehabilitation: 38 (15) Sex (M/F): • Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: n=14/n=3 • Tilt table standing plus multidisciplinary rehabilitation: n=15/n=3 Chronic neurological disorder category: Acquired brain injury. *Participant characteristics only reported for n=17 for tilt table standing, electrical stimulation and ankle splinting and n=18 tilt table standing only due to incorrect diagnosis after randomisation	physiotherapists. In addition, participants received usual multidisciplinary rehabilitation as appropriate (no further details reported). Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics.		
Lozano-Berrio 2022 RCT Spain	N=28 adults* with cervical spinal cord injury • Robotic training plus conventional therapy: n=14 • Conventional therapy: n=14 Age in years [Mean (SD)]**: • Robotic training plus conventional therapy: 39.92 (16.52)	Robotic training plus conventional therapy 5x 60-minute sessions per week for 8 weeks (maximum of 10 weeks) with clinical staff in an inpatient paraplegic unit. Participants received 30-minutes of daily conventional therapy focused on upper limb function and activities of daily living treatment as well as 30-minutes of upper limb robotic	Conventional therapy 5x 60-minute sessions per week for 8 weeks (maximum of 10 weeks) with clinical staff in an inpatient paraplegic unit. Participants received 30-minutes of daily conventional therapy for upper limb function and activities of daily living treatment plus	• Limb/joint/muscle function • Functioning

Study	Population	Intervention	Comparison	Outcomes
	• Conventional therapy: 46.81 (16.30) Sex (M/F): • Robotic training plus conventional therapy: n=8/n=5 • Conventional therapy: n=10/n=3 Chronic neurological disorder category: Acquired spinal cord injury. *Defined as 16 years or above. **Participants characteristics only presented for participants analysed rather than randomised (n=13 for each arm)	therapy using the Armeo®Spring device. This was split into two parts: 15-minutes each of normal and activities of daily living training for drinking. In the game, participants used the Armeo®Spring device to simulate the actions of reaching, lifting, drinking, and returning a glass to the table. Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training	an additional 30-minutes of conventional therapy (no further details).	
Lozano-Quilis 2014 RCT Spain	N=11 adults with relapsing-remitting and secondary-progressive multiple sclerosis • Virtual reality-based motor rehabilitation plus traditional physiotherapy: n=6 • Traditional physiotherapy: n=5 Age in years [Mean (SD)]: • Virtual reality-based motor rehabilitation plus traditional physiotherapy: 48.33 (10.82) • Traditional physiotherapy: 40.60 (9.24)	Virtual reality-based motor rehabilitation plus traditional physiotherapy 1x 15-minute (virtual reality) and 1x 45-minute (traditional therapy) weekly session for 10 weeks within a neurorehabilitation service in a multiple sclerosis association with a therapist. Virtual rehabilitation with RemoviEM software and hardware for motor rehabilitation exercises. Exercises were chosen by the therapist and involved 1) TouchBall, focused on balance and weight transfer with lateral movements of the trunk involving only the upper	Traditional physiotherapy 1x 60-minute weekly session for 10 weeks within a neurorehabilitation service in a multiple sclerosis association with a physiotherapist. Participants received standard balance and gait rehabilitation exercises.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	Sex (M/F): • Virtual reality-based motor rehabilitation plus traditional physiotherapy: n=3/n=3 • Traditional physiotherapy: n=4/n=1 Chronic neurological disorder category: Acquired spinal cord injury.	body, 2) TakeBall, focused on complete movements of upper limbs with coordination, 3) StepBall, focused on balance and weight transfer with lateral movements and monopodal load. Each exercise included time limits, visual and audio cues and feedback. Virtual rehabilitation occurred after traditional standard balance and gait rehabilitation. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR		
Manzanares 2021 RCT Spain	N=11 adults with spinal cord injury • Virtual reality navigation therapy plus standard rehabilitation programme: n=6 • Standard rehabilitation programme: n=5 Age in years [Mean (SD)]: • Virtual reality navigation therapy plus standard rehabilitation programme: 42.33 (10.72) • Standard rehabilitation programme: 42.40 (16.68) Sex (M/F): • Virtual reality navigation therapy plus standard rehabilitation	Virtual reality navigation therapy plus standard rehabilitation programme 3x 40-minutes per week for intervention and 5x 2-hours per week for standard rehabilitation for 6 weeks in a rehabilitation hospital with primary researcher. Semi-immersive virtual reality navigation therapy using an Interactive Rehabilitation Exercise system for 30- to 40-minutes per session. Participants sat in a real adapted boat with controls and VSail-Access simulation was projected ahead on a screen with boat, sail, sea and land visuals. Participants also underwent rehabilitation as per hospital protocol (details in control group).	Standard rehabilitation programme 5x 2-hours per week for 6 weeks in a rehabilitation hospital. Standard rehabilitation based on hospital protocol which included physiotherapeutic exercise, strengthening and mobility work.	• Gait and balance • Functioning

Study	Population	Intervention	Comparison	Outcomes
	programme: n=3/n=3 • Standard rehabilitation programme: n=4/n=1 Chronic neurological disorder category: Acquired spinal cord injury.	Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – exergaming and AR/VR		
Maranesi 2022 RCT Italy	N=32 adults with Parkinson's disease • Non-immersive virtual reality exergame and traditional rehabilitation programme: n=16 • Traditional rehabilitation programme: n=16 Age in years [Mean (SD)]*: • Non-immersive virtual reality exergame and traditional rehabilitation programme: 72.7 (6.3) • Traditional rehabilitation programme: 75.5 (5.4) Sex (M/F): • Non-immersive virtual reality exergame and traditional rehabilitation programme: n=6/n=10 • Traditional rehabilitation programme: n=9/n=5 Chronic neurological disorder category:	Non-immersive virtual reality exergame and traditional rehabilitation programme 2x 50-minute sessions per week for 5 weeks in an outpatient rehabilitation unit with physiotherapist. 30-minutes of traditional rehabilitation therapy (described in control arm) and 20-minutes of individually tailored non-immersive virtual reality exergaming (Tymo system). The participant controlled actions on a screen via body movements. Games involved movement to avoid obstacles, controlling the centre of gravity or objects on a plane, with some involving a cognitive element. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR	Traditional rehabilitation programme 2x 50-minute sessions per week for 5 weeks in an outpatient rehabilitation unit with physiotherapist. Sessions included breathing and relaxation, task-oriented exercises, walking with cues, stretching, static and dynamic balance training, flexibility exercises, unilateral and contralateral coordination exercises carried out both in bed as well as standing and using all limbs.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=16 for non-immersive virtual reality exergame and traditional rehabilitation programme and n=16 for traditional rehabilitation programme)			
Nilsagard 2013 RCT Sweden	N=44 adults with multiple sclerosis • Exergame-based balance exercises (Nintendo Wii): n=42 • Waitlist control: n=42 Age in years [Mean (SD)]: • Exergame-based balance exercises (Nintendo Wii): 50.0 (11.5) • Waitlist control: 49.4 (11.1) Sex (M/F): • Exergame-based balance exercises (Nintendo Wii): n=10/n=32 • Waitlist control: n=10/n=32 Chronic neurological disorder category: Progressive neurological diseases.	Exergame-based balance exercises (Nintendo Wii) 3x 30-minute sessions per week for 6-7 weeks with a physiotherapist. Supervised sessions of balance exercise using Nintendo Wii Fit Plus® with Wii Balance Board®. Programme exercises were controlled by balancing on the board. Initial exercises were easier and progressed to more difficult exercises where possible or after 'completing' a level. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Waitlist control No further details reported.	• Gait and balance • Exercise capacity
Novotna 2019	N=39 adults with multiple sclerosis	Tailored balance exercise programme	Waitlist control	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
RCT Czech Republic	• Tailored home-based balance exercise: n=23 • Waitlist control: n=16 Age in years [Mean (SD)]: • Tailored home-based balance exercise: 39.39 (9.68) • Waitlist control: 42.56 (10.63) Sex (M/F): • Tailored home-based balance exercise: n=6/n=17 • Waitlist control: n=4/n=12 Chronic neurological disorder category: Progressive neurological diseases.	Minimum 15-minutes daily (total estimated 7-hours) for 4 weeks in participant's home. Initial supervision by physiotherapist and then self-led. Interactive tailored home-based balance exercise training (Homebalance) with audio and visual feedback. The programme consists of two therapeutic games, one focusing on positioning and directional control, and a second focusing on stability with cognitive training. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	No further details reported.	
Palamara 2017 RCT Italy	N=34 adults with Parkinson's disease • Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: n=17 • Multidisciplinary intensive rehabilitation treatment: n=17 Age in years [Mean (SD)]: • Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: 70.9 (5.7) • Multidisciplinary intensive rehabilitation	Aquatic therapy plus multidisciplinary intensive rehabilitation treatment 3x 60-minutes per week of aquatic therapy on alternate days and 3-4x 60-minute daily sessions of physical therapy for 5 days. 60-minutes of physical exercise on day 6. Delivered in inpatient neurorehabilitation ward of a general hospital with physiotherapist specialised and multidisciplinary team. The aquatic therapy programme involved aerobic exercises and physical activities to assist with balance, motor skills, coordination and joint mobility. Sessions	Multidisciplinary intensive rehabilitation treatment 4x 60-minute daily sessions of physical therapy for 5 days. 60-minutes of physical exercise on day 6. Delivered in inpatient neurorehabilitation ward of a general hospital with multidisciplinary team. Tailored land based multidisciplinary intensive rehabilitation treatment. Physical therapy sessions involved, stretching, postural exercises, aerobic exercises, occupational therapy	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	treatment: 70.8 (5.3) Sex (M/F): • Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: n=9/n=8 • Multidisciplinary intensive rehabilitation treatment: n=11/n=6 Chronic neurological disorder category: Progressive neurological diseases.	consisted of 10-minutes of warm-up, 30-45 minutes of central session training (trunk mobility exercises, static and dynamic exercises, and balance training) and 5-minutes of cooldown. Complexity increased weekly. Participants additionally received multidisciplinary intensive rehabilitation treatment (described in control group). Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy	and speech therapy. The programme could involve robotic-assisted walking training for participants with gait complexity (for example, freezing) , virtual reality training, or consultations with neuropsychologist.	
Paul 2019 RCT UK	N=90 adults with multiple sclerosis • Web-based individualised physiotherapy programme: n=45 • Physiotherapy exercise information sheet: n=45 Age in years [Mean (SD)]: • Web-based individualised physiotherapy programme: 55.6 (10.2) • Physiotherapy exercise information sheet: 56.5 (9.1) Sex (M/F): • Web-based individualised physiotherapy programme: n=13/n=32	Web-based individualised physiotherapy programme Number and frequency of sessions tailored to exercise diaries every 2 weeks for 6 months in multiple sclerosis outpatient centres with physiotherapist. Personalised exercise programme via www.webbasedphysio.com. Programmes included disease-specific and tailored exercises, advice and education relating to cardiovascular, strengthening, and balance exercises, along with warm-up, cool-down, and stretching exercises at varying difficulty levels and in video, text and audio format. The physiotherapist remotely adjusted the intervention after	Physiotherapy exercise information sheet Setting was multiple sclerosis outpatient centre. Participants were provided with a printed exercise sheet, including exercises similar to those in the intervention group. Participants filled out a paper-based exercise diary.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	• Physiotherapy exercise information sheet: n=8/n=37 Chronic neurological disorder category: Progressive neurological diseases.	reviewing electronic exercise diaries every two weeks. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes		
Pavlikova 2020 RCT Czech Republic and Italy	N=178 adults with multiple sclerosis • Balance specific physiotherapy ○ Sensory-motor integration training: n=79 ○ Motor programme activating therapy: n=35 • Non-balance specific physiotherapy: ○ Conventional dynamic strengthening exercises: n=40 ○ Vojta reflex locomotion: n=24 Age in years [Mean (SD) not reported] [Median (IQR)]*: • Italian cohort (inpatient): 45.5 (14.5) • Italian cohort (outpatient): 48.9 (16.9) • Czech cohort (outpatient): 45.5 (19.0) Sex (M/F): • Italian cohort (inpatient): n=12/n=30 • Italian cohort (outpatient): n=21/n=36	Balance specific physiotherapy (Sensory-motor integration training or motor programme activating therapy) 20 sessions across 20 consecutive days for inpatients, and across 2 months for outpatients. Interventions included at least 25-minutes of balance specific treatment aimed to improve position, centre of mass, and body segment movement during static, dynamic and transitional tasks. Sensory-motor Integration Training focused on motor skill acquisition and balance exercises conducted under different sensory contexts oriented to the task execution. Motor Programme Activating Therapy exercises were conducted using a many somatosensory stimuli (mainly proprioceptive) in different functionally centred initial postural positions to foster responses. Protocol intervention group: Rehabilitation interventions to address	Non-balance specific physiotherapy (Conventional dynamic strengthening exercises or Vojta reflex locomotion) 20 sessions across 20 consecutive days for inpatients, and across 2 months for outpatients. Programmes aimed to reduce functional limitation with specific balance treatment restricted to a maximum of 10-minutes per session. Conventional dynamic strengthening exercises included stretching, core stability and light strengthening exercises. Vojta reflex locomotion treatment focused on activating global locomotion patterns by stimulating specific zones, with participants placed in a precisely determined initial position.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Czech cohort (outpatient): n=18/n=39 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics reported by study site and not intervention group	stability – Balance exercises		
Pazzaglia 2020 RCT Italy	N=51 adults with Parkinson's disease • Virtual reality-based rehabilitation programme: n=25 • Conventional rehabilitation programme: n=26 Age in years [Mean (SD)]: • Virtual reality-based rehabilitation programme: 72 (7) • Conventional rehabilitation programme: 70 (10) Sex (M/F): • Virtual reality-based rehabilitation programme: n=18/n=7 • Conventional rehabilitation programme: n=17/n=9 Chronic neurological disorder category: Progressive	Virtual reality-based rehabilitation programme 3x 40-minute sessions per week for 6 weeks in an outpatient setting. Using immersive virtual reality and motion analysis equipment, participants interacted with a screen through movement with 7 exercises and 4-minute tasks followed by a 1-minute break. Examples of exercises include touching and moving a trumpet across a screen, touching moles appearing from the ground, motor task balancing and quickly clearing leaves appearing on screen. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR	Conventional rehabilitation programme 3x 40-minute sessions per week for 6 weeks in an outpatient setting. Standard rehabilitation programme comprised of: warm-up (passive movements and muscular strengthening of lower limbs); active phase (motor coordination with upper and lower limbs, balance training, start and stop exercises and walking training, performed both standing or seated); and seated cool-down (manipulation, mobilisation and respiratory exercises).	• Gait and balance • Joint/limb/muscle function

Study	Population	Intervention	Comparison	Outcomes
	neurological diseases.			
Pelosin 2017 RCT Italy	N=30 adults with idiopathic Parkinson's disease • High-frequency treadmill training: n=10 • Intermediate-frequency treadmill training: n=10 • Low-frequency treadmill training: n=10 Age in years [Mean (SD)]: • Low-frequency treadmill training: 73.1 (6.8) • Intermediate-frequency treadmill training: 73.7 (8.3) • High-frequency treadmill training: 69.9 (4.5) Sex: Not reported Chronic neurological disorder category: Progressive neurological diseases.	1. High-frequency treadmill training 2. Intermediate-frequency treadmill training 5x (high-frequency) or 3x (intermediate-frequency) 45-minute sessions per week, totalling 10 sessions, in an outpatient clinic. Initial treadmill speed to 90% of overground comfortable walking speed with increase of 5% every 2 sessions to reach the target 115% for the final 2 training sessions. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Low-frequency treadmill training 2x 45-minute sessions per week, totalling 10 sessions, in an outpatient clinic. Initial treadmill speed to 90% of overground comfortable walking speed with increase of 5% every 2 sessions to reach the target 115% for the final 2 training sessions.	• Gait and balance
Picelli 2013 RCT Italy	N=60 adults with idiopathic Parkinson's disease • Robot-assisted gait training: n=20 • Treadmill training: n=20 • Conventional gait training: n=20 Age in years [Mean (SD)]: • Robot-assisted gait training: 68.50 (10.10)	Robot-assisted gait training 3x 45-minute sessions on alternating days per week for 4 weeks in a neurorehabilitation unit. Participants trained in a static suspension system with two motor-controlled footplates on two bars creating robotic assisted propulsion. Each session contained 3 parts with 5-minute breaks in-between.	1. Treadmill training 2. Conventional gait training 3x 45-minute (treadmill) or 30-minute (conventional) sessions on alternating days per week for 4 weeks in a neurorehabilitation unit with practitioner not reported (treadmill) or unspecified therapist (conventional).	• Gait and balance • Exercise capacity • Functioning

Study	Population	Intervention	Comparison	Outcomes
	• Treadmill training: 68.80 (7.72) • Conventional gait training: 67.55 (7.08) Sex (M/F): • Robot-assisted gait training: n=9/n=11 • Treadmill training: n=6/n=14 • Conventional gait training: n=8/n=12 Chronic neurological disorder category: Progressive neurological diseases.	Participants were initially trained at 20% of bodyweight supported with speed of 1 km/h for 10-minutes. This gradually changed to 0% of bodyweight supported and 2.0 km/h for 10-minutes. Sessions occurred during "ON" medication phase. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Treadmill training without bodyweight support comprised 3 parts and 5-minute breaks in-between. Conventional gait training was based on the proprioceptive neuromuscular facilitation concept focusing on pelvic control and movement for regulating gait. Sessions involved 10-minutes each of rhythmic initiation, slow reversal and agonistic reversal pelvic exercises. Participants started at 1 km/h for 10-minutes, increased to 1.5 km/h for 10-minutes and then 2.0 km/h for 10-minutes. Sessions occurred during "ON" medication phase.	
Piira 2019a RCT Norway	N=24 adults with motor incomplete spinal cord injury • Robot-assisted locomotor training (Lokomat): n=12 • Usual care: n=12 Age in years [Mean (SD)]*: • Robot-assisted locomotor training (Lokomat): 55 (8) • Usual care: 46 (15) Sex (M/F): • Robot-assisted locomotor training (Lokomat): n=4/n=3 • Usual care: n=5/n=7	Robot-assisted locomotor training (Lokomat) 3x per week over 6 months in an outpatient clinic with therapist. Sessions involved 20-30-minutes of preparation, 20-60 minutes of treadmill training with bodyweight support (less than 40% of initial bodyweight) and if time, a few minutes of overground walking with or without exercises on the treadmill. Feet and hips were placed in motorised braces (lining with the treadmill speed) and ongoing feedback was provided. Body-weight support was gradually reduced and adjusted guidance	Usual care 1-5x per week for 6 months in an outpatient clinic with local physical therapist. Low intensity usual care and participants wrote daily activities and training in a diary which was handed in once a month. Received regular follow-up phone calls to assist with compliance.	• Gait and balance • Exercise capacity • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	Chronic neurological disorder category: Acquired spinal cord injury. *Participant characteristics only reported for participants analysed rather than randomised (n=7 for robot-assisted locomotor training (Lokomat) and n=12 for usual care)	force and walking speed increased. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training		
Piira 2019b RCT Norway	N=20 adults with motor incomplete spinal cord injury • Bodyweight supported locomotor training: n=10 • Usual care: n=10 Age in years [Mean (SD)]: • Bodyweight supported locomotor training: 46 (14) • Usual care: 54 (13) Sex (M/F): • Bodyweight supported locomotor training: n=6/n=4 • Usual care: n=9/n=1 Chronic neurological disorder category: Acquired spinal cord injury.	Bodyweight supported locomotor training 2x 90-minute sessions, 5 days per week within 3 periods, each of 4 weeks, totalling 12 weeks. Delivered in an inpatient rehabilitation centre and home exercises with 3-5 practitioners. Participants used a treadmill with bodyweight support system. Training session length was based on individual endurance, correct lower limb movement and walking rhythm. Bodyweight support was aimed to be reduced to less than 40% with or without greater walking speed of 2-4 km/h. Mirror visual feedback aided pelvic and leg movement. Before and after each session, soft-tissue mobilisation and stretching was undertaken. Participants were provided with home exercises between sessions.	Usual care Varied number of sessions with physical therapist in inpatient rehabilitation centre. Usual care from local physical therapist ranging in frequency and intensity (for some this only involved passive movement of joints while for over 50% there was some overground gait training and independent gym training). Participants wrote daily activity and training diaries, submitted monthly. They received regular follow-up phone calls to aid compliance.	• Gait and balance • Exercise capacity • Joint/limb/muscle function

Study	Population	Intervention	Comparison	Outcomes
		Protocol intervention group: Rehabilitation interventions to address mobility – Gait training		
Pollet 2023 RCT Italy	N=42 adults with idiopathic Parkinson's disease • Custom-made shoe insole plus standard rehabilitation: n=21 • Sham flat insole plus standard rehabilitation: n=21 Age in years [Mean (SD)]: • Custom-made shoe insole plus standard rehabilitation: 72.0 (7.05) • Sham flat insole plus standard rehabilitation: 72.0 (5.02) Sex (M/F): • Custom-made shoe insole plus standard rehabilitation: n=15/n=6 • Sham flat insole plus standard rehabilitation: n=14/n=7 Chronic neurological disorder category: Progressive neurological diseases.	Custom-made shoe insole plus standard rehabilitation Wearing soles for a minimum 6-hours per day for 10 weeks at home and during daily activities. Rehabilitations sessions were 2x 90-minutes per week. Both groups received rehabilitation with each session consisting of 60-minutes of physiotherapy and 30-minutes of occupational therapy. At the end of this period, participants were assigned home-based exercises. Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics.	Sham flat insole plus standard rehabilitation Wearing soles for a minimum 6-hours per day for 10 weeks at home and during daily activities. Rehabilitations sessions were 2x 90-minutes per week for 20 sessions. Both groups received rehabilitation with each session consisting of 60-minutes of physiotherapy and 30-minutes of occupational therapy. At the end of this period, participants were assigned home-based exercises.	• Gait and balance
Pompa 2017 RCT Italy	N=50 adults with multiple sclerosis Robot-assisted gait training plus standard rehabilitation programme: n=25 • Conventional gait training plus	Robot-assisted gait training plus standard rehabilitation programme 3x 40-minute sessions per week for gait training and minimum 2 hours per day for standard rehabilitation.	Conventional gait training plus standard rehabilitation programme 3x 40-minute sessions per week for gait training and minimum 2 hours	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	standard rehabilitation programme: n=25 Age in years [Mean (SD)]: • Robot-assisted gait training plus standard rehabilitation programme: 47.00 (11.17) • Conventional gait training plus standard rehabilitation programme: 49.86 (8.21) Sex (M/F): • Robot-assisted gait training plus standard rehabilitation programme: n=11/n=10 • Conventional gait training plus standard rehabilitation programme: n=10/n=12 Chronic neurological disorder category: Progressive neurological diseases.	Over 4 weeks in an inpatient setting with 2 physiotherapists (gait training) multidisciplinary team (standard rehabilitation). Robot-assisted gait training sessions using harness support with feet placed on motorised foot-plates and movements guided by trainer, totalling 20-minutes of walking time. Initial sessions had 40-50% of bodyweight support and decreased quickly in remaining sessions due to the disability severity. Speed was usually 1.3-1.8 km/h. Participants also received standard rehabilitation as described in the control arm. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	per day for standard rehabilitation. Over 4 weeks in an inpatient setting with 2 physiotherapists (gait training) multidisciplinary team (standard rehabilitation). Conventional gait training sessions included static exercises (for example, balance and coordination exercises) and ground walking (which gradually increased in difficulty). Standard rehabilitation programme consisted of physical therapy (active and passive motion exercises, strengthening exercises, hand function, transfer and balance training) plus occupational, cognitive, respiratory or phoniatric therapy as needed.	
Prosperini 2013 Crossover RCT Italy	N=36 adults with relapsing-remitting or secondary progressive multiple sclerosis • Exergame-based balance training (Nintendo Wii): n=18 • No intervention: n=18 Age in years [Mean (SD)]: • Exergame-based balance training (Wii): 35.3 (8.6)	Exergame-based balance training (Nintendo Wii) 5x 30-minute sessions per week for 12 weeks at home with first sessions supervised by physiotherapist and thereafter self-led. Participants used the Nintendo Wii Balance Board® balance board and played games from a pre-specified list. The balance board used	No intervention No intervention received during the first 12 weeks by participants in the comparator arm (second cross-over period where they received the intervention is not considered in this review).	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• No intervention: 37.1 (8.8) Sex (M/F): • Exergame-based balance training (Nintendo Wii): n=5/n=13 • No intervention: n=6/n=12 Chronic neurological disorder category: Progressive neurological diseases.	centre of balance and links to an avatar on the screen. Each game started at the lowest level of difficulty and when users reach a certain score the programme automatically starts a new level. If this progress was not achieved, participants played each game for a maximum of ten minutes. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises		
Pullia 2023 RCT Italy	N=20 adults with Parkinson's disease • Virtual reality-based treadmill training (C-Mill): n=10 • Conventional gait training: n=10 Age in years [Mean (SD)]: • Virtual reality-based treadmill training (C-Mill): 64.5 (10.84) • Conventional gait training: 65. 5 (10.36) Sex (M/F): • Virtual reality-based treadmill training (C-Mill): n=9/n=1 • Conventional gait training: n=4/n=6 Chronic neurological disorder category: Progressive neurological diseases.	Virtual reality-based treadmill training (C-Mill) 4x 45-minute sessions per week over 5 weeks in a neurorehabilitation laboratory with physiotherapists. Participants trained with a C-Mill treadmill which had semi-immersive virtual reality. The treadmill contained bodyweight sensors, harness with safety rope, handrail and a projector for audio-visual stimuli. Sessions involved gait with projection of virtual obstacles, traffic cones or country paths and accompanying audio-visual stimuli, differential walking speeds and changes in lateral direction, based on virtual exercises projected on a screen ahead. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Conventional gait training 4x 45-minute sessions per week over 5 weeks in a rehabilitation gym with physiotherapists. Conventional motor rehabilitation programme with provision of weight-shifting exercises, monoprodalic and bipodal balance exercises, and gait training by the use of obstacles, tandem, and slalom walking with a variety of audio-visual cues. Manual guidance by physiotherapists lowered the risk of falls.	• Gait and balance • Exercise capacity • Limb/joint/muscle function • Functioning

Study	Population	Intervention	Comparison	Outcomes
Raciti 2022 RCT Italy	N=30 adults with idiopathic Parkinson's disease • Upper limb robotic therapy: n=15 • Conventional physical therapy: n=15 Age in years [Mean (SD)]*: • Upper limb robotic therapy: 65.7 (7) • Conventional physical therapy: 62.7 (10.1) Sex: Not reported Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=15 for upper limb robotic therapy and n=9 for conventional physical therapy)	Upper limb robotic therapy 6x 45-minute sessions per week for 8 weeks in an outpatient movement disorders clinic with a physiotherapist. Participants wore the Armeo®Spring mechanical device with an adaptable suspension system for the upper limb, supporting from the shoulder to the wrist and ending with a grasping system for the hand. Its sensitivity was adjusted based on the participant's condition. The system calibrated the working space and difficulty level according to the participant's active mobility and enhanced movements with visual feedback. A qualified physiotherapist adjusted the device, selected the workspace and exercises, and modified exercise difficulties. Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training	Conventional physical therapy 6x 45-minute sessions per week for 8 weeks in an outpatient movement disorders clinic with a physiotherapist. Participants underwent conventional rehabilitation, including passive and active-assisted mobilisation of the upper limbs, traditional neuromuscular facilitation training, proprioception exercises, stiffness reduction for joints and muscles, and active exercises involving reaching and picking objects.	• Limb/joint/muscle function • Functioning
Renfrew 2019 RCT UK	N=85 adults with multiple sclerosis and persistent foot-drop • Functional electrical stimulation: n=42 • Ankle-foot orthosis: n=43 Age in years [Mean (SD)]*: • Functional electrical	Functional electrical stimulation 12 months with physiotherapist. Odstock Dropped Foot Stimulator Pace was fitted, applying a wired heel switch and a 40 Hz stimulation frequency. Electrode position, pulse width, waveform and ramping parameters were	Ankle-foot orthosis 12 months with orthotist. Custom made, solid ankle-foot orthosis, made with 5 mm homopolymer polypropylene and following guideline for ankle-foot orthoses after stroke. Participants were instructed in	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	stimulation: 50.4 (10.4) • Ankle-foot orthosis: 51.4 (11.2) Sex (M/F): • Functional electrical stimulation: n=8/n=33 • Ankle-foot orthosis: n=20/n=18 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=41 for functional electrical stimulation and n=38 for ankle-foot orthosis)	adjusted for each participant for optimal muscle contraction. Participants were instructed in gradually increase usage over initial 6 weeks. Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics	gradually increase usage over initial 6 weeks.	
Robinson 2015 RCT UK	N=56 adults with multiple sclerosis • Exergame-based balance training (Nintendo Wii): n=20 • Traditional balance training: n=18 • No intervention: n=18 Age in years [Mean (SD)]*: • Exergame-based balance training (Nintendo Wii): 52.6 (6.1) • Traditional balance training: 53.9 (6.5) • No intervention: 51.9 (4.7)	1. Traditional balance training 2x 40-60-minute sessions per week for 4 weeks in an outpatient setting with physiotherapist. The traditional balance training was designed to be comparable to the exergame-based balance programme. All exercises were undertaken in standing position Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	No intervention No further details reported.	• Gait and balance • Functioning

Study	Population	Intervention	Comparison	Outcomes
	Sex (M/F): • Exergame-based balance training (Nintendo Wii): n=6/n=14 • Traditional balance training: n=7/n=12 • No intervention: n=5/n=12 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics reported for different allocation of participants (n=20 for exergame-based balance training (Nintendo Wii), n-19 for traditional balance training, and n=17 for no intervention)	2. Exergame-based balance training (Nintendo Wii) 2 x 40-60-minute sessions per week for 4 weeks in an outpatient setting with physiotherapist. Sessions were one-on-one and comprised of Nintendo Wii Fit® system games. These focus on balance, aerobic activity, and muscle strength. All games were undertaken in the standing position. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises		
Schaible 2021 RCT Germany	N=29 adults with Parkinson's disease • Personalised intensive physiotherapy programme: n=16 • Conventional physiotherapy programme: n=13 Age in years [Mean (SD)]: • Personalised intensive physiotherapy programme: 66.20 (8.65) • Conventional physiotherapy programme: 65.50 (8.21)	Personalised intensive physiotherapy programme 4x 60-minute sessions per week for 4 weeks in a university hospital with a physiotherapist and home-based practice. Individual sessions with personalised programme, including exercises such as complex motor sequences, stretching, dual tasks, core stability, and mental imagery. Training progressively increased in difficulty and take home worksheets were provided with encouragement of	Conventional physiotherapy programme 2x 60-minute sessions per week for 8 weeks in an office-based practice with a physiotherapist. No specific exercises, repetitions, or resistance levels were prescribed, reflecting the standard physiotherapy treatment for Parkinson's disease in such settings.	• Exercise capacity • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	Sex (M/F): • Personalised intensive physiotherapy programme: n=6/n=9 • Conventional physiotherapy programme: n=10/n=2 Chronic neurological disorder category: Progressive neurological diseases.	home practice for 4-6 hours per week. All participants were instructed to avoid additional activities. Sessions aimed for 60-80% maximal effort. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes		
Schlenstedt 2015 RCT Germany	N=40 adults with idiopathic Parkinson's disease • Resistance training balance exercises: n=20 • Conventional balance training: n=20 Age in years [Mean (SD)]*: • Resistance training balance exercises: 75.7 (5.5) • Conventional balance training: 75.7 (7.2) Sex (M/F): • Resistance training balance exercises: n=12/ n=5 • Conventional balance training: n=9/n=6 Chronic neurological disorder category: Progressive neurological diseases.	Resistance training balance exercises 2x 60-minute group based (4-5 participants) sessions per week for 7 weeks with sport scientist. Each session consisted of 10-minutes warm-up and 50-minutes of training. Training was focused on improving lower limb muscle strength. Participants completed 3 sets of 15-20 repetitions for each exercise or until failure. Resistance was increased if participants were able to complete the repetitions without failure. Resistance was provided using small weights or bodyweight. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Conventional balance training 2x 60-minute group based (4-5 participants) sessions per week for 7 weeks with sport scientist. Each session consisted of 10-minutes warm-up and 50-minutes of training. Training comprised stance and gait tasks requiring feedforward and feedback postural control. Progression was achieved by reducing or manipulating the sensory information needed to maintain balance and by adding movement to make the activity more dynamic. Each exercise lasted for 45 seconds and was repeated 3 times.	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	*Participant characteristics only reported for participants analysed rather than randomised (n=17 for resistance training balance exercises and n=20 for conventional balance training)			
Solaro 2020 RCT Italy	N=41 adults with multiple sclerosis • Robot-based haptic training: n=20 • Sensorimotor training: n=21 Age in years [Mean (SD)]: • Robot-based haptic training: 53 (10) • Sensorimotor training: 46 (10) Sex (M/F): • Robot-based haptic training: n=8/n=12 • Sensorimotor training: n=9/n=12 Chronic neurological disorder category: Progressive neurological diseases.	Robot-based haptic training 2x 40-minute sessions per week for 4 weeks in a neurology unit with a neurologist. The Haptic group's task was similar to the Sensorimotor group's but involved moving a virtual point mass connected to their hand by a linear spring. Subjects moved the point mass to the target area as quickly as possible. Difficulty could be adjusted. A performance score was displayed after each movement. Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training	Sensorimotor training 2x 40-minute sessions per week for 4 weeks in a neurology unit with a neurologist. Participants performed fast and accurate reaching movements toward targets with their most affect hand. The task was successfully completed when the virtual mass remained on the target for at least 150 ms. If a subject couldn't reach the target within 7 seconds, the robot completed the movement. A performance score was displayed at the end of each movement.	• Limb/joint/muscle function
Song 2018 RCT Australia	N=60 adults with idiopathic Parkinson's disease • Exergame-based step training: n=31 • Usual care: n=29 Age in years [Mean (SD)]: • Exergame-based step training: 68 (7)	Exergame-based step training 3x sessions for a minimum 15-minutes per week for 12 weeks at home with physiotherapist (first 2 sessions). Exergame (Dance Dance Revolution "Stepmania") where participants needed to	Usual care 12 weeks in the community setting. No intervention was received by participants and they were asked to continue usual healthcare.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Usual care: 65 (7) Sex (M/F): • Exergame-based step training: n=15/n=16 • Usual care: n=9/n=20 Chronic neurological disorder category: Progressive neurological diseases.	match direction and timing of arrows appearing on their television screen with customised step mat with arrows. Three types of randomly shown targets also appeared during the game to increase cognitive load. Each game lasted 2-3 minutes, and there were 4 levels of difficulty. Difficulty progressed through the sessions and physiotherapists visited after 6 weeks to check progress. Participants were every 2 weeks to check-in. Participants recorded exercise and adverse events in a log book. Participants had to be in the ”ON” phase of medication. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training		
Steib 2017 RCT Germany	N=43 adults with idiopathic Parkinson’s disease • Perturbation treadmill training: n=21 • Conventional treadmill training: n=22 Age in years [Mean (SD)]*: • Perturbation treadmill training: 67.6 (8.2) • Conventional treadmill training: 62.5 (7.9) Sex (M/F): • Perturbation treadmill training: n=11/n=7	Perturbation treadmill training 2x 40-minute session per week for 8 weeks with physiotherapist in movement disorder unit. A standard medical treadmill with handrails was mounted on a tiltable platform with 3 pneumatic actuators, inducing small, audible, three-dimensional tilting movements to perturb balance during walking. Participants were secured with a safety harness and minimal handrail support was encouraged. Treadmill speed was individually adjusted. Instructions and feedback from therapists were limited to step length, heel	Conventional treadmill training 2x 40-minute session per week for 8 weeks with physiotherapist in movement disorder unit. Thirty-minutes of treadmill training with 5-minutes each of warm up and cooldown. Participants in the control group walked on the same treadmill device but without perturbations.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	• Conventional treadmill training: n=16/n=4 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=18 for perturbation treadmill training and n=20 for conventional treadmill training)	strike, arm swing, and posture. One of these 4 instructions was given every 10-minutes, with a maximum of 3 instructions. Sessions included 5-minutes each of warm-up and cool-down (non-perturbated treadmill walking). Protocol intervention group: Rehabilitation interventions to address stability – Perturbation training		
Straudi 2013 RCT Italy	N=18 adults with multiple sclerosis • Robot-assisted gait training (Lokomat): n=9 • Conventional physiotherapy: n=9 Age in years [Mean (SD)]*: • Robot-assisted gait training (Lokomat): 49.6 (12.0) • Conventional physiotherapy: 61.0 (8.8) Sex (M/F): • Robot-assisted gait training (Lokomat): n=4/n=4 • Conventional physiotherapy: n=1/n=7 Chronic neurological disorder category: Progressive	Robot-assisted gait training (Lokomat) 2x 60-minute sessions per week for 6 weeks. Treadmill walking with assistance of Lokomat robotic-driven gait orthosis and harness for bodyweight support. Knee and hip torque was adjusted from 100-0% for one or both legs. Half of the session time was used as walking time. Treadmill speed ranged from 0-3 km/h and bodyweight support ranged from 0-100%. Speed and bodyweight support was adjusted based on individual performance. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Conventional physiotherapy 2x 60-minute sessions per week for 6 weeks. Initial 10-15 minutes of therapy for lower-limb and core stretching exercises and then lower-limb muscle strengthening exercises adjusted according to individual. Gait, coordination and balance exercises were optional during sessions.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=8 for each arm)			
Straudi 2016 RCT Italy	N=58 adults with primary or secondary progressive multiple sclerosis • Robot-assisted gait training (Lokomat): n=30 • Conventional walking therapy: n=28 Age in years [Mean (SD)]: • Robot-assisted gait training (Lokomat): 52.26 (11.11) • Conventional walking therapy: 54.12 (11.44) Sex (M/F): • Robot-assisted gait training (Lokomat): n=10/n=17 • Conventional walking therapy: n=8/n=17 Chronic neurological disorder category: Progressive neurological diseases.	Robot-assisted gait training (Lokomat) 2x 60-minute sessions per week for 6 weeks. Participants walked on a treadmill with assistance of Lokomat robotic-driven gait orthosis and wore a harness for bodyweight support. Half of the session time was used as walking time. Knee and hip torque was adjusted from 100-0% for one or both legs (Set to 100% for first sessions). Treadmill speed ranged from 0-3 km/h and bodyweight support ranged from 0-100%. Body-weight support was initially set to 50%. Speed and bodyweight support was adjusted by 10% at each session based on individual performance. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Conventional walking therapy 2x 60-minute sessions per week for 6 weeks. Participants underwent conventional walking therapy with the initial 10-15 minutes focused on lower limb and core stretching and then lower limb muscle stretching for 10 minutes, followed by motor coordination and gait and balance exercises for 30-minutes with adjustment to the individual's baseline.	• Gait and balance • Exercise capacity
Straudi 2020 RCT Italy	N=72 adults with primary or secondary progressive multiple sclerosis • Robot-assisted gait training (Lokomat) plus stretching and	Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises 60-minutes each of robot-assisted gait training and stretching and strengthening	Overground walking therapy plus stretching and strengthening exercises 60-minute each of overground walking and stretching and	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	strengthening exercises: n=36 • Overground walking therapy plus stretching and strengthening exercises: n=36 Age in years [Mean (SD)]: • Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: 56 (11) • Overground walking therapy plus stretching and strengthening exercises: 55 (11) Sex (M/F): • Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: n=12/n=24 • Overground walking therapy plus stretching and strengthening exercises: n=11/n=25 Chronic neurological disorder category: Progressive neurological diseases.	exercises over 12 sessions for 4 weeks. Treadmill walking with assistance of Lokomat robotic-driven gait orthosis and harness for bodyweight support. The session ran for 40-minutes including set up and familiarisation with about 30-minutes of real walking time. Knee and hip torque was adjusted from 100 to 0% for one or both legs (100% for first sessions). Treadmill speed ranged from 0- 3 km/h and bodyweight support ranged from 0 to 100% (initially 50%). Speed and bodyweight support was adjusted by 10% at each session based on performance. Afterwards, common to both arms, participants underwent lower limb and core stretching exercises as well as lower limbs strengthening exercises. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	strengthening exercises over 12 sessions for 4 weeks with physiotherapist and delivery setting indoors. One-on-one physiotherapy sessions including overground walking for about 40-minutes and 10-minutes of warm up and cool-down. Participants walked along an 80-metre corridor with no incline with usual walking aid. Rest pauses were allowed and gait speed was based on individual tolerance. Afterwards participants underwent exercises common to both arms as described in the intervention arm.	
Szefler-Derela 2020 RCT Poland	N=40 adults with idiopathic Parkinson's disease • Nordic walking training: n=20 • Standard rehabilitation: n=20	Nordic walking training 2x 90-minute sessions for 6 weeks with trained physiotherapist in a park. Each Nordic Walking session involved 5-10	Standard rehabilitation 2x 45-minute sessions for 6 weeks with physiotherapist in an indoors rehabilitation facility.	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	Age in years [Mean (SD) not reported] [Median (range)]: • Nordic walking training: 62.5 (50–75) • Standard rehabilitation: 65.5 (54–75) Sex (M/F): • Nordic walking training: n=10/n=10 • Standard rehabilitation: n=10/n=10 Chronic neurological disorder category: Progressive neurological diseases.	minutes of warm-up, Nordic walking training for 60-minutes which involved training to increase walking intensity and distance, and then cool-down with stretching for 5-10 minutes. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Sessions involved personalised, standard, general exercises for fine and gross motor skills in addition to active exercises to increase muscle strength, flexibility, balance, gait and transfers.	
Szymura 2020 RCT Poland	N=29 adults with idiopathic Parkinson's disease • Moderate-intensity balance exercises: n=16 • Waitlist control: n=13 Age in years [Mean (SD)]: • Moderate-intensity balance exercises: 66.00 (2.59) • Waitlist control: 65.23 (7.40) Sex (M/F): • Moderate-intensity balance exercises: n=11/n=5 • Waitlist control: n=8/n=5 Chronic neurological disorder category:	Moderate-intensity balance exercises 3x 60-minute sessions per week for 12 weeks with physiotherapist. Sessions were comprised 5-minutes warm-up, 50-minutes of balance training, and 5-minutes cool down. In order to allow adaptation, sessions only lasted for 30-minutes in the first week (with training was limited to 20-minutes). Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Waitlist control 12 weeks. Participants with Parkinson's disease that did not receive any intervention during the 12 week intervention period, but were able to take part in the balance programme after this period.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	Progressive neurological diseases.			
Taylor 2014 Crossover RCT UK	N=25 adults with secondary progressive multiple sclerosis and one dropped foot • Functional electrical stimulation: n=11 • Core stability physiotherapy programme: n=14 Age in years [Mean (SD)]*: • Functional electrical stimulation: 54.6 (9.4) • Core stability physiotherapy programme: 56.9 (7.8) Sex (M/F): • Functional electrical stimulation: n=4/n=8 • Core stability physiotherapy programme: n=4/ n=10 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics reported for participants enrolled prior to randomisation (n=12 for functional electrical stimulation and n=14 for core stability	Functional electrical stimulation 12 weeks, in clinic and at home. Participants received common peroneal stimulation via self-adhesive skin electrodes, focusing on dropped foot correction for initial 6 weeks. Gluteal stimulation was added in the last 6 weeks of the intervention period, focusing on hip extension. Current was applied between 20-100 mA, pulse width 200 microseconds, frequency 40 Hz. Protocol intervention group: Interventions for mobility – Lower limb wearables, electrical stimulation and lower-body robotics	Core stability physiotherapy programme 12 weeks, in clinic and at home. Participants received 6 in-clinic core physiotherapy sessions, progressing in difficulty. After this, the exercises were continued at home (and difficulty was not progressed during this period). No further details reported.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	physiotherapy programme).			
Taylor 2021 RCT UK	N=64 adults with idiopathic Parkinson's disease • Functional electrical stimulation plus standard care: n=32 • Standard care: n=32 Age in years [Mean (SD)]: • Functional electrical stimulation plus standard care: 69.3 (8.7) • Standard care: 71.3 (7.8) Sex (M/F): • Functional electrical stimulation plus standard care: n=23/n=9 • Standard care: n=23/n=9 Chronic neurological disorder category: Progressive neurological diseases.	Functional electrical stimulation plus standard care 18 weeks with initial visit in a clinic with physiotherapist or clinical scientist then home-based. Participants had a foot stimulator fitted in the clinic (to the leg the treating clinician identified as having the greatest deficit in dorsiflexion and eversion) and were shown how to fit it themselves in their own home. Participants did not receive guidance on how often to wear the foot stimulator. Both groups received standard care consisting of medication, attendance at medical clinics, exercise classes or visits from specialist nurses. Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics	Standard care 18 weeks with specialist nurses. Both groups received standard care consisting of medication, attendance at medical clinics, exercise classes or visits from specialist nurses.	• Gait and balance • Limb/joint/muscle function
Tollár 2018 RCT Hungary	N=64 adults with Parkinson's disease • Sensorimotor and visuomotor agility training: n=35 • Usual care: n=29 Age in years [Mean (SD)]*: • Sensorimotor and visuomotor agility training: 67.3 (3.4)	Sensorimotor and visuomotor agility training 5x 60-minute small group sessions per week for 3 weeks with physiotherapist at the gym. The intervention targeted postural instability and mobility deficits with a high-intensity, high-frequency sensorimotor	Usual care 3 weeks in the community setting. The control group continued their usual activities without exercise therapy and took prescribed medications.	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	• Usual care: 67.6 (4.1) Sex (M/F): • Sensorimotor and visuomotor agility training: n=17/n=18 • Usual care: n=12/n=8 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=35 for sensorimotor and visuomotor agility training and n=20 for usual care).	and visuomotor agility training program. Sessions involved: 10-minute warm-up (spinal mobilisation and stabilization and coordination exercises); 20-minute agility training (sensorimotor and visuomotor exercises focused on gait, coordination, posture, and balance); 20-minute Xbox virtual reality exergames (focusing on movement accuracy and reaction to visual and auditory cues); and 10-minute cooldown. The Xbox exergames provided feedback and adjusted difficulty. Participants kept logs of symptoms, and attendance was monitored daily. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Sensorimotor exercises		
Tollár 2019 RCT Hungary	N=49 adults with Parkinson's disease • Exergame-based rehabilitation programme: n=25 • Waitlist control: n=24 Age in years [Mean (SD)]: • Exergame-based rehabilitation programme: 70.0 (4.69) • Waitlist control: 67.5 (4.28) Sex: Not reported Chronic neurological disorder category:	Exergame-based rehabilitation programme 5x 60-minute group (4-8 participants) sessions per week for 5 weeks in a hospital outpatient gym with physical therapists. The intervention used three visual feedback modules of Xbox 360 for 15-minutes per module. These were Reflex Ridge (stimuli response); Space Pop (limb and whole-body movement) and Just Dance, (movement sequences). The intervention aimed to improve postural control, gait mobility,	Waitlist control 5 weeks. Continued normal activity with offer for enrolment into supervised exercise after the study. Participants were asked to not change their diet, medication or exercise routines during the study period.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	Progressive neurological diseases.	gait stability, turning, and dynamic and static. The intervention ran for 45-minutes with 5-minute each warm-up and cool down and 5-minutes of rest incorporated into sessions. Sessions occurred during “ON” medication phase. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR		
Tollár 2020 RCT Hungary	N=40 adults with multiple sclerosis • Balance training programme: n=14 • Exergame-based rehabilitation programme: n=14 • Waitlist control: n=12 Age in years [Mean (SD)]: • Balance training programme: 46.9 (6.6) • Exergame-based rehabilitation programme: 48.2 (5.8) • Waitlist control: 44.4 (6.76) Sex (M/F): • Balance training programme: n=2/n=12 • Exergame-based rehabilitation programme: n=2/n=12 • Waitlist control: n=1/n=11 Chronic neurological	1. Balance training programme 5x 60-minute group (4-8 participant) sessions per week for 5 weeks with physical therapists in an outpatient hospital. Dynamic and static balance and stepping exercises performed in multiple directions designed to improve clinical and motor symptoms of multiple sclerosis, quality of life, postural stability, and mobility. Each session comprised 40-minutes of training, and 10-minutes each of warm-up and cool-down. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises 2. Exergame-based rehabilitation programme 5x 60-minute group (4-8 participant) sessions per week for 5 weeks with physical therapists	Waitlist control Participants in this group were instructed to continue with standard physical therapy and their usual activities.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	disorder category: Progressive neurological diseases.	in an outpatient hospital physiotherapy gym. Training comprised sensorimotor and visuomotor agility training using an Xbox 360 core designed to improve clinical and motor symptoms of multiple sclerosis, quality of life, postural stability, and mobility. Each session comprised 40-minutes of training, and 10-minutes each of warm-up and cool-down. Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR		
Tramontano 2018 RCT Italy	N=30 adults with multiple sclerosis • Vestibular rehabilitation: n=15 • Standard neurorehabilitation: n=15 Age in years [Mean (SD)]: • Vestibular rehabilitation: 50.64 (11.73) • Standard neurorehabilitation: 45.77 (10.91) Sex (M/F): • Vestibular rehabilitation: n=6/n=9 • Standard neurorehabilitation: n=7/n=8 Chronic neurological disorder category: Progressive	Vestibular rehabilitation 5x 40-minute sessions per week and 5x 20-minute sessions per week for 4 weeks with physiotherapist in an inpatient multiple sclerosis unit. Vestibular rehabilitation treatment included gaze stability exercises (gaze on target with horizontal and vertical head movement, maximum 10-minutes) and postural stability exercises (blindfolded, marching in place and then turning clockwise for up to 10-minutes with breaks). Exercises were adapted to each participant's motor competence and needs. Protocol intervention group: Rehabilitation interventions to address stability – Vestibular	Standard neurorehabilitation 5x 40-minute sessions per week for 4 weeks with physiotherapist in an inpatient multiple sclerosis unit. Muscle stretching, postural alignment, active-assisted mobilisations, and neuromuscular facilitation to improve motor recruitment. Balance training involved standing and dynamic tasks with progressive restrictions of the support base, using unstable surfaces in various positions. Dual-task exercises with a ball were incorporated to create open tasks, performed with eyes open and closed.	• Gait and balance • Exercise capacity

Study	Population	Intervention	Comparison	Outcomes
	neurological diseases.	exercise, including optokinetic training		
Tramontano 2020 RCT Italy	N=31 adults with multiple sclerosis • Robot-assisted upper limb training (PABLO-Tyromotion): n=15 • Upper limb sensorimotor training: n=16 Age in years [Mean (SD)]*: • Robot-assisted upper limb training (PABLO-Tyromotion): 46.7 (10.4) • Upper limb sensorimotor training: 52.3 (5.4) Sex (M/F): • Robot-assisted upper limb training (PABLO-Tyromotion): n=6/n=8 • Upper limb sensorimotor training: n=6/n=10 Chronic neurological disorder category: Progressive neurological diseases. *Participant characteristics only reported for participants analysed rather than randomised (n=14 for Robot-assisted upper limb training (PABLO-Tyromotion) and n=16 for upper limb sensorimotor training)	Robot-assisted upper limb training (PABLO-Tyromotion) 3x 40-minute sessions per week for 4 weeks with physiotherapist in clinical setting. Upper limb training using PABLO®-Tyromotion. Each session involved virtual reality-based interactive games, providing task-oriented exercises and neurocognitive feedback. The exercises required precision tasks and one-dimensional and two-dimensional reactions, training attention, strength control, movement control, coordination, and precision. Training was performed in addition to conventional neurorehabilitation (no further details reported). Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training	Upper limb sensorimotor training 3x 40-minute sessions per week for 4 weeks with physiotherapist in clincal setting. Participants completed upper limb sensory-motor training without robotic support, focusing on recovering global upper limb functions, controlling hand grasp, and improving fine hand movements. Training was performed in addition to the conventional neurorehabilitation (no further details reported)	• Gait and balance • Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
Tramontano 2022 RCT Italy	N=30 adults* with severe traumatic brain injury • Vestibular rehabilitation plus standard neurorehabilitation: n=15 • Conventional balance rehabilitation plus standard neurorehabilitation: n=15 Age in years [Mean (SD)]: • Vestibular rehabilitation plus standard neurorehabilitation: 34.7 (12.8) • Conventional balance rehabilitation plus standard neurorehabilitation: 36.8 (12.9) Sex (M/F): • Vestibular rehabilitation plus standard neurorehabilitation: n=7/n=8 • Conventional balance rehabilitation plus standard neurorehabilitation: n=12/n=3 Chronic neurological disorder category: Acquired brain injury. *Defined as 15 years or above.	Vestibular rehabilitation plus standard neurorehabilitation 3x 20-minute sessions for 4 weeks with physiotherapist in an inpatient neurorehabilitation unit. Vestibular rehabilitation involved gaze stability (focus on target with horizontal and vertical head movement, up to 10-minutes) exercises and dynamic postural stability exercises (blindfolded clockwise steps in place and on treadmill, up to 5-minutes including rests). Details of standard neurorehabilitation not reported. Protocol intervention group: Rehabilitation interventions to address stability – Vestibular exercise, including optokinetic training	Conventional balance rehabilitation plus standard neurorehabilitation 3x 20-minute sessions for 4 weeks with physiotherapist in an inpatient neurorehabilitation unit. Conventional balance rehabilitation focused on trunk stabilisation through 3 exercises: seated on a Bobath ball blindfolded for 5-minutes, with physiotherapist support, standing on a Freeman board for 5-minutes, and transferring bodyweight while standing using parallel bars for 10-minutes. Details of standard neurorehabilitation not reported.	• Gait and balance
van den Heuvel 2014 RCT	N=33 adults with idiopathic Parkinson's disease • Interactive balance training with augmented	Interactive balance training with augmented visual feedback 2x 60-minute sessions per week for 5 weeks	Conventional balance training 2x 60-minute sessions per week for 5 weeks with	• Gait and balance • Functioning

Study	Population	Intervention	Comparison	Outcomes
The Netherlands	visual feedback: n=17 • Conventional balance training: n=16 Age in years [Mean (SD)]: • Interactive balance training with augmented visual feedback: 66.3 (6.39) • Conventional balance training: 68.8 (9.68) Sex (M/F): • Interactive balance training with augmented visual feedback: n=12/n=5 • Conventional balance training: n=8/n=8 Chronic neurological disorder category: Progressive neurological diseases.	with senior therapist in an outpatient setting. Each session included 45-minutes of balance training with an on-screen virtual avatar connected to force plate and sensors providing balance visual feedback. Programme exercises challenged control of body lean and functional ability and difficulty could be adjusted. The programme involved dynamic balance exercises focusing on controlling body posture and included dual-task exercises. Participants worked in pairs, taking turns in performing the exercise or resting. Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	senior therapist in an outpatient setting. Each session included 45-minutes of balance training with dynamic balance exercises focusing on controlling body posture and included dual-task exercises. Participants worked in pairs, taking turns in performing the exercise or resting. Exercises were taken from national physical therapy guidelines. These exercises focused on training standing balance and included exercises completed under different conditions.	
Wallén 2018 RCT Sweden	N=100 adults with Parkinson's disease • Hi Balance training programme: n=51 • Usual care: n=49 Age in years [Mean (SD)]: See Conradsson 2015 Sex (M/F): See Conradsson 2015 Chronic neurological disorder category: Progressive	Hi Balance training programme See Conradsson 2015 Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises	Usual care See Conradsson 2015	• Gait and balance

Study	Population	Intervention	Comparison	Outcomes
	neurological diseases.			
Wirz 2017 RCT Switzerland	N=21 adults with subacute traumatic spinal cord injury • High-intensity (50 mins) robotic-assisted gait training sessions (Lokomat): n=11 • Low-intensity (25 mins) robotic-assisted gait training sessions (Lokomat): n=10 Age in years [Mean (SD)]*: • High-intensity (50 mins) robotic-assisted gait training sessions (Lokomat): 35.56 (13.80) • Low-intensity (25 mins) robotic-assisted gait training sessions (Lokomat): 34.33 (15.96) Sex (M/F): • High-intensity (50 mins) robotic-assisted gait training sessions (Lokomat): n=8/n=1 • Low-intensity (25 mins) robotic-assisted gait training sessions (Lokomat): n=8/n=1 Chronic neurological disorder category: Acquired spinal cord injury. *Participant characteristics only reported for	High-intensity (50 mins) robotic-assisted gait training sessions (Lokomat) 3-5x minimum 50-minutes per week for 8 weeks. Robotic assisted locomotor training Lokomat for a minimum of 50-minutes walking time. The first 5 sessions optimised set up and familiarisation. Legs were loaded with bodyweight as tolerated, speed ranged from 1.6-3.5 km/h, force was 100% to lowest tolerated (0%) and participants could view graphical feedback of hip and knee joints. Each session involved 3-minutes of walking without specification and every third minute, speed and force were changed or feedback was switched on or off to avoid monotony. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	Low-intensity (25 mins) robotic-assisted gait training sessions (Lokomat) 3-5x minimum 25-minutes per week for 8 weeks. Robotic assisted locomotor training using Lokomat with a minimum of 25-minutes training session walking time. Otherwise, protocol was same as intervention.	• Limb/joint/muscle function

Study	Population	Intervention	Comparison	Outcomes
	participants analysed rather than randomised (n=9 in each arm)			
Wroblewska 2019 RCT Poland	N=40 adults with Parkinson's disease • Nordic walking training: n=20 • No intervention: n=20 Age in years [Mean (SD)]: • Nordic walking training: 72.1 (7.5) • No intervention: 67.6 (6.6) Sex (M/F): • Nordic walking training: n=8/n=12 • No intervention: n=9/n=11 Chronic neurological disorder category: Progressive neurological diseases.	Nordic walking training 2x 60-minute sessions per week for 12 weeks with physiotherapist outdoors. Participants had three initial sessions for familiarisation with the Nordic Walking technique. Each session started with warm up and stretching, then Nordic Walking and then final stretch and cool down. Protocol intervention group: Rehabilitation interventions to address mobility – Gait training	No intervention 12 weeks. Participants did not use any form of physiotherapy and advised not to change current lifestyle or discontinue any leisure activities.	• Gait and balance
Zivi 2018 RCT Italy	N=40 adults with general peripheral neuropathies • Hydrotherapy plus inpatient rehabilitation programme: n=21 • Land-based therapy plus inpatient rehabilitation programme: n=19 Age in years [Mean (SD)]: • Hydrotherapy plus inpatient rehabilitation programme: 66.3 (13.0)	Hydrotherapy plus inpatient multidisciplinary rehabilitation programme 3x 60-minute sessions per week of aquatic based therapy and daily rehabilitation programme for 4 weeks in an inpatient setting with multidisciplinary team. Hydrotherapy sessions involved relaxation and breath control, balance and posture and gait exercises and occurred on three alternate days of the first rehabilitation	Land-based therapy plus inpatient multidisciplinary rehabilitation programme 3x 60-minute sessions per week of land-based therapy and daily rehabilitation programme for 4 weeks in an inpatient setting with multidisciplinary team. Same protocol as intervention, except on 3 alternate days of the week the first session was carried	• Gait and balance • Functioning

Study	Population	Intervention	Comparison	Outcomes
	• Land-based therapy plus inpatient rehabilitation programme: 71.8 (7.7) Sex (M/F): • Hydrotherapy plus inpatient rehabilitation programme: n=11/n=10 • Land-based therapy plus inpatient rehabilitation programme: n=8/n=11 Chronic neurological disorder category: Mixed (General peripheral neuropathies).	programme session (below). Inpatient multidisciplinary rehabilitation programme was specific to peripheral neuropathy with daily sessions involving individual training with physical therapist (60-minutes per day, 5 days per week), exercise with physical therapist using devices such as treadmill, cycloergometer, cyclette, stabilometric platform (60-minutes per day, 6 days per week) and occupational therapy (60-minutes per day, 5 days per week). Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy	out overground. As for hydrotherapy, sessions involved relaxation and breath control, balance and posture and gait exercises.	

AR: augmented reality; CoDuSe: core stability, dual task training, and sensory strategies; Hz: hertz; km/h: kilometres per hour; mA: milliamps; mm: millimetre; ms: miliseconds; RCT: randomised controlled trial; SD: standard deviation; VR: virtual reality.

See the full evidence tables in appendix D and the forest plots in appendix E.

Summary of the evidence

For the purpose of analysis, results where the effect estimate is above a minimum important difference (MID) and the 95% CI crosses the line of no effect are interpreted as showing no evidence of important difference. If the effect estimate is between the 2 MIDs, this is interpret-ed as showing no important difference. This level of detail can be found in the GRADE tables in appendix F. However, to improve the clarity of reporting throughout this evidence summary, any effect estimate where the 95% confidence interval crosses a line of no effect has simply been interpreted as no important difference, regardless of whether the point estimate exceeds the minimally important difference.

Rehabilitation interventions to address upper limb function

Robotics and repetitive task training

Across all comparisons within this protocol intervention group, the majority showed no important difference between the interventions compared (for example robotic training plus conventional therapy for people with spinal cord injury versus conventional therapy only, and upper limb robotics for people with multiple sclerosis versus control). There was 1 exception identified at post-intervention in people with Parkinson's disease receiving upper limb robotic

therapy compared to those receiving conventional physical therapy, where intervention participants had statistically significantly better upper limb function outcomes compared to control, although it should be noted that there was no corresponding important difference seen in hand function and no statistically significant difference in motor functioning or functioning outcomes at the same time point. The term statistically significant benefit rather than important benefit is used because although there is a statistically significant benefit, we cannot ascertain clinical importance (for example, if standard deviations were not reported or if only f-values were reported).

All evidence in this protocol intervention group was judged to be very low quality. Effect estimates where no difference was found between interventions were all marked down for imprecision, and typically only came from 1 study. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

Rehabilitation interventions to address stability

Vestibular exercise, including optokinetic training

Across all comparisons within this protocol intervention group, the majority showed no important difference between the interventions compared (for example, vestibular rehabilitation in adults with acquired brain injury compared to control and home-based optokinetic training intervention compared to usual care for adults with spinocerebellar ataxia 6). One exception was important benefits seen in balance only outcomes at post-intervention in adults with multiple sclerosis receiving vestibular rehabilitation compared to conventional neurorehabilitation. However, no important difference was seen in the gait and balance, gait only and exercise capacity outcomes for the same comparison at the same timepoint.

Evidence in this protocol intervention group was judged to be of very low to low quality. Effect estimates where no difference was found between interventions were all marked down for imprecision, and typically only came from 1 study. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

Balance exercises

Across all comparisons within this protocol intervention group, most outcomes showed no important or statistically significant difference between the interventions compared at any time point (for example, gait and balance outcomes at either post-intervention or follow-up in adults with multiple sclerosis receiving balance exercises compared to control participants and balance only outcomes at either post-intervention or follow-up in adults with Parkinson's disease performing balance exercises versus a control group). There were several exceptions to this rule, where important benefits were identified: balance at post-intervention in adults with multiple sclerosis receiving balance exercises compared to control (although this was not sustained at follow-up time points); and gait and balance at post-intervention in adults with Parkinson's disease receiving balance exercises compared to control (although this was not sustained at follow-up time points)

A few other significant benefits were seen throughout the comparisons, but these tended to be studies that had reported multiple measures of an outcome domain, and already had data included in the meta-analysis, or interim improvements in outcomes that were not sustained at a later follow-up date.

The quality of the evidence in this protocol intervention group ranged from very low to low. Outcomes were typically downgraded due to concerns over risk of bias from the contributing studies and imprecision in the effect estimate.

Perturbation training

For the 1 intervention investigated in this group in adults with Parkinson's disease, an important benefit was seen in 1 gait and balance outcome (timed up and go) at post-intervention in people receiving perturbation treadmill training. However, this difference was not retained at follow-up and no difference was observed in any other outcome at any timepoint (including another gait and balance measure).

All evidence in this protocol intervention group was judged to be of very low quality. Effect estimates where no difference was found between interventions were all marked down for imprecision, and only came from 1 study. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

Rehabilitation interventions to address mobility

Gait training

Across all the comparisons comparing gait training with a control group, the majority of outcomes showed no important or statistically significant difference between interventions (for example, gait and balance at post-intervention or follow-up in adults with multiple sclerosis, and limb/joint/muscle function at post-intervention in people with Parkinsons's disease). The main exception to this was results from a 3-arm trial comparing robot-assisted gait training with treadmill training with conventional gait training. There were important benefits seen in gait, balance and exercise capacity outcomes at both post-intervention and follow-up when comparing robot-assisted or treadmill training to conventional gait training. Evidence was mixed but generally there was no important difference between groups when comparing robot-assisted gait training to treadmill training.

One study compared gait training with different frequencies, a 3-arm trial in adults with Parkinson's disease. Typically, high-frequency treadmill training showed important harms in changes in all outcomes at all timepoints when compared to both low- and intermediate-frequency treadmill training. Evidence was mixed when comparing intermediate- and low-frequency treadmill training but typically showed no difference between groups for gait and balance and gait only outcomes, but an important benefit in participants receiving intermediate-frequency training for balance only outcomes.

A few other significant benefits were seen throughout the comparisons, but these tended to be studies that had reported multiple measures of an outcome domain, and already had data included in the meta-analysis, or interim improvements in outcomes that were not sustained at a later follow-up date.

The quality of the evidence in this protocol intervention group ranged from very low to moderate. Outcomes were typically downgraded due to concerns over risk of bias from the contributing studies, inconsistency between studies that could not be explained by sub-group analysis, and imprecision in the effect estimate.

Lower limb wearable, electrical stimulation and lower-body robotics

Across all comparisons within this protocol intervention group, the majority showed no important or no statistically significant difference between the interventions compared (for example, a custom-made shoe insole plus standard rehabilitation for adults with Parkinson's disease compared to a sham flat insole plus standard rehabilitation, and functional electrical stimulation versus ankle foot orthosis in adults with multiple sclerosis). One exception was identified in spasticity outcomes at post-intervention, which showed an important benefit in adults with acquired brain injury receiving functional electrical stimulation plus ankle splinting plus tilt table standing compared to tilt table standing only. This difference was not sustained at follow-up.

The quality of the evidence in this protocol intervention group ranged from very low to moderate. All but 2 effect estimates where no difference was found between interventions were marked down for imprecision, and were always informed by only 1 study. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

Rehabilitation interventions to address limb functioning, stability and mobility together

Sensorimotor exercises

Adults with Parkinson's disease receiving a sensorimotor and visuomotor agility training programme showed an important benefit in changes in gait and balance at post-intervention.

The quality of the evidence was judged to be low, as it was downgraded for concerns over the risk of bias from the 1 contributing study.

Hydrotherapy

Across all comparisons for this intervention group, the majority reported no important difference between groups (for example, aquatic training plus multidisciplinary neurorehabilitation for people with acquired brain injury compared to land-based training plus multidisciplinary neurorehabilitation, and aquatic therapy and land-based training in children and young people with Duchenne's muscular dystrophy versus land-based training alone). The exceptions to this was important benefits identified in changes in gait and balance and balance only outcomes at 6 months follow-up in adults with Parkinson's disease receiving aquatic therapy plus multidisciplinary intensive rehabilitation treatment, and an important benefit identified in a gait and balance outcome at post-intervention in adults with general peripheral neuropathies participating in hydrotherapy plus inpatient multidisciplinary rehabilitation programme.

The quality of the evidence in this protocol intervention group ranged from very low to moderate. Effect estimates where no difference was found between interventions were all marked down for imprecision, and were only informed by 1 study. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

Exergaming and AR/VR

Across all comparisons within this protocol intervention group, half showed no important difference between the interventions compared (for example, non-immersive virtual reality exergame and traditional rehabilitation programme compared to traditional rehabilitation programme in adults with Parkinson's disease, and virtual reality-based motor rehabilitation plus traditional physiotherapy versus traditional physiotherapy in adults with multiple sclerosis). Exceptions were 2 studies investigating exergame-based rehabilitation programmes versus waitlist control, which showed important benefits at post-intervention: gait and balance and exercise capacity outcomes in adults with Parkinson's disease, and exercise capacity outcomes in adults with multiple sclerosis.

All but 1 effect estimate in this protocol intervention group was judged to be either very low or low quality. Effect estimates where no difference was found between interventions were all marked down for imprecision, and came from a single or low number of studies. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

Wearable garments, technology and exoskeletons

One study investigated the impact of an exercise programme completed with an exoskeleton to both the same exercise programme completed without an exoskeleton and a waitlist control, in adults with Parkinson's disease. No important difference was seen in changes in

gait and balance or motor functioning outcomes at post-intervention, when the exoskeleton exercise programme was compared to either control. However, an important benefit was seen in the post-intervention exercise capacity of exoskeleton participants compared to both controls.

All evidence in this protocol intervention group was judged to be either low or very low quality. Effect estimates were all marked down for imprecision, and only came from 1 study.

Individualised (tailored) exercise programmes

Across all comparisons within this protocol intervention group, the majority showed no important difference between the interventions compared (for example, a web-based individualised physiotherapy programme versus a physiotherapy exercise information sheet in adults with multiple sclerosis, and a home-based and centre-based individualised exercise programme compared to centre-based individualised exercise programme in adults with Parkinson's disease). There were 2 exceptions. Adults with amyotrophic lateral sclerosis receiving a tailored exercise programme showed an important benefit in gait and balance, exercise capacity and functioning outcomes at post-intervention, compared to usual care. Similarly, important benefits in exercise capacity and motor functioning outcomes at post-intervention were seen in adults with Parkinson's disease taking part in a personalised intensive physiotherapy programme versus those performing conventional physiotherapy. No follow-up data were reported.

The quality of evidence in this intervention protocol group ranged from very low to low. Outcomes were typically downgraded due to concerns over risk of bias from the contributing studies and imprecision in the effect estimate.

Mixed interventions

For both comparisons in this intervention group (bodyweight supported gait training plus bodyweight supported balance exercises compared to conventional rehabilitation treatment in adults with Parkinson's disease and functional electrical stimulation plus bodyweight supported treadmill training versus a resistance and aerobic exercise programme in adults with acquired spinal cord injury), the majority reported no important difference between groups. The 1 exception to this was a statistically significantly higher (better) change in functioning in participants receiving bodyweight supported gait training plus bodyweight supported balance exercises at post-intervention.

All effect estimates in this protocol intervention group were judged to be of very low quality. Effect estimates where no difference was found between interventions were all marked down for imprecision, and came from a single study. As such, these findings should not be taken as definitive evidence of no difference between the interventions.

See appendix F for full GRADE tables.

Economic evidence

Included studies

A systematic review of the economic literature was conducted but no economic studies were identified which were applicable to this review question.

See supplementary material 2 for details on the economic search undertaken for this guideline.

Excluded studies

Economic studies not included in this review are listed, and reasons for their exclusion are provided in appendix J.

Summary of included economic evidence

No economic studies were identified which were applicable to this review question.

Economic model

No economic modelling was undertaken for this review because the committee agreed that other topics were higher priorities for economic evaluation.

The committee's discussion and interpretation of the evidence

The outcomes that matter most

The guideline committee discussed which outcomes to include in this review and chose the following: gait and balance; exercise capacity; limb/joint/muscle function; respiratory function; and functioning. All were judged to be critical.

The committee noted that the aim of this review had 3 components: stability, mobility and upper limb function. Therefore, they prioritised outcomes to assess gait and balance, and limb/joint/muscle functioning in order to cover each of this broad domains. Additionally, they noted that interventions should not just be effective in this discrete domains, but that it matters how these benefits translate to overall functional independence of an individual. With this in mind, they included general functioning as a critical outcome. Finally, the committee went on to discuss a potential longer-term benefit of improved stability, mobility and upper limb function, that of physical activity and exercise. They agreed that maintaining physical activity and ability to exercise is paramount when discussing rehabilitation for people with chronic neurological disorders, not only when considering rehabilitation exercises themselves but its well documented impact on endurance, cardiac health and cognition. Due to this importance, they selected exercise capacity and respiratory functioning as a further outcome.

The quality of the evidence

The evidence was assessed using GRADE methodology and the overall confidence in the findings ranged from very low to moderate.

Findings were downgraded due to concerns relating to risk of bias (for example, when studies reported a lack of blinding of either participants or assessors because rehabilitation interventions and controls are difficult to conceal or if a large number of participants were lost to follow-up) and imprecision (when 95% confidence intervals crossed 1 or 2 decision-making thresholds). Evidence was also downgraded for inconsistency (for example, when difference in intervention content or comparators causes significant heterogeneity between studies that could not be explained by sub-group analysis). No evidence was downgraded for indirectness.

Due to the range of validated and standardised assessment tools used to measure outcomes across studies, meta-analyses were conducted using standardised mean differences. In order to ensure results were directly comparable, single study effect estimates were also reported as standardised mean differences. Some studies did not report enough data to calculate mean change scores for outcomes. In these cases, results were reported separately alongside meta-analysis results.

No studies were identified investigating upper limb wearables for upper limb functioning; electrical stimulation for upper limb functioning; backward chaining for mobility; dual task training for upper limb functioning, stability and mobility together; neuromodulation for upper limb functioning, stability and mobility together; or cough augmentation and inspiratory muscle training.

Evidence was found for all outcomes apart from the following:

- Respiratory function

Benefits and harms

Pain management

The committee discussed the importance of adequate pain management during rehabilitation for people with chronic neurological disorders. While it is not a primary intervention for stability, mobility and upper limb functioning, and therefore has not been covered in this evidence review, the committee's experience and expertise show how central proper analgesia is to the effectiveness of rehabilitation for chronic neurological disorders. Individuals are much less likely to complete rehabilitation programmes if they cause or exacerbate current pain levels. Unmanaged pain levels can also negatively impact physical functioning and emotional wellbeing, which can mask potential benefits of interventions. Therefore, the committee recommended that pain management should be discussed alongside rehabilitation goals and plans. They also highlighted the reciprocal nature of pain management, noting that interventions for stability, mobility and limb function (including muscle tone and postural management strategies) can also act to reduce or improve pain.

Physical activity and exercise

The committee discussed the importance of structured rehabilitation programmes targeting mobility, stability and upper limb functioning in people with chronic neurological disorders, for allowing people to optimise their muscle strength and physical functioning. However, as with many areas of rehabilitation, these programmes would only be effective if they were discussed and designed around the person, holistically. For example, exercise or physical activity programmes should consider possible issues with cognitive needs in order to ensure they are completed properly. Similarly, programme schedules should be flexible around a person’s level of pain and fatigue, which may be static or fluctuating. The committee wanted to highlight that, while physical activity and exercise should be encouraged in people with chronic neurological disorders due to the benefits already discussed, there can be harms associated with such programmes if not properly considered and tailored to the individual and their abilities. Examples could include overexercise leading to permanent damage of muscles, or burnout through unconsidered fatigue. Therefore, they recommended that risks and unintended consequences be considered fully when developing these programmes. The committee also discussed unsupervised or supervised exercises such as online resources or local subsidised programmes. On the one hand, some committee members noted that supervision and guidance from professionals (for example, occupational therapists, physiotherapists or coaches) can add a motivational factor that can increase engagement, as well as helping people overcome other barriers they may face in exercise participation (for example, condition specific impacts on motivation, problem solving, and environmental access). On the other hand, some individuals may prefer the privacy and convenience of online programmes. The committee agreed that offering exercise programmes in different modes and providing a choice can increase participation. This type of flexibility can help to accommodate different levels of physical ability, access to resources, and personal comfort. Furthermore, the committee wanted to highlight that exercises or physical activity programmes need to be prescribed at a correct dose (covering sufficient frequency, duration and intensity) for them to be effective. In their experience, plenty of exercise programmes fail to show an effect because the programmes themselves are underpowered.

The committee discussed the need to promote participation in activities outside of formalised exercise and physical activity rehabilitation programmes, in order to promote long-term physical well-being benefits in this population. They were aware that this will be different for every individual, and so recommended that discussions be led by the preferences of the individual. This should include exploring a wide-range of physical activities and considering less typical physical activities to find the most appropriate ones and encourage engagement. Examples could include walking, aerobic activity, yoga, martial arts, Pilates, play (for children and young people), dance and ball sports.

Stability, mobility and limb function

The committee then discussed the evidence identified by this review, highlighting the lack of important differences identified and very low or low quality evidence presented for most of the interventions listed in the protocol. The committee also noted that there were several instances where point estimates suggested a potential important benefit, but the level of imprecision shown by the confidence intervals made it too uncertain. They discussed that randomised controlled trials in people with chronic neurological disorders are often hard to recruit for, due to concerns about capacity in some sub-groups (for example, individuals with acquired brain injury) and the rare nature of many disorders. The relatively small numbers of participants included in the studies, despite being normal for neurological rehabilitation, may have increased the amount of imprecision and masked important benefits of the several interventions. They also discussed that many of the interventions captured in this review were standardised across participants which, in the committee's experience, is less effective in a population with such a wide variety of rehabilitation needs such as chronic neurological disorders. Therefore, the committee emphasised that, whatever component interventions are included rehabilitation programmes for stability, mobility, or limb function, healthcare professionals should ensure that exercises were specific and targeted to individuals and their needs. This tailoring is not a one-off process, but a continual one with incremental progression aligned with a person's abilities. Based on their own expertise, the committee listed examples of what these could include, to showcase the variety of options available to people (including play therapy for children and young people, which can often be overlooked). Due to the inevitable overlap between interventions for stability, mobility, and upper limb functioning and their impact on personal care and activities of daily living, the committee included 2 interventions in this list that had not been included in this evidence review but had been looked for in evidence review D: functional activity including task-based training and wheelchair skills training. The committee recognised a potential resource impact robotics, exoskeletons and hydrotherapy. For example, hydrotherapy can be very effective in children and young people but not many services have access to hydrotherapy pools and even if they do, these are expensive to maintain. The discussion regarding robotics and exoskeletons was more nuanced. On the one hand, the addition of robotics or exoskeletons to rehabilitation programmes can increase engagement and motivation, as well as allowing increased frequency and intensity to some exercises. Furthermore, the committee argued that robotics may actually reduce the number of trained professionals needed to perform rehabilitation programmes. For example, a robot-assisted arm device can provide the same physical support to the upper limbs that would normally need 2 rehabilitation professionals to hold and position. However, robotics and exoskeletons are very expensive pieces of equipment and the large resource impact cannot be overlooked. Combined with the lack of clinical or cost-effectiveness evidence found, they decided to recommend that robotics, exoskeletons and hydrotherapy only be offered where already available.

The committee went on to discuss the effectiveness of splinting and orthotics for stability, mobility and upper limb function in people with chronic neurological disorders. This is current standard practice to support limbs throughout movement (for example, aiding gait efficiency), but also to prevent secondary impairments (for example, preventing falls and preventing contracture across joints). The most suitable orthosis and splint will depend on the individual and their rehabilitation needs, but can include off-the-shelf splints, pre-made hand splints (for

example, thumb spica bespoke thermoplastic splinting), dynamic splints, palm protectors, strapping and taping.

However, the committee discussed that in their knowledge and experience some interventions in this section, such as casting, may be harmful for people living with a functional neurological disorder. The committee acknowledged that while orthotics and splints may be beneficial in other neurological conditions, their application in people with functional neurological disorders requires careful consideration due the distinct way the disorder functions, as functional neurological disorders is less about structural damage but more about processing brain signals. In the committee's knowledge and experience interventions such as serial casting can lead to significant deterioration in patients with functional neurological disorder, including onset or worsening of dystonia. The committee agreed that recovery in functional neurological disorder is often contingent on psychologically-informed approaches, and that interventions such as orthotics and splints can reinforce maladaptive illness beliefs and hinder progress.

The committee noted several important differences identified in the evidence on exergaming and augmented or virtual reality interventions, but they were not confident in the longevity of benefits due to the lack of follow-up data presented by included studies. As such, they did not want to make a recommendation on the use of these as stand-alone interventions in rehabilitation for chronic neurological disorders. However, they did discuss their combined experiences with one of the most important aspects of gaming and virtual reality, which is engagement. Rehabilitation for chronic disorders is a continual process, which can often become static and tedious if care is not taken to address this. Exergaming and augmented or virtual reality is a safe and accessible way of introducing variety (for example, new experiences or different environments) into rehabilitation programmes, which can promote participation. For children and young people, exergaming is a way of prescribing interventions in a fun and playful manner that is similar to some of their recreational activities.

The committee highlighted once again that rehabilitation cannot be an isolated intervention or programme for a set period of time for people with chronic neurological disorders. Most of the conditions covered by this guideline require lifelong management of symptoms, including rehabilitation for stability, mobility and limb function to maintain functioning and prevent deterioration. To increase the probability of continued benefits from a rehabilitation programme, healthcare professionals need to foster long-term engagement in the process. One way of doing this is to decrease the inconvenience that rehabilitation has on an individual and de-medicalise exercise so it becomes a lifestyle rather than a treatment. This can be achieved by either incorporating training and exercises into daily routine and activities or, if this is not possible, finding ways for programmes to be completed at home or in community settings so people do not have to spend time and energy commuting to a clinic. This way they are completing their rehabilitation without having to spend extra time or effort to do so.

The committee discussed an additional challenge for rehabilitation programmes for stability, mobility or limb function in people with chronic neurological disorders, which is the sustainability element. Individuals will likely require a long (if not life-long) period of rehabilitation and it is unlikely that they will want to receive supervised sessions for all that time, considering the commitment continued attendance at these appointments requires. Therefore, there is a need to agree exercises that individuals can carry out without clinical supervision and that can fit into their daily life. Again, the exercises prescribed should be targeted and adapted to an individual's rehabilitation needs. The committee also stressed that, while these can be independent exercises if appropriate, they should also include family members or carers if needed. This is especially pertinent in children and young people, where they may need parental support to carry out their exercises.

Treadmill gait training

Although not consistently demonstrated, the committee focused on several important benefits (namely gait and balance and exercise capacity outcomes) shown by studies investigating treadmill training interventions, especially when compared against conventional gait training or no intervention. This evidence corresponded with their experience. In particular, the committee discussed that increasing capacity for exercise could advantage another area of rehabilitation, physical activity. Despite treadmill training interventions being a short-term solution, increasing exercise capacity can result in increased levels of exercise endurance, which in turn helps motivation and engagement in exercise programmes, and promotes long-term participation in physical activities. The committee stressed that encouraging long-term physical activity is particularly important in rehabilitation for chronic neurological disorders, as it is one of the most helpful interventions in preventing deterioration in functioning. Following on from this recommendation, the committee discussed 1 study investigating treadmill training at different frequencies, which provided evidence (mainly moderate quality) that high frequency (5 times per week) training produced worse gait and balance outcomes in adults with Parkinson's disease, when compared to both low (2 times per week) and intermediate frequency (3 times per week) programmes. Due to the lack of follow-up data, and the fact that the committee's experience was that high-frequency treadmill training can be useful for populations other than Parkinson's disease, the committee did not caution against high frequency treadmill training. Instead they focused on the benefits offered by intermediate and low frequency treadmill training, recommending that they be considered in people with progressive neurological diseases.

The committee discussed that, while individual studies showed a few important benefits outside of meta-analysed results, robotic-assisted gait training as a whole did not show important differences in outcomes. This disagreed with the committee experience, which was that including robotics in treadmill gait training can often allow people to perform rehabilitation earlier, for longer periods, and at a higher intensity which benefits both mobility and exercise capacity outcomes. Although the intervention is not currently standard practice, the committee discussed that it was becoming more of a mainstream treatment and wanted to ensure that recommendations for this section remained contemporaneous between this and future guideline updates. However, the committee were aware that a recommendation on robot-assisted treadmill gait training could have a large resource impact on settings that did not offer this service, so they caveated their recommendation that it should only be offered where the appropriate equipment and specialism was already available.

The committee went on to discuss that one of the main benefits of treadmill gait training, exercise capacity, is not a prolonged effect and it will decrease quickly if exercises are stopped without a suitable replacement. Therefore, they recommended a plan be constructed to aid supporting exercise capacity when transferring from a clinical to a community setting. This might be continuing treadmill training in a recreational gym or could involve learning new exercises that can be easily implemented at home.

Electrical stimulation

The committee discussed the evidence identified for functional electrical stimulation, all aimed at lower limb function. The majority of evidence failed to show an important difference, was of very low quality, and came from single studies as meta-analysis was not appropriate. One outcome measure showed a benefit at post-intervention in adults with traumatic brain injury, but this was not retained at follow-up, which limits confidence in the longevity of functional electrical stimulation. Therefore, the committee did not consider this evidence sufficient to inform recommendations, and recommendations in this section were made by the committee using their experience and expertise.

The committee also discussed the use of neuromuscular electrical stimulation to aid muscle strength for both upper and lower limbs, or when a person has issues with coordination. For

example, including neuromuscular electrical stimulation within a coordination task will support relevant muscle groups so an individual can practice the action without experiencing as much fatigue. Also, neuromuscular electrical stimulation can act as a good timing cue to leg muscles during gait or standing practice. Again, this is common practice for people with both peripheral and central nerve disorders resulting from chronic neurological disorders and most settings will have the resources available to provide this service. The committee stressed that neuromuscular electrical stimulation should be provided alongside a functional exercise programme, not in isolation.

Functional electrical stimulation is common practice for both people with upper motor neurone lesions leading to lower limb muscle weakness or an inability to adequately dorsiflex the ankle for foot clearance in gait. The committee discussed the advantages of the intervention, namely the ability to optimise timing and strength of muscle contractions within the gait cycle, with results being seen fairly quickly. Electrical stimulation can be used alongside other mobility interventions, such as gait training, to increase their effectiveness (for example, improve the fluidity of the gait cycle or increase gait cadence). The committee's expertise highlighted that functional electrical stimulation is very effective if appropriately applied in people with incomplete spinal cord injury or lesions above T10 vertebral. The committee stressed that, to be as effective as possible, functional electrical stimulation should form part of a comprehensive rehabilitation programme for mobility (for example, alongside gait training) rather than simply providing people with the equipment alone. The committee referred readers to NICE's interventional procedures guideline on functional electrical stimulation for drop foot of central neurological origin for further detailed recommendations on this intervention.

The committee additionally noted that electrical stimulation devices are not tolerated by everyone, with some people reporting uncomfortable sensations during use. This can lead to poor adherence unless issues are rectified. They suggested that these devices are always trialled before they are fully incorporated into a rehabilitation programme, allowing individuals and rehabilitation professionals time to identify areas for improvement and try solutions, thus ensuring maximum engagement.

Interventions for vestibular problems

The committee discussed the evidence identified for vestibular exercises in people with chronic neurological disorders. The majority of evidence failed to show an important difference and was of very low quality. In the only instance where a benefit was identified in the intervention group, it was not supported by other measures within the same study. Additionally, where meta-analysis was possible, there was often high heterogeneity between studies which limits confidence in findings. Therefore, the committee did not consider this evidence sufficient to inform recommendations, and the recommendation in this section was made by the committee using their experience and expertise.

The committee discussed that balance problems in some people with chronic neurological disorders can be due to central or peripheral vestibular changes, especially in people with acquired brain injuries or spinal cord injuries. Due to the specialised nature of diagnosis, the committee recommended that people who may have vestibular issues undergo an assessment with a trained professional, who can then prescribe appropriate exercises (for example, ocular motor exercises for stability) or perform appropriate manoeuvres (for example, canalith repositioning manoeuvres). Cawthorne Cooksey exercises may also be beneficial to help with dizziness symptoms in this population.

Application of recommendations across the guideline population

Finally, the committee discussed whether these recommendations could apply to the whole population of people with chronic neurological disorders, or if there would be exceptions for certain groups of people. Although the evidence was primarily from an adult population, they

noted that nothing in the recommendations excluded children. The committee did acknowledge that there are added layers of complexity when designing paediatric rehabilitation programmes for upper limb, stability and mobility. For example, treadmill training in younger people is not always safe, particularly in children who are not yet confident in their walking. Similarly, while functional electrical stimulation is not contraindicated for children, the committee noted that rehabilitation professionals would have to spend a greater amount of time explaining the equipment in this population, the sensations that accompany the intervention, and make sure that children and young people are comfortable with their choice.

The committee were disappointed by the paucity of effectiveness evidence identified for children and young people in this review. Despite the large number of included studies, only 1 was conducted in the paediatric population. Although this review area is important for everyone undergoing rehabilitation for chronic neurological disorders, it is especially so in children and young people. Early intervention for mobility, stability and upper limb function will help to maintain functioning for longer, but also can prevent symptoms from affecting subsequent growth and developmental milestones. They therefore made a research recommendation covering the original review question but with an exclusive focus on children and young people, with a view to both strengthening existing recommendations and informing new recommendations in future guideline updates.

Cost effectiveness and resource use

There was no existing economic evidence on the cost effectiveness of interventions or approaches for managing stability, mobility, and limb function in people with chronic neurological conditions.

Pain management is already integral to rehabilitation. Consistently considering pain when discussing and agreeing rehabilitation goals and plans may identify more people needing pain management. However, many existing rehabilitation interventions can also reduce pain or improve pain management, so no significant increase in resource use is anticipated.

The committee discussed that training, and exercises are guided by clinical need, with each patient generally receiving care that is specific and targeted to their needs. The committee discussed variation in practice and various training and exercises options that are available. For example, gait training rehabilitation is standard care. They also discussed that robotic treadmill training is very expensive and robotic exoskeleton are currently available mainly at specialist centres or private sector, while splints, orthotics, and wearable garments are common practice and universally used. Also, advanced de-weighting machines are available only in some tertiary centres. They further noted that wheelchair skills training is a key treatment, and that hydrotherapy is declining due to high maintenance costs compared to land-based therapy but is still widely used in children.

They further explained that even though robotics have high initial capital costs it can release professional time, allowing greater training intensity and potentially better outcomes since there is a dose response relationship. Robotics also enable long-term training and are likely to be a cost effective use of healthcare resources, especially given the shortage of staff to deliver and supervise rehabilitation interventions. It was further explained that while robotics can save professional time, some monitoring and adjustments are still needed during a patient's session, which could be provided by a therapy assistant. The committee also discussed that there is an expectation in people with chronic neurological conditions to be able to access newer equipment and robotics likely to become more mainstream. Additionally, they noted that if services lose access to options like hydrotherapy, there should be increased investment in newer alternatives.

The committee discussed challenges in sustaining engagement and supporting access, noting that rehabilitation is often a cyclical process requiring intensive periods of intervention. They noted that gaming modalities and virtual reality may be more accessible and lead to

better engagement. According to the committee, virtual reality equipment costs around £2000 and once acquired can be reused on multiple people. Therapist can also monitor several patients at the same time, replacing traditional rehabilitation modalities that requires costly machines.

Electrical stimulation combined with task-based activity is widely used. While most rehabilitation services typically have some form of electrical stimulation devices some places, such as community settings, may lack devices. Therefore, there may be cost implications where this is not available. There are different indications for functional electrical stimulation and neuromuscular electrical stimulation, and not all devices are funded by the NHS. Some people purchase stimulators themselves or use Personal Independence Payment funding.

Overall, the committee acknowledged variation in practice, however given the lack of comparative effectiveness data, they did not prioritise one intervention over another but provided a menu of options that are currently being used by services. The recommendations do not imply services having to, for example, acquire new equipment such as robotic devices, virtual reality systems but instead focus on local availability. Therefore, the recommendations should not result in a significant resource impact.

All other recommendations, including rehabilitation programmes, should be person-centred, flexible, appropriately dosed, and adopt a lifelong approach, align with current practices in most services. Integrating training and exercises into daily routines, promoting ongoing community-based interventions, and ensuring vestibular assessments are conducted by trained professionals should also be standard practice. The committee noted that while these practices should already be in place, some resource implications may arise for services where practices are sub-optimal. However, these are unlikely to be significant.

Recommendations supported by this evidence review

This evidence review supports recommendations 1.13.3, 1.15.1, 1.15.3 to 1.15.4, 1.16.1 to 1.16.5, 1.16.7, 1.16.9 to 1.16.15 and the recommendation for research on stability, mobility and upper limb function.

References – included studies

Effectiveness

Arntzen 2020

Arntzen, Ellen Christin, Straume, Bjorn, Odeh, Francis et al. (2020) Group-based, individualized, comprehensive core stability and balance intervention provides immediate and long-term improvements in walking in individuals with multiple sclerosis: A randomized controlled trial. Physiotherapy research international: the journal for researchers and clinicians in physical therapy 25(1): e1798

Bello 2013

Bello, O, Sanchez, J A, Lopez-Alonso, V et al. (2013) The effects of treadmill or overground walking training program on gait in Parkinson's disease. Gait & posture 38(4): 590-5

Berra 2018

Berra, Eliana, De Icco, Roberto, Avenali, Micol et al. (2018) Body Weight Support Combined With Treadmill in the Rehabilitation of Parkinsonian Gait: A Review of Literature and New Data From a Controlled Study. Frontiers in neurology 9: 1066

Berriozabalgoitia 2021

Berriozabalgoitia, Rakel, Bidaurrazaga-Letona, Iraia, Otxoa, Erika et al. (2021) Overground Robotic Program Preserves Gait in Individuals With Multiple Sclerosis and Moderate to Severe Impairments: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 102(5): 932-939

Brichetto 2013

Brichetto, G., Spallarossa, P., De Carvalho, M.L.L. et al. (2013) The effect of Nintendo Wii on balance in people with multiple sclerosis: A pilot randomized control study. Multiple Sclerosis Journal 19(9): 1219-1221

Brichetto 2015

Brichetto, Giampaolo, Piccardo, Elisa, Pedulla, Ludovico et al. (2015) Tailored balance exercises on people with multiple sclerosis: A pilot randomized, controlled study. Multiple sclerosis (Houndmills, Basingstoke, England) 21(8): 1055-63

Bunn 2015

Bunn, Lisa M, Marsden, Jonathan F, Giunti, Paola et al. (2015) Training balance with opto-kinetic stimuli in the home: a randomized controlled feasibility study in people with pure cerebellar disease. Clinical rehabilitation 29(2): 143-53

Cabrera-Martos 2020

Cabrera-Martos, Irene, Jimenez-Martin, Ana Teresa, Lopez-Lopez, Laura et al. (2020) Effects of a core stabilization training program on balance ability in persons with Parkinson's disease: a randomized controlled trial. Clinical rehabilitation 34(6): 764-772

Capecci 2019

Capecci, Marianna, Pournajaf, Sanaz, Galafate, Daniele et al. (2019) Clinical effects of robot-assisted gait training and treadmill training for Parkinson's disease. A randomized controlled trial. Annals of physical and rehabilitation medicine 62(5): 303-312

Cattaneo 2018

Cattaneo, Davide, Rasova, Kamila, Gervasoni, Elisa et al. (2018) Falls prevention and balance rehabilitation in multiple sclerosis: a bi-centre randomised controlled trial. Disability and rehabilitation 40(5): 522-526

Ciatto 2023

Ciatto, Laura, Pullia, Massimo, Tavilla, Graziana et al. (2023) Do Patients with Parkinson's Disease Benefit from Dynamic Body Weight Support? A Pilot Study on the Emerging Role of Rysen. Biomedicines 11(8)

Clerici 2017

Clerici, Ilaria, Ferrazzoli, Davide, Maestri, Roberto et al. (2017) Rehabilitation in progressive supranuclear palsy: Effectiveness of two multidisciplinary treatments. PloS one 12(2): e0170927

Conradsson 2015

Conradsson, David, Lofgren, Niklas, Nero, Hakan et al. (2015) The Effects of Highly Challenging Balance Training in Elderly With Parkinson's Disease: A Randomized Controlled Trial. Neurorehabilitation and neural repair 29(9): 827-36

Coote 2015

Coote, Susan, Hughes, Lonan, Rainsford, Gary et al. (2015) Pilot randomized trial of progressive resistance exercise augmented by neuromuscular electrical stimulation for people with multiple sclerosis who use walking aids. Archives of physical medicine and rehabilitation 96(2): 197-204

Coulter 2017

Coulter, E H, McLean, A N, Hasler, J P et al. (2017) The effectiveness and satisfaction of web-based physiotherapy in people with spinal cord injury: a pilot randomised controlled trial. Spinal cord 55(4): 383-389

Curcio 2020

Curcio, A, Temperoni, G, Tramontano, Marco et al. (2020) The effects of aquatic therapy during post-acute neurorehabilitation in patients with severe traumatic brain injury: a preliminary randomized controlled trial. Brain injury 34(12): 1630-1635

Donkers 2020

Donkers, Sarah J, Nickel, Darren, Paul, Lorna et al. (2020) Adherence to Physiotherapy-Guided Web-Based Exercise for Persons with Moderate-to-Severe Multiple Sclerosis: A Randomized Controlled Pilot Study. International journal of MS care 22(5): 208-214

Esclarín-Ruz 2014

Esclarín-Ruz, Ana, Alcobendas-Maestro, Monica, Casado-Lopez, Rosa et al. (2014) A comparison of robotic walking therapy and conventional walking therapy in individuals with upper versus lower motor neuron lesions: a randomized controlled trial. Archives of physical medicine and rehabilitation 95(6): 1023-31

Ferri 2019

Ferri, Alessandra, Lanfranconi, Francesca, Corna, Giovanni et al. (2019) Tailored Exercise Training Counteracts Muscle Disuse and Attenuates Reductions in Physical Function in Individuals With Amyotrophic Lateral Sclerosis. Frontiers in physiology 10: 1537

Flynn 2021

Flynn, Allyson, Preston, Elisabeth, Dennis, Sarah et al. (2021) Home-based exercise monitored with telehealth is feasible and acceptable compared to centre-based exercise in Parkinson's disease: A randomised pilot study. Clinical rehabilitation 35(5): 728-739

Forsberg 2016

Forsberg, Anette; von Koch, Lena; Nilsagard, Ylva (2016) Effects on Balance and Walking with the CoDuSe Balance Exercise Program in People with Multiple Sclerosis: A Multicenter Randomized Controlled Trial. Multiple sclerosis international 2016: 7076265

Gandolfi 2015

Gandolfi, Marialuisa, Munari, Daniele, Geroin, Christian et al. (2015) Sensory integration balance training in patients with multiple sclerosis: A randomized, controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 21(11): 1453-62

Gandolfi 2017

Gandolfi, Marialuisa, Geroin, Christian, Dimitrova, Eleonora et al. (2017) Virtual Reality Telerehabilitation for Postural Instability in Parkinson's Disease: A Multicenter, Single-Blind, Randomized, Controlled Trial. BioMed research international 2017: 7962826

Gandolfi 2018

Gandolfi, Marialuisa, Vale, Nicola, Dimitrova, Eleonora Kirilova et al. (2018) Effects of High-intensity Robot-assisted Hand Training on Upper Limb Recovery and Muscle Activity in Individuals With Multiple Sclerosis: A Randomized, Controlled, Single-Blinded Trial. Frontiers in neurology 9: 905

Gandolfi 2019

Gandolfi, Marialuisa, Tinazzi, Michele, Magrinelli, Francesca et al. (2019) Four-week trunk-specific exercise program decreases forward trunk flexion in Parkinson's disease: A single-blinded, randomized controlled trial. Parkinsonism & related disorders 64: 268-274

Gasner 2019

Gasner, Heiko, Steib, Simon, Klamroth, Sarah et al. (2019) Perturbation Treadmill Training Improves Clinical Characteristics of Gait and Balance in Parkinson's Disease. Journal of Parkinson's disease 9(2): 413-426

Gil-Agudo 2023

Gil-Agudo, Angel, Megia-Garcia, Alvaro, Pons, Jose Luis et al. (2023) Exoskeleton-based training improves walking independence in incomplete spinal cord injury patients: results from a randomized controlled trial. Journal of neuroengineering and rehabilitation 20(1): 36

Gryfe 2022

Gryfe, Pearl; Sexton, Andrew; McGibbon, Chris A (2022) Using gait robotics to improve symptoms of Parkinson's disease: an open-label, pilot randomized controlled trial. European journal of physical and rehabilitation medicine 58(5): 723-737

Hind 2017

Hind, Daniel, Parkin, James, Whitworth, Victoria et al. (2017) Aquatic therapy for boys with Duchenne muscular dystrophy (DMD): an external pilot randomised controlled trial. Pilot and feasibility studies 3: 16

Hoang 2016

Hoang, Phu, Schoene, Daniel, Gandevia, Simon et al. (2016) Effects of a home-based step training programme on balance, stepping, cognition and functional performance in people with multiple sclerosis--a randomized controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 22(1): 94-103

Kapadia 2014

Kapadia, Naaz, Masani, Kei, Catharine Craven, B et al. (2014) A randomized trial of functional electrical stimulation for walking in incomplete spinal cord injury: Effects on walking competency. The journal of spinal cord medicine 37(5): 511-24

Kleffelgaard 2019

Kleffelgaard, Ingerid, Soberg, Helene Lundgaard, Tamber, Anne-Lise et al. (2019) The effects of vestibular rehabilitation on dizziness and balance problems in patients after traumatic brain injury: a randomized controlled trial. Clinical rehabilitation 33(1): 74-84

Lam 2015

Lam, Tania, Pauhl, Katherine, Ferguson, Amanda et al. (2015) Training with robot-applied resistance in people with motor-incomplete spinal cord injury: Pilot study. Journal of rehabilitation research and development 52(1): 113-29

Leung 2014

Leung, Joan, Harvey, Lisa A, Moseley, Anne M et al. (2014) Standing with electrical stimulation and splinting is no better than standing alone for management of ankle plantarflexion contractures in people with traumatic brain injury: a randomised trial. Journal of physiotherapy 60(4): 201-8

Lozano-Berrio 2022

Lozano-Berrio, V, Alcobendas-Maestro, M, Polonio-Lopez, B et al. (2022) The Impact of Robotic Therapy on the Self-Perception of Upper Limb Function in Cervical Spinal Cord Injury: A Pilot Randomized Controlled Trial. International journal of environmental research and public health 19(10)

Lozano-Quilis 2014

Lozano-Quilis, Jose-Antonio, Gil-Gomez, Hermenegildo, Gil-Gomez, Jose-Antonio et al. (2014) Virtual rehabilitation for multiple sclerosis using a kinect-based system: randomized controlled trial. JMIR serious games 2(2): e12

Manzanares 2021

Manzanares, Aaron, Camblor, Angel, Romero-Arenas, Salvador et al. (2021) Effect of a semi-immersive virtual reality navigation therapy on quality of life in persons with spinal cord injury. Disability and rehabilitation. Assistive technology: 1-6

Maranesi 2022

Maranesi, Elvira, Casoni, Elisa, Baldoni, Renato et al. (2022) The Effect of Non-Immersive Virtual Reality Exergames versus Traditional Physiotherapy in Parkinson's Disease Older Patients: Preliminary Results from a Randomized-Controlled Trial. International journal of environmental research and public health 19(22)

Nilsagard 2013

Nilsagard, Ylva E; Forsberg, Anette S; von Koch, Lena (2013) Balance exercise for persons with multiple sclerosis using Wii games: a randomised, controlled multi-centre study. Multiple sclerosis (Houndmills, Basingstoke, England) 19(2): 209-16

Novotna 2019

Novotna, K., Janatova, M., Hana, K. et al. (2019) Biofeedback Based Home Balance Training can Improve Balance but Not Gait in People with Multiple Sclerosis. Multiple Sclerosis International 2019: 2854130

Palamara 2017

Palamara, Grazia, Gotti, Francesco, Maestri, Roberto et al. (2017) Land Plus Aquatic Therapy Versus Land-Based Rehabilitation Alone for the Treatment of Balance Dysfunction in Parkinson Disease: A Randomized Controlled Study With 6-Month Follow-Up. Archives of physical medicine and rehabilitation 98(6): 1077-1085

Paul 2019

Paul, Lorna, Renfrew, Linda, Freeman, Jennifer et al. (2019) Web-based physiotherapy for people affected by multiple sclerosis: a single blind, randomized controlled feasibility study. Clinical rehabilitation 33(3): 473-484

Pavlikova 2020

Pavlikova, M, Cattaneo, D, Jonsdottir, J et al. (2020) The impact of balance specific physiotherapy, intensity of therapy and disability on static and dynamic balance in people with multiple sclerosis: A multi-center prospective study. Multiple sclerosis and related disorders 40: 101974

Pazzaglia 2020

Pazzaglia, C, Imbimbo, I, Tranchita, E et al. (2020) Comparison of virtual reality rehabilitation and conventional rehabilitation in Parkinson's disease: a randomised controlled trial. Physiotherapy 106: 36-42

Pelosin 2017

Pelosin, Elisa, Avanzino, Laura, Barella, Roberta et al. (2017) Treadmill training frequency influences walking improvement in subjects with Parkinson's disease: a randomized pilot study. European journal of physical and rehabilitation medicine 53(2): 201-208

Picelli 2013

Picelli, Alessandro, Melotti, Camilla, Origano, Francesca et al. (2013) Robot-assisted gait training versus equal intensity treadmill training in patients with mild to moderate Parkinson's disease: a randomized controlled trial. Parkinsonism & related disorders 19(6): 605-10

Piira 2019a

Piira, Anu, Lannem, Anne M, Sorensen, Marit et al. (2019) Robot-assisted locomotor training did not improve walking function in patients with chronic incomplete spinal cord injury: A randomized clinical trial. Journal of rehabilitation medicine 51(5): 385-389

Piira 2019b

Piira, Anu, Lannem, Anne M, Sorensen, Marit et al. (2019) Manually assisted body-weight supported locomotor training does not re-establish walking in non-walking subjects with chronic incomplete spinal cord injury: A randomized clinical trial. Journal of rehabilitation medicine 51(2): 113-119

Pollet 2023

Pollet, Joel, Buraschi, Riccardo, Ranica, Giorgia et al. (2023) The Effect of Personalized Shoe Insoles on Parkinson's Disease Subjects: A Triple-Blind Randomized Controlled Trial. Journal of clinical medicine 12(23)

Pompa 2017

Pompa, Alessandra, Morone, Giovanni, Iosa, Marco et al. (2017) Does robot-assisted gait training improve ambulation in highly disabled multiple sclerosis people? A pilot randomized control trial. Multiple sclerosis (Houndmills, Basingstoke, England) 23(5): 696-703

Prosperini 2013

Prosperini, Luca, Fortuna, Deborah, Gianni, Costanza et al. (2013) Home-based balance training using the Wii balance board: a randomized, crossover pilot study in multiple sclerosis. Neurorehabilitation and neural repair 27(6): 516-25

Pullia 2023

Pullia, Massimo, Ciatto, Laura, Andronaco, Giuseppe et al. (2023) Treadmill Training Plus Semi-Immersive Virtual Reality in Parkinson's Disease: Results from a Pilot Study. Brain sciences 13(9)

Raciti 2022

Raciti, Loredana, Pignolo, Loris, Perini, Valentina et al. (2022) Improving Upper Extremity Bradykinesia in Parkinson's Disease: A Randomized Clinical Trial on the Use of Gravity-Supporting Exoskeletons. Journal of clinical medicine 11(9)

Renfrew 2019

Renfrew, Linda Miller, Paul, Lorna, McFadyen, Angus et al. (2019) The clinical- and cost-effectiveness of functional electrical stimulation and ankle-foot orthoses for foot drop in Multiple Sclerosis: a multicentre randomized trial. Clinical rehabilitation 33(7): 1150-1162

Robinson 2015

Robinson, Jonathan, Dixon, John, Macsween, Alasdair et al. (2015) The effects of exergaming on balance, gait, technology acceptance and flow experience in people with multiple sclerosis: a randomized controlled trial. BMC sports science, medicine & rehabilitation 7: 8

Schaible 2021

Schaible, Fabian, Maier, Franziska, Buchwitz, Timo Marcel et al. (2021) Effects of Lee Silverman Voice Treatment BIG and conventional physiotherapy on non-motor and motor symptoms in Parkinson's disease: a randomized controlled study comparing three exercise models. Therapeutic advances in neurological disorders 14: 1756286420986744

Schlenstedt 2015

Schlenstedt, Christian, Paschen, Steffen, Kruse, Annika et al. (2015) Resistance versus Balance Training to Improve Postural Control in Parkinson's Disease: A Randomized Rater Blinded Controlled Study. PloS one 10(10): e0140584

Solaro 2020

Solaro, Claudio, Cattaneo, Davide, Basteris, Angelo et al. (2020) Haptic vs sensorimotor training in the treatment of upper limb dysfunction in multiple sclerosis: A multi-center, randomised controlled trial. Journal of the neurological sciences 412: 116743

Song 2018

Song, Jooeun, Paul, Serene S, Caetano, Maria Joana D et al. (2018) Home-based step training using videogame technology in people with Parkinson's disease: a single-blinded randomised controlled trial. Clinical rehabilitation 32(3): 299-311

Steib 2017

Steib, Simon, Klamroth, Sarah, Gasner, Heiko et al. (2017) Perturbation During Treadmill Training Improves Dynamic Balance and Gait in Parkinson's Disease: A Single-Blind Randomized Controlled Pilot Trial. Neurorehabilitation and neural repair 31(8): 758-768

Straudi 2013

Straudi, S, Benedetti, M G, Venturini, E et al. (2013) Does robot-assisted gait training ameliorate gait abnormalities in multiple sclerosis? A pilot randomized-control trial. NeuroRehabilitation 33(4): 555-63

Straudi 2016

Straudi, Sofia, Fanciullacci, Chiara, Martinuzzi, Carlotta et al. (2016) The effects of robot-assisted gait training in progressive multiple sclerosis: A randomized controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 22(3): 373-84

Straudi 2020

Straudi, Sofia, Manfredini, Fabio, Lamberti, Nicola et al. (2020) Robot-assisted gait training is not superior to intensive overground walking in multiple sclerosis with severe disability (the RAGTIME study): A randomized controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 26(6): 716-724

Szefler-Derela 2020

Szefler-Derela, J, Arkuszewski, M, Knapik, A et al. (2020) Effectiveness of 6-Week Nordic Walking Training on Functional Performance, Gait Quality, and Quality of Life in Parkinson's Disease. Medicina (Kaunas, Lithuania) 56(7)

Szymura 2020

Szymura, Jadwiga, Kubica, Jadwiga, Wiecek, Magdalena et al. (2020) The Immunomodulary Effects of Systematic Exercise in Older Adults and People with Parkinson's Disease. Journal of clinical medicine 9(1)

Taylor 2014

Taylor, Paul, Barrett, Catherine, Mann, Geraldine et al. (2014) A feasibility study to investigate the effect of functional electrical stimulation and physiotherapy exercise on the quality of gait of people with multiple sclerosis. Neuromodulation : journal of the International Neuromodulation Society 17(1): 75-84

Taylor 2021

Taylor, Paul N, Sampson, Trish, Beare, Ben et al. (2021) The effectiveness of peroneal nerve functional electrical simulation for the reduction of bradykinesia in Parkinson's disease: A feasibility study for a randomised control trial. Clinical rehabilitation 35(4): 546-557

Tollár 2018

Tollár, Jozsef, Nagy, Ferenc, Kovacs, Norbert et al. (2018) A High-Intensity Multicomponent Agility Intervention Improves Parkinson Patients' Clinical and Motor Symptoms. Archives of physical medicine and rehabilitation 99(12): 2478-2484e1

Tollár 2019

Tollár, Jozsef; Nagy, Ferenc; Hortobagyi, Tibor (2019) Vastly Different Exercise Programs Similarly Improve Parkinsonian Symptoms: A Randomized Clinical Trial. Gerontology 65(2): 120-127

Tollár 2020

Tollár, Jozsef, Nagy, Ferenc, Toth, Bela E et al. (2020) Exercise Effects on Multiple Sclerosis Quality of Life and Clinical-Motor Symptoms. Medicine and science in sports and exercise 52(5): 1007-1014

Tramontano 2018

Tramontano, Marco, Martino Cinnera, Alex, Manzari, Leonardo et al. (2018) Vestibular rehabilitation has positive effects on balance, fatigue and activities of daily living in highly disabled multiple sclerosis people: A preliminary randomized controlled trial. Restorative neurology and neuroscience 36(6): 709-718

Tramontano 2020

Tramontano, Marco, Morone, Giovanni, De Angelis, Sara et al. (2020) Sensor-based technology for upper limb rehabilitation in patients with multiple sclerosis: A randomized controlled trial. Restorative neurology and neuroscience 38(4): 333-341

Tramontano 2022

Tramontano, Marco, Belluscio, Valeria, Bergamini, Elena et al. (2022) Vestibular Rehabilitation Improves Gait Quality and Activities of Daily Living in People with Severe Traumatic Brain Injury: A Randomized Clinical Trial. Sensors (Basel, Switzerland) 22(21)

van den Heuvel 2014

van den Heuvel, Maarten R C, Kwakkel, Gert, Beek, Peter J et al. (2014) Effects of augmented visual feedback during balance training in Parkinson's disease: a pilot randomized clinical trial. Parkinsonism & related disorders 20(12): 1352-8

Wallén 2018

Wallén, Martin Benka, Hagstromer, Maria, Conradsson, David et al. (2018) Long-term effects of highly challenging balance training in Parkinson's disease-a randomized controlled trial. Clinical rehabilitation 32(11): 1520-1529

Wirz 2017

Wirz, Markus, Mach, Orpheus, Maier, Doris et al. (2017) Effectiveness of Automated Locomotor Training in Patients with Acute Incomplete Spinal Cord Injury: A Randomized, Controlled, Multicenter Trial. Journal of neurotrauma 34(10): 1891-1896

Wroblewska 2019

Wroblewska, Agata, Gajos, Agata, Smyczynska, Urszula et al. (2019) The Therapeutic Effect of Nordic Walking on Freezing of Gait in Parkinson's Disease: A Pilot Study. Parkinson's disease 2019: 3846279

Zivi 2018

Zivi, Ilaria, Maffia, Sara, Ferrari, Vanessa et al. (2018) Effectiveness of aquatic versus land physiotherapy in the treatment of peripheral neuropathies: a randomized controlled trial. Clinical rehabilitation 32(5): 663-670

Appendices

Appendix A Review protocols

Review protocol for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Table 3: Review protocol

ID	Field	Content
0.	PROSPERO registration number	CRD42024518789
1.	Review title	Rehabilitation for physical functioning
2.	Review question	What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?
3.	Objective	To determine the effectiveness of interventions for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders.
4.	Searches	The following databases will be searched: • Medline All • Embase • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • PsycInfo • Social Policy and Practice Searches will be restricted by: • Date: 2013 onwards • English language • Human studies • Systematic Reviews

ID	Field	Content
		• RCTs • Non-randomised studies Other searches: • Inclusion lists of systematic reviews With the agreement of the guideline committee the searches will be re-run 6 weeks before final submission of the review and further studies retrieved for inclusion. The full search strategies will be published in the final review.
5.	Condition or domain being studied	Rehabilitation interventions to improve and sustain physical functioning for people with chronic neurological disorders
6.	Population	**Inclusion:** Adults and children with rehabilitation needs due to the following chronic neurological disorders: • Acquired brain injury • Acquired spinal cord injury • Acquired peripheral nerve disorders • Progressive neurological diseases • Functional neurological disorders **Exclusion:** • Conditions which do not fit one of the 5 categories of chronic neurological disorder as defined in the guideline scope. These exclusions will be by exception and examined on a case-by-case basis rather than whole disorder groups. For example, this guideline will not cover autonomic neuropathy or the acute stabilisation of conditions such as encephalitis or hydrocephalus and will not cover degenerative disc disorder as spinal discs do not form part of the spinal cord. • Disorders for which interventions are primarily focused on altering body structure and functions, for example isolated peripheral nerve injuries, that is, single nerve or plexus injuries. • Surgical management of conditions (for example brain tumours, orthopaedic complications).

ID	Field	Content
		• Conditions for which NICE rehabilitation and rehabilitation related recommendations already exist, including stroke in people aged 16 years and over, dementia including Alzheimer's disease, cerebral palsy, myalgic encephalomyelitis (or encephalopathy)/chronic fatigue syndrome and post-COVID-19 syndrome. • Early rehabilitation after spinal cord injury as this will be covered in the NICE guideline on rehabilitation after traumatic injury
7.	Intervention	**Intervention group 1 – Rehabilitation interventions to address upper limb functioning.** • Upper limb wearables • Electrical stimulation • Robotics and repetitive task training **Intervention group 2 – Rehabilitation interventions to address stability.** • Vestibular exercise, including optokinetic training. • Balance exercises (such as sitting/ standing and reaching) • Perturbation training **Intervention group 3 – Rehabilitation interventions to address mobility.** • Gait training (including body-weight supported/ treadmill based and/ or robotically assisted interventions, outdoor gait training) • Backward chaining • Lower limb wearables, electrical stimulation and lower-body robotics **Intervention group 4 – Rehabilitation interventions to address stability, mobility, and upper limb functioning together.** • Dual task training • Sensorimotor exercises • Neuromodulation (electrical/ vibratory) • Hydrotherapy • Exergaming and AR/VR • Wearable garments, technology (for example MOLLII) and exoskeletons

ID	Field	Content
		• Individualised (tailored) exercise programmes for stability, mobility, limb functioning and coordination tasks (coordinating the body to be able to walk or be functional) • Cough augmentation techniques (manual and device assisted cough, breath stacking,) and inspiratory muscle training
8.	Comparator	Interventions compared with others in the same group or: • Placebo (placebo or sham) • Control (no intervention, waitlist, standard rehabilitation care alone, or 'usual care') • The same intervention (as listed under 'intervention') but varied in terms of: ○ Frequency ○ Intensity ○ Timing ○ Setting
9.	Types of study to be included	Include published full-text papers: • Systematic reviews of RCTs • Experimental studies with random assignment to intervention and control groups. If insufficient* RCT evidence is located to support decision making about children and young people, then experimental studies with non-random assignment to intervention and control groups (quasi-randomised controlled trials, non-randomised controlled trials and prospective and retrospective cohort studies) will also be considered, if a method of controlling for confounding variables is used. Systematic reviews of these studies will also be considered. *Sufficiency will be judged on issues such as the number and quality of the included studies; sample sizes, reported outcomes, and availability of data on subgroups of interest. **Studies must match or adjust for age and chronic neurological disorder. Other confounding factors are: • Sex

ID	Field	Content
		• Delivery setting, for instance whether community or inpatient.
10.	Other exclusion criteria	**Inclusion:** • Full text papers • Studies conducted in the UK, Australia, New Zealand and Canada and high-income European countries (according to the World Bank). **Exclusion:** • Conference abstracts/proceedings • Non-English language articles • Articles published before 2013 • Non-English language articles • Books, book chapters and theses. • Papers that do not include methodological details will not be included as they do not provide sufficient information to evaluate risk of bias/study quality.
11.	Context	Recommendations will apply to all inpatient (excluding critical care units), outpatient and community settings, including tertiary settings and care homes in which either fully or partially NHS-funded rehabilitation interventions for chronic neurological disorders are provided.
12.	Primary outcomes (critical outcomes)	• **Gait and balance –** measured using validated, global scales such as the Rivermead Mobility Index (RMI); Berg Balance Scale (BBS); Dynamic Gait Index or Functional Gait Assessment, Four Step Square Test; Timed “Up & Go” Test (TUG) • **Exercise capacity –** measured using validated, global scales such as the 6 Minute Walk Test (6MWT); Five Times Sit to Stand Test. • **Limb/joint/muscle function –** measured using validated, global scales such as the (Modified) Ashworth Spasticity Scale; Manual Muscle Test (MMT); Penn Spasm Frequency Scale • **Respiratory function –** measured using validated, global respiratory function outcome measures such as the Forced Expiratory Volume in 1 second (FEV1) or expiratory sounds. • **Functioning –** measured using validated, global scales such as the functional independence measure (FIM) and the Paediatric Evaluation of Disability Inventory (PEDICAT).

ID	Field	Content
13.	Secondary outcomes (important outcomes)	N/A
14.	Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. Titles and abstracts of the retrieved citations will be screened to identify studies that potentially meet the inclusion criteria outlined in the review protocol. Dual sifting will be performed on at least 10% of records (or 300 records, whichever is smaller); 90% agreement is required and disagreements will be resolved via discussion with the senior systematic reviewer. The full set of records will not be dual screened because the population, interventions and relevant study designs are relatively clear and should be readily identified from titles and abstracts. Full versions of the selected studies will be obtained for assessment. Studies that fail to meet the inclusion criteria once the full version has been checked will be excluded at this stage. Each study excluded after checking the full version will be listed, along with the reason for its exclusion. The included and excluded studies lists will be circulated to the Topic Group for their comments. Resolution of disputes will be by discussion between the senior reviewer, Topic Advisor and Chair. A standardised form will be used to extract the following data from included studies: study details (reference, country where study was carried out, type and dates), participant characteristics, inclusion and exclusion criteria, details of the interventions if relevant, setting and follow-up, relevant outcome data and source of funding. This will be quality assessed by the senior reviewer.
15.	Risk of bias (quality) assessment	Quality assessment of individual studies will be performed using the following checklists. • ROBIS tool for systematic reviews • Cochrane RoB tool v.2 for RCTs • Cochrane ROBINS-I for non-randomised controlled trials.

ID	Field	Content
		The quality assessment will be performed by one reviewer and this will be quality assured by a senior reviewer.

16.	Strategy for data synthesis	Depending on the availability of the evidence, the findings will be summarised narratively or quantitatively. Where possible, pairwise meta-analyses will be conducted using Cochrane Review Manager software. A fixed effect meta-analysis will be conducted and data will be presented as odds ratios or risk ratios for dichotomous outcomes. Peto odds ratio will be used for outcomes with zero events. Mean differences or standardised mean differences will be calculated for continuous outcomes.
		
		Heterogeneity in the effect estimates of the individual studies will be assessed using the I2 statistic. Alongside visual inspection of the point estimates and confidence intervals, I2 values of greater than 50% and 80% will be considered as significant and very significant heterogeneity, respectively.
		
		Heterogeneity will be explored as appropriate using sensitivity analyses and pre-specified subgroup analyses. If heterogeneity cannot be explained through subgroup analysis then a random effects model will be used for meta-analysis, or the data will not be pooled.
		
		The confidence in the findings across all available evidence will be evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group: http://www.gradeworkinggroup.org/.
		
		Importance and imprecision of findings will be assessed against minimally important differences (MIDs). Default MIDs will be used for risk ratios and continuous outcomes only, unless the committee pre-specifies published or other MIDs for specific outcomes
		• For risk ratios: 0.8 and 1.25.
		• For continuous outcomes:
		  ○ MID is calculated by ranking the studies in order of SD in the control arms. The MID is calculated as +/- 0.5 times median SD.
		  ○ For studies that have been pooled using SMD (meta-analysed): +0.5 and -0.5 in the SMD scale are used as MID boundaries.

17.	Analysis of sub-groups	Evidence will be stratified by:

ID	Field	Content	
		• Age at time of intervention (children versus. adults). Children are classified as being aged 17 years or younger. • Functional neurological disorders as distinct from the 4 other categories of neurological disorder. Evidence will be subgrouped by the following only in the event that there is significant heterogeneity in outcomes: • The 4 disorder categories not separated out through a priori stratification (acquired brain injury, acquired spinal cord injury, acquired peripheral nerve disorders and progressive neurological diseases • Study design (RCT v. NRS) • Age (for the ≤17 years of age stratification only). Categories are <4 years, 4-11 years and >11 years. Where evidence is stratified or subgrouped the committee will consider on a case by case basis if separate recommendations should be made for distinct groups. Separate recommendations may be made where there is evidence of a differential effect of interventions in distinct groups. If there is a lack of evidence in one group, the committee will consider, based on their experience, whether it is reasonable to extrapolate and assume the interventions will have similar effects in that group compared with others.	
18.	Type and method of review	☒	Intervention
		☐	Diagnostic
		☐	Prognostic
		☐	Qualitative
		☐	Epidemiologic
		☐	Service Delivery
		☐	Other (please specify)
19.	Language	English	
20.	Country	England	
21.	Anticipated or actual start date	May 2022	
22.	Anticipated completion date	December 2023	

ID	Field	Content		
23.	Stage of review at time of this submission	Review stage	Started	Completed
		Preliminary searches	☑	☑
		Piloting of the study selection process	☑	☑
		Formal screening of search results against eligibility criteria	☑	☑
		Data extraction	☑	☑
		Risk of bias (quality) assessment	☑	☑
		Data analysis	☑	☑
24.	Named contact	**5a Named contact** NICE **5b Named contact e-mail** rehabforcnd@nice.org.uk **5c Organisational affiliation of the review** National Institute for Health and Care Excellence (NICE)		
25.	Review team members	NICE Technical Team		
26.	Funding sources/sponsor	This systematic review is being completed by NICE, which receives funding from the Department of Health and Social Care.		
27.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be		

ID	Field	Content	
		documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.	
28.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: https://www.nice.org.uk/guidance/indevelopment/gid-ng10181	
29.	Other registration details	N/A	
30.	Reference/URL for published protocol	https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=518789	
31.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.	
32.	Keywords	Acquired brain injury; acquired spinal cord injury; neurological diseases; neurological disorders; peripheral nerve disorders; rehabilitation; upper limb; lower limb; stability; mobility	
33.	Details of existing review of same topic by same authors	N/A	
34.	Current review status	☐	Ongoing
		☐	Completed but not published
		☒	Completed and published
		☐	Completed, published and being updated
		☐	Discontinued
35..	Additional information	N/A	
36.	Details of final publication	www.nice.org.uk	

AR: augmented reality; CDSR: Cochrane Database of Systematic Reviews; CENTRAL: Cochrane Central Register of Controlled Trials; COVID-19: coronavirus; EPPI: Evidence for Policy and Practice Information; GRADE: Grading of Recommendations Assessment, Development and Evaluation; MID: minimally important difference; N/A: not applicable; NGA: National Guideline Alliance; NRS: non-randomised study; RCT: randomised controlled trial; RoB: risk of bias; ROBINS-I: Risk of Bias in Non-randomised Studies – of interventions; SD: standard deviation; SMD: standardised mean difference; VR: virtual reality.

Appendix B Literature search strategies

Literature search strategies for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Review question search strategies

Databases: Medline all

Date of last search: 27/03/2024

#	Searches
1	(CRANIOCEREBRAL TRAUMA/ or brain injuries/ or exp brain hemorrhage, traumatic/ or exp brain injuries, diffuse/ or exp brain injuries, traumatic/ or exp brain injury, chronic/ or Shaken Baby Syndrome/ or HYPOXIA, BRAIN/ or Brain Damage, Chronic/ or exp INTRACRANIAL HEMORRHAGE, TRAUMATIC/ or exp BRAIN NEOPLASMS/ or BRAIN DISEASES/ or BRAIN ABSCESS/ or BRAIN DISEASES, METABOLIC/ or CEREBELLAR DISEASES/ or cerebrovascular disorders/ or basal ganglia cerebrovascular disease/ or cerebrovascular trauma/ or intracranial arteriovenous malformations/ or "intracranial embolism and thrombosis"/ or intracranial hemorrhages/ or vascular headaches/ or exp ENCEPHALITIS/ or exp HYDROCEPHALUS/) not (exp STROKE/ or dementia/)
2	((brain* or cereb* or craniocereb* or cranial or intracrani* or neurocognit*) adj2 (injur* or trauma* or damage* or disease*1 or disorder* or infect* or h?emorrhag* or neoplasm* or cancer* or tumo?r* or insult* or impair* or ischemi* or ischaemi* or infarcti* or hypoxi* or drown*)).ti,ab.
3	(chronic* adj1 trauma* adj2 encephalopath*).ti,ab.
4	((infratentorial* or supratentorial* or hypothalam* or pituitar* or choroid plexus) adj2 (neoplasm* or cancer* or tumo?r* or carcinom* or adenocarcinom*)).ti,ab.
5	(brain* adj2 abscess*).ti,ab.
6	(carotid arter* adj2 (disease* or injur*)).ti,ab.
7	("basal ganglia disease*" or encephalitis or meningoencephalitis or hydrocephal* or "paraneoplastic cereb* degenerat*" or "shak* baby syndrome*").ti,ab.
8	exp STROKE/ and (ADOLESCENT/ or MINORS/ or exp CHILD/ or exp INFANT/ or exp PEDIATRICS/ or exp PUBERTY/)
9	(stroke? adj3 (p?ediatric* or child* or adolescen* or kid or kids or youth* or youngster* or minor or minors or underage* or under-age* or "under age*" or teen or teens or teenager* or juvenile* or boy or boys or boyhood or girl or girls or girlhood or schoolchild* or "school age*" or schoolage* or "under 16" or "under sixteen*")).ti,ab.
10	exp SPINAL CORD INJURIES/ or exp SPINAL CORD NEOPLASMS/ or EPIDURAL ABSCESS/ or SPINAL CORD DISEASES/ or exp SPINAL CORD VASCULAR DISEASES/ or SPINAL CORD COMPRESSION/ or MYELITIS, TRANSVERSE/
11	((spinal* or spine?) adj2 (injur* or trauma* or tumo?r* or neoplasm* or cancer* or infect* or insult* or disease? or disorder* or degenrat* or compress* or vascular* or ischemi* or ischaemi* or infarct* or h?emorrhag*)).ti,ab.
12	(Central cord syndrome* or transverse myelitis).ti,ab.
13	(epidural* adj2 (neoplasm* or cancer* or tumo?r* or abscess*)).ti,ab.
14	((spinal* or spine?) adj2 (viral* or virus* or polio* or acquired immunodeficiency syndrome or AIDS or HIV or bacterial* or neurosyphili* or neuro-syphili* or tubercul*)).ti,ab.
15	PERIPHERAL NERVE INJURIES/ or exp CRANIAL NERVE INJURIES/ or PERIPHERAL NERVOUS SYSTEM NEOPLASMS/ or exp CRANIAL NERVE NEOPLASMS/ or exp PERIPHERAL NERVOUS SYSTEM DISEASES/ or exp CRANIAL NERVE DISEASES/
16	((periph* or cranial*) adj1 (nerve? or nervous system) adj2 (injur* or trauma* or disorder* or disease* or damage* or neoplasm* or cancer* or tumo?r* or inflamm* or autoimmun* or paraneoplastic* or neuropath* or syndrome?)).ti,ab.
17	(Guillain* adj1 Barr*).ti,ab.
18	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 injur*).ti,ab.
19	(optic* adj1 nerve* adj2 (neoplasm* or cancer* or tumo?r*)).ti,ab.
20	(brachial plexus adj1 (neuropath* or neuritis)).ti,ab.
21	(complex regional pain syndrome* or causalgia or mononeuropath* or nerve compression syndrome*).ti,ab.
22	((femoral or median or peroneal or radial or sciatic or tibial or ulnar) adj1 neuropath*).ti,ab.
23	((carpal-tunnel or piriformis-muscle or tarsal-tunnel or thoracic-outlet) adj1 syndrome*).ti,ab.

#	Searches
24	(pudendal neuralgia or polyneuropath* or polyradiculoneuropath* or polyradiculopath* or radiculopath*).ti,ab.
25	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 disease*).ti,ab.
26	(periph* adj2 neuropath*).ti,ab.
27	(((periph* or cranial*) adj2 (nerve? or nervous system)) and lupus).ti,ab.
28	((multi-focal* or multifocal*) adj2 motor adj1 neuropath*).ti,ab.
29	(((periph* or cranial*) adj2 (nerve? or nervous system)) and alcohol*).ti,ab.
30	exp MOTOR NEURON DISEASE/ or POSTPOLIOMYELITIS SYNDROME/ or exp PARKINSONIAN DISORDERS/ or MUSCULAR DYSTROPHY, DUCHENNE/ or exp MULTIPLE SCLEROSIS/ or NEUROMUSCULAR DISEASES/ or SPASTIC PARAPLEGIA, HEREDITARY/ or FRIEDREICH ATAXIA/ or exp MULTIPLE SYSTEM ATROPHY/ or SUPRANUCLEAR PALSY, PROGRESSIVE/ or CORTICOBASAL DEGENERATION/ or LEUKODYSTROPHY, METACHROMATIC/ or exp MITOCHONDRIAL MYOPATHIES/ or exp MUCOPOLYSACCHARIDOSES/ or WILLIAMS SYNDROME/ or GENETIC DISEASES, INBORN/ or RETT SYNDROME/ or FETAL ALCOHOL SPECTRUM DISORDERS/ or DYSTONIC DISORDERS/ or "HEREDITARY SENSORY AND MOTOR NEUROPATHY"/ or SPINAL DYSRAPHISM/
31	(neurolog* adj1 (condition* or disease* or damage* or disorder* or impair*)).ti,ab.
32	((motor-neuron* or gehrig* or charcott* or kennedy*) adj1 disease*).ti,ab.
33	((amyotroph* or primary) adj1 lateral* adj1 sclero*).ti,ab.
34	(bulbar adj1 pals*).ti,ab.
35	((muscular or muscle* or bulbo) adj1 atroph* adj1 spin*).ti,ab.
36	(progressiv* adj1 (muscular or muscle*) adj1 atroph*).ti,ab.
37	((postpolio* or post-polio*) adj1 syndrome?).ti,ab.
38	(Parkinson* or duchenne* or multiple scleros?s* or aphasia or creutzfeldt-jakob or huntington* or kluver-bucy).ti,ab.
39	(muscular adj1 dystroph*).ti,ab.
40	(neuromusc* adj1 (disease* or disorder?)).ti,ab.
41	(heredit* adj1 spastic* adj1 parapleg*).ti,ab.
42	"friedreich* ataxia*".ti,ab.
43	((multiple system or olivopontocerebellar) adj1 atroph*).ti,ab.
44	(shy-drager syndrome* or striatonigral degenerat* or batten* disease?).ti,ab.
45	(progressive adj1 supranuclear adj1 pals*).ti,ab.
46	(richardson* adj1 (disease? or syndrome?)).ti,ab.
47	((corticobasal or cortico basal) adj1 degenerat*).ti,ab.
48	(white adj1 matter adj1 disorder?).ti,ab.
49	(metachromatic leukodystroph* or mitochondrial myopath* or mucopolysaccharidos*).ti,ab.
50	(lysosomal adj1 storage adj1 disorder?).ti,ab.
51	((genetic or William* or catch-22 or rett* or congenital or f?etal alcohol) adj1 (syndrome or disorder*)).ti,ab.
52	(perinatal illness* or perinatal hypoxia*).ti,ab.
53	(primary adj1 dystonia?).ti,ab.
54	(heredit* adj1 motor* adj1 sens* adj1 neuropath*).ti,ab.
55	(spina bifida? or spinal dysraphism?).ti,ab.
56	MOVEMENT DISORDERS/ or MOTOR DISORDERS/ or CONVERSION DISORDER/
57	((functional* or psychogenic* or dissociative*) adj1 neurologic* adj1 (disorder* or dysfunction* or difficult*)).ti,ab.
58	((movement* or motor* or convers*) adj1 (disorder* or dysfunct*)).ti,ab.
59	((psychogenic or dissociative or non-epilep* or nonepilep*) adj1 (seizure* or convulsion* or fit or fits or spasm* or attack*)).ti,ab.
60	(pseudo-seizure* or pseudoseizure*).ti,ab.
61	(medical* adj1 (unexplain* or un-explain*) adj1 symptom?).ti,ab.
62	or/1-61
63	exp UPPER EXTREMITY/
64	(upper adj2 (limb? or extremit*)).ti,ab.
65	(arm? or axilla? or elbow? or forearm? or hand? or finger? or thumb? or phalange* or metacarp* or carpal* or shoulder? or wrist?).ti,ab.

#	Searches
66	(bicep* or tricep* or brachialis or ((abductor* or extensor* or flexor*) adj1 (pollicis or carpi or radialis* or digitorium*))).ti,ab.
67	or/63-66
68	WEARABLE ELECTRONIC DEVICES/
69	(wear* or worn).ti,ab.
70	((cloth* or strap* or armband? or waistband? or shorts or trousers or splint*) adj3 (neuromuscular* or function* or electric* or stimulat* or NMES or FES)).ti,ab.
71	((smart or sensor?) adj3 system?).ti,ab.
72	interactive feedback.ti,ab.
73	ELECTRIC STIMULATION/
74	ELECTRIC STIMULATION THERAPY/
75	(electric* adj3 (stimulat* or therap*)).ti,ab.
76	NEURAL PROSTHESES/
77	((neural or neuro) adj3 prosthe*).ti,ab.
78	(neuralprosthe* or neuroprosthe*).ti,ab.
79	MOLLII.ti,ab.
80	ROBOTICS/
81	robot*.ti,ab.
82	EXOSKELETON DEVICE/
83	(exoskeleton* or exo-skeleton*).ti,ab.
84	(Rex adj3 bionic*).ti,ab.
85	EKSO.ti,ab.
86	(rewalk or Indego).ti,ab.
87	(saebo adj3 (reach or glove or flex)).ti,ab.
88	((repetitiv* or repeat* or practice? or practicing) adj3 (task? or skill? or train*)).ti,ab.
89	((train* or retrain* or relearn*) adj3 (task? or skill?)).ti,ab.
90	or/68-89
91	(vestibular adj3 (exercis* or compensat* or rehab* or therap*)).ti,ab.
92	((Cawthorne or Cooksey or Brandt or Daroff or Frenkel) adj3 exercis*).ti,ab.
93	((gaz* or postur*) adj3 stabili* adj3 (exercis* or intervention?)).ti,ab.
94	(canalith adj3 reposition*).ti,ab.
95	(optokinetic adj3 train*).ti,ab.
96	(balanc* adj3 (exercis* or rehab* or therap* or train* or retrain* or program*)).ti,ab.
97	((shak* or nod* or stare or staring) adj3 exercis*).ti,ab.
98	((sit* or stand? or standing or reach*) adj3 exercis*).ti,ab.
99	(perturb* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program*)).ti,ab.
100	GAIT/ and (exp EXERCISE THERAPY/ or BODY WEIGHT/ or ROBOTICS/)
101	(gait adj3 (train* or retrain* or relearn* or rehab* or exercis* or treadmill? or robot* or outdoor?)).ti,ab.
102	(train* adj3 (body or bodies or weight) adj3 support*).ti,ab.
103	cal?isthenic*.ti,ab.
104	(backward? adj3 chain*).ti,ab.
105	exp LOWER EXTREMITY/
106	(lower adj2 (limb? or extremit*)).ti,ab.
107	(ankle? or buttock? or foot or feet? or forefoot or forefeet or metatars* or tarsal* or toe? or hallux or heel? or hip? or knee? or leg? or thigh?).ti,ab.
108	(abductor or adductor or articularis genu or biceps femoris or dorsal interosseous or extensor or fibularis or flexor or gastrocnemius femur or gemellus or gluteus or gracilis or iliac* or iliopsoas or lumbricals or obturator or pectineus or peroneus or piriformis or plantaris or popliteus or psoas or quadratus or rectus femoris or sartorius or semimembranosus upper or semitendinosus lower or soleus posterior or superior gemellus or tensor fasciae latae or tibialis or vastus).ti,ab.
109	or/105-108
110	or/68-87
111	((dual* or multi*) adj3 task? adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.

#	Searches
112	(multitask* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
113	(sensorimotor* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
114	neuromodulation.ti,ab.
115	TRANSCRANIAL MAGNETIC STIMULATION/
116	TRANSCRANIAL DIRECT CURRENT STIMULATION/
117	(transcranial adj3 (direct* or current* or magnetic*) adj3 stimulat*).ti,ab.
118	or/114-117
119	HYDROTHERAPY/
120	AQUATIC THERAPY/
121	(hydrotherap* or aquatherap*).ti,ab.
122	((water* or hydro* or aqua* or pool? or ai chi*) adj3 (therap* or rehab* or exercis*)).ti,ab.
123	EXERGAMING/
124	(exergam* or gamerci*).ti,ab.
125	((activ* or exercis* or fitness*) adj3 (game? or gaming or gamificat*)).ti,ab.
126	(interact* adj1 (fitness* or exerci*)).ti,ab.
127	VIRTUAL REALITY/
128	AUGMENTED REALITY/
129	((virtual* or augment*) adj3 realit*).ti,ab.
130	(exercis* adj3 program* adj5 (stabili* or mobili* or limb function* or coordinat*)).ti,ab.
131	((individual* or tailor*) adj5 exercis* adj3 program*).ti,ab.
132	(cough* adj3 augment* adj3 technique?).ti,ab.
133	((manual* or device? or mechanic*) adj3 (assist* or augment*) adj3 cough*).ti,ab.
134	((manual* or ventilat* or mechanical*) adj3 (hyperinflation or insufflator* or exsufflator)).ti,ab.
135	(breath* adj3 stack*).ti,ab.
136	lung volume recruitment.ti,ab.
137	(inspirat* adj3 muscl* adj3 train*).ti,ab.
138	(rehab* adj5 intervention? adj5 (limb? function* or stabilit* or mobilit*)).ti,ab.
139	91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101 or 102 or 103 or 104 or 111 or 112 or 113 or 119 or 120 or 121 or 122 or 123 or 124 or 125 or 126 or 127 or 128 or 129 or 130 or 131 or 132 or 133 or 134 or 135 or 136 or 137 or 138
140	67 and 90
141	109 and 110
142	(67 or 109) and 118
143	or/139-142
144	62 and 143
145	letter/
146	editorial/
147	news/
148	exp historical article/
149	Anecdotes as topic/
150	comment/
151	case reports/
152	(letter or comment*).ti.
153	or/145-152
154	randomized controlled trial/ or random*.ti,ab.
155	153 not 154
156	animals/ not humans/
157	exp Animals, Laboratory/
158	exp Animal Experimentation/
159	exp Models, Animal/
160	exp Rodentia/

#	Searches
161	(rat or rats or rodent* or mouse or mice).ti.
162	or/155-161
163	144 not 162
164	limit 163 to english language
165	limit 164 to yr="2013 -Current"
166	meta-analysis/
167	meta-analysis as topic/
168	(meta analy* or metanaly* or metaanaly*).ti,ab.
169	((systematic* or evidence*) adj2 (review* or overview*)).ti,ab.
170	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
171	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
172	(search* adj4 literature).ab.
173	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
174	cochrane.jw.
175	or/166-174
176	randomized controlled trial.pt.
177	controlled clinical trial.pt.
178	pragmatic clinical trial.pt.
179	randomi#ed.ab.
180	placebo.ab.
181	randomly.ab.
182	Clinical Trials as topic.sh.
183	trial.ti.
184	or/176-183
185	exp EPIDEMIOLOGIC STUDIES/ or exp CLINICAL TRIAL/ or COMPARATIVE STUDY/
186	(control and study).mp.
187	program.mp.
188	or/185-187
189	exp Infant/ or Infant Health/ or Infant Welfare/
190	(prematur* or pre-matur* or preterm* or pre-term* or infan* or newborn* or new-born* or perinat* or peri-nat* or neonat* or neo-nat* or baby* or babies or toddler*).ti,ab,in,jn.
191	exp Child/ or exp Child Behavior/ or Child Health/ or Child Welfare/
192	Minors/
193	(child* or minor or minors or boy* or girl* or kid or kids or young*).ti,ab,in,jn.
194	exp pediatrics/
195	(pediatric* or paediatric* or peadiatric*).ti,ab,in,jn.
196	Adolescent/ or Adolescent Behavior/ or Adolescent Health/
197	Puberty/
198	(adolescen* or pubescen* or prepubescen* or pre-pubescen* or pubert* or prepubert* or pre-pubert* or teen* or preteen* or pre-teen* or juvenil* or youth* or under*age*).ti,ab,in,jn.
199	Schools/
200	Child Day Care Centers/ or exp Nurseries/ or Schools, Nursery/
201	(pre-school* or preschool* or kindergar* or daycare or day-care or nurser* or school* or pupil* or student*).ti,ab,jn.
202	("under 18*" or "under eighteen*" or "under 25*" or "under twenty five*").ti,ab.
203	or/189-202
204	165 and (175 or 184)
205	165 and 188 and 203
206	or/204-205

Databases: Embase

Date of last search: 27/03/2024

#	Searches
1	(head injury/ or exp brain injury/ or chronic brain disease/ or brain hemorrhage/ or brain hypoxia/ or exp brain tumor/ or brain disease/ or brain abscess/ or metabolic encephalopathy/ or cerebellum disease/ or exp cerebrovascular disease/ or encephalitis/ or hydrocephalus/) not (exp cerebrovascular accident/ or dementia/)
2	((brain* or cereb* or craniocereb* or cranial or intracrani* or neurocognit*) adj2 (injur* or trauma* or damage* or disease*1 or disorder* or infect* or h?emorrhag* or neoplasm* or cancer* or tumo?r* or insult* or impair* or ischemi* or infarcti* or hypoxi* or drown*)).ti,ab.
3	(chronic* adj1 trauma* adj2 encephalopath*).ti,ab.
4	((infratentorial* or supratentorial* or hypothalam* or pituitar* or choroid plexus) adj2 (neoplasm* or cancer* or tumo?r* or carcinom* or adenocarcinom*)).ti,ab.
5	(brain* adj2 abscess*).ti,ab.
6	(carotid arter* adj2 (disease* or injur*)).ti,ab.
7	("basal ganglia disease*" or encephalitis or meningoencephalitis or hydrocephal* or "paraneoplastic cereb* degenerat*" or "shak* baby syndrome*").ti,ab.
8	exp cerebrovascular accident/ and (adolescent/ or "minor (person)"/ or exp child/ or exp infant/ or pediatrics/ or exp pediatrics/ or exp puberty/)
9	(stroke? adj3 (p?ediatric* or child* or adolescen* or kid or kids or youth* or youngster* or minor or minors or underage* or under-age* or "under age*" or teen or teens or teenager* or juvenile* or boy or boys or boyhood or girl or girls or girlhood or schoolchild* or "school age*" or schoolage* or "under 16" or "under sixteen*")).ti,ab.
10	exp spinal cord injury/ or exp spinal cord tumor/ or epidural abscess/ or spinal cord disease/ or exp spinal cord vascular disease/ or spinal cord compression/ or transverse myelitis/
11	((spinal* or spine?) adj2 (injur* or trauma* or tumo?r* or neoplasm* or cancer* or infect* or insult* or disease? or disorder* or degenrat* or compress* or vascular* or ischemi* or ischaemi* or infarct* or h?emorrhag*)).ti,ab.
12	(Central cord syndrome* or transverse myelitis).ti,ab.
13	(epidural* adj2 (neoplasm* or cancer* or tumo?r* or abscess*)).ti,ab.
14	((spinal* or spine?) adj2 (viral* or virus* or polio* or acquired immunodeficiency syndrome or AIDS or HIV or bacterial* or neurosyphili* or neuro-syphili* or tubercul*)).ti,ab.
15	peripheral nerve injury/ or exp cranial nerve injury/ or peripheral nerve tumor/ or exp cranial nerve tumor/ or exp peripheral neuropathy/ or exp cranial neuropathy/
16	((periph* or cranial*) adj1 (nerve? or nervous system) adj2 (injur* or trauma* or disorder* or disease* or damage* or neoplasm* or cancer* or tumo?r* or inflamm* or autoimmun* or paraneoplastic* or neuropath* or syndrome?)).ti,ab.
17	(Guillain* adj1 Barr*).ti,ab.
18	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 injur*).ti,ab.
19	(optic* adj1 nerve* adj2 (neoplasm* or cancer* or tumo?r*)).ti,ab.
20	(brachial plexus adj1 (neuropath* or neuritis)).ti,ab.
21	(complex regional pain syndrome* or causalgia or mononeuropath* or nerve compression syndrome*).ti,ab.
22	((femoral or median or peroneal or radial or sciatic or tibial or ulnar) adj1 neuropath*).ti,ab.
23	((carpal-tunnel or piriformis-muscle or tarsal-tunnel or thoracic-outlet) adj1 syndrome*).ti,ab.
24	(pudendal neuralgia or polyneuropath* or polyradiculoneuropath* or polyradiculopath* or radiculopath*).ti,ab.
25	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 disease*).ti,ab.
26	(periph* adj2 neuropath*).ti,ab.
27	(((periph* or cranial*) adj2 (nerve? or nervous system)) and lupus).ti,ab.
28	((multi-focal* or multifocal*) adj2 motor adj1 neuropath*).ti,ab.
29	(((periph* or cranial*) adj2 (nerve? or nervous system)) and alcohol*).ti,ab.
30	exp motor neuron disease/ or postpoliomyelitis syndrome/ or exp parkinsonism/ or Duchenne muscular dystrophy/ or exp multiple sclerosis/ or neuromuscular disease/ or hereditary motor sensory neuropathy/ or Friedreich ataxia/ or exp Shy Drager syndrome/ or progressive supranuclear palsy/ or corticobasal degeneration/ or metachromatic leukodystrophy/ or exp mitochondrial myopathy/ or exp mucopolysaccharidosis/ or Williams Beuren syndrome/ or genetic disorder/ or Rett syndrome/ or fetal alcohol syndrome/ or dystonic disorder/ or hereditary motor sensory neuropathy/ or spinal dysraphism/
31	(neurolog* adj1 (condition* or disease* or damage* or disorder* or impair*)).ti,ab.
32	((motor-neuron* or gehrig* or charcott* or kennedy*) adj1 disease*).ti,ab.

#	Searches
33	((amyotroph* or primary) adj1 lateral* adj1 sclero*).ti,ab.
34	(bulbar adj1 pals*).ti,ab.
35	((muscular or muscle* or bulbo) adj1 atroph* adj1 spin*).ti,ab.
36	(progressiv* adj1 (muscular or muscle*) adj1 atroph*).ti,ab.
37	((postpolio* or post-polio*) adj1 syndrome?).ti,ab.
38	(Parkinson* or duchenne* or multiple scleros?s* or aphasia or creutzfeldt-jakob or huntington* or kluver-bucy).ti,ab.
39	(muscular adj1 dystroph*).ti,ab.
40	(neuromusc* adj1 (disease* or disorder?)).ti,ab.
41	(heredit* adj1 spastic* adj1 parapleg*).ti,ab.
42	"friedreich* ataxia*".ti,ab.
43	((multiple system or olivopontocerebellar) adj1 atroph*).ti,ab.
44	(shy-drager syndrome* or striatonigral degenerat* or batten* disease?).ti,ab.
45	(progressive adj1 supranuclear adj1 pals*).ti,ab.
46	(richardson* adj1 (disease? or syndrome?)).ti,ab.
47	((corticobasal or cortico basal) adj1 degenerat*).ti,ab.
48	(white adj1 matter adj1 disorder?).ti,ab.
49	(metachromatic leukodystroph* or mitochondrial myopath* or mucopolysaccharidos*).ti,ab.
50	(lysosomal adj1 storage adj1 disorder?).ti,ab.
51	((genetic or William* or catch-22 or rett* or congenital or f?etal alcohol) adj1 (syndrome or disorder*)).ti,ab.
52	(perinatal illness* or perinatal hypoxia*).ti,ab.
53	(primary adj1 dystonia?).ti,ab.
54	(heredit* adj1 motor* adj1 sens* adj1 neuropath*).ti,ab.
55	(spina bifida? or spinal dysraphism?).ti,ab.
56	motor dysfunction/ or motor dysfunction/ or conversion disorder/
57	((functional* or psychogenic* or dissociative*) adj1 neurologic* adj1 (disorder* or dysfunction* or difficult*)).ti,ab.
58	((movement* or motor* or convers*) adj1 (disorder* or dysfunct*)).ti,ab.
59	((psychogenic or dissociative or non-epilep* or nonepilep*) adj1 (seizure* or convulsion* or fit or fits or spasm* or attack*)).ti,ab.
60	(pseudo-seizure* or pseudoseizure*).ti,ab.
61	(medical* adj1 (unexplain* or un-explain*) adj1 symptom?).ti,ab.
62	or/1-61
63	exp UPPER LIMB/
64	(upper adj2 (limb? or extremit*)).ti,ab.
65	(arm? or axilla? or elbow? or forearm? or hand? or finger? or thumb? or phalange* or metacarp* or carpal* or shoulder? or wrist?).ti,ab.
66	(bicep* or tricep* or brachialis or ((abductor* or extensor* or flexor*) adj1 (pollicis or carpi or radialis* or digitorium*))).ti,ab.
67	or/63-66
68	exp WEARABLE COMPUTER/
69	(wear* or worn).ti,ab.
70	((cloth* or strap* or armband? or waistband? or shorts or trousers or splint*) adj3 (neuromuscular* or function* or electric* or stimulat* or NMES or FES)).ti,ab.
71	((smart or sensor?) adj3 system?).ti,ab.
72	interactive feedback.ti,ab.
73	ELECTROSTIMULATION/
74	ELECTROTHERAPY/
75	(electric* adj3 (stimulat* or therap*)).ti,ab.
76	NEUROPROSTHESIS/
77	((neural or neuro) adj3 prosthe*).ti,ab.
78	(neuralprosthe* or neuroprosthe*).ti,ab.
79	MOLLII.ti,ab.

#	Searches
80	ROBOTICS/ or COGNITIVE ROBOTICS/
81	robot*.ti,ab.
82	exp "EXOSKELETON (REHABILITATION)"/
83	(exoskeleton* or exo-skeleton*).ti,ab.
84	(Rex adj3 bionic*).ti,ab.
85	EKSO.ti,ab.
86	(rewalk or Indego).ti,ab.
87	(saebo adj3 (reach or glove or flex)).ti,ab.
88	((repetitiv* or repeat* or practice? or practicing) adj3 (task? or skill? or train*)).ti,ab.
89	((train* or retrain* or relearn*) adj3 (task? or skill?)).ti,ab.
90	or/68-89
91	(vestibular adj3 (exercis* or compensat* or rehab* or therap*)).ti,ab.
92	((Cawthorne or Cooksey or Brandt or Daroff or Frenkel) adj3 exercis*).ti,ab.
93	((gaz* or postur*) adj3 stabili* adj3 (exercis* or intervention?)).ti,ab.
94	(canalith adj3 reposition*).ti,ab.
95	(optokinetic adj3 train*).ti,ab.
96	(balanc* adj3 (exercis* or rehab* or therap* or train* or retrain* or program*)).ti,ab.
97	((shak* or nod* or stare or staring) adj3 exercis*).ti,ab.
98	((sit* or stand? or standing or reach*) adj3 exercis*).ti,ab.
99	(perturb* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program*)).ti,ab.
100	GAIT/ and (exp KINESIOTHERAPY/ or BODY WEIGHT/ or ROBOTICS/ or COGNITIVE ROBOTICS/)
101	(gait adj3 (train* or retrain* or relearn* or rehab* or exercis* or treadmill? or robot* or outdoor?)).ti,ab.
102	(train* adj3 (body or bodies or weight) adj3 support*).ti,ab.
103	CALISTHENICS/
104	cal?isthenic*.ti,ab.
105	(backward? adj3 chain*).ti,ab.
106	exp LOWER LIMB/
107	(lower adj2 (limb? or extremit*)).ti,ab.
108	(ankle? or buttock? or foot or feet? or forefoot or forefeet or metatars* or tarsal* or toe? or hallux or heel? or hip? or knee? or leg? or thigh?).ti,ab.
109	(abductor or adductor or articularis genu or biceps femoris or dorsal interosseous or extensor or fibularis or flexor or gastrocnemius femur or gemellus or gluteus or gracilis or iliac* or iliopsoas or lumbricals or obturator or pectineus or peroneus or piriformis or plantaris or popliteus or psoas or quadratus or rectus femoris or sartorius or semimembranosus upper or semitendinosus lower or soleus posterior or superior gemellus or tensor fasciae latae or tibialis or vastus).ti,ab.
110	or/106-109
111	or/68-87
112	((dual* or multi*) adj3 task? adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
113	(multitask* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
114	(sensorimotor* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
115	*NEUROMODULATION/
116	neuromodulation.ti,ab.
117	exp TRANSCRANIAL MAGNETIC STIMULATION/
118	TRANSCRANIAL DIRECT CURRENT STIMULATION/
119	(transcranial adj3 (direct* or current* or magnetic*) adj3 stimulat*).ti,ab.
120	or/117-119
121	exp HYDROTHERAPY/
122	(hydrotherap* or aquatherap*).ti,ab.
123	((water* or hydro* or aqua* or pool? or ai chi*) adj3 (therap* or rehab* or exercis*)).ti,ab.
124	EXERGAMING/
125	(exergam* or gamerci*).ti,ab.
126	((activ* or exercis* or fitness*) adj3 (game? or gaming or gamificat*)).ti,ab.

#	Searches
127	(interact* adj1 (fitness* or exerci*)).ti,ab.
128	*VIRTUAL REALITY/
129	AUGMENTED REALITY/
130	((virtual* or augment*) adj3 realit*).ti,ab.
131	(exercis* adj3 program* adj5 (stabili* or mobili* or limb function* or coordinat*)).ti,ab.
132	((individual* or tailor*) adj5 exercis* adj3 program*).ti,ab.
133	(cough* adj3 augment* adj3 technique?).ti,ab.
134	((manual* or device? or mechanic*) adj3 (assist* or augment*) adj3 cough*).ti,ab.
135	((manual* or ventilat* or mechanical*) adj3 (hyperinflation or insufflator* or exsufflator)).ti,ab.
136	(breath* adj3 stack*).ti,ab.
137	lung volume recruitment.ti,ab.
138	(inspirat* adj3 muscl* adj3 train*).ti,ab.
139	(rehab* adj5 intervention? adj5 (limb? function* or stabilit* or mobilit*)).ti,ab.
140	91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 101 or 102 or 103 or 104 or 105 or 112 or 113 or 114 or 115 or 116 or 121 or 122 or 123 or 124 or 125 or 126 or 127 or 128 or 129 or 130 or 131 or 132 or 133 or 134 or 135 or 136 or 137 or 138 or 139
141	67 and 90
142	110 and 111
143	(67 or 110) and 120
144	or/140-143
145	62 and 144
146	letter.pt. or letter/
147	note.pt.
148	editorial.pt.
149	case report/ or case study/
150	(letter or comment*).ti.
151	or/146-150
152	randomized controlled trial/ or random*.ti,ab.
153	151 not 152
154	animal/ not human/
155	nonhuman/
156	exp Animal Experiment/
157	exp Experimental Animal/
158	animal model/
159	exp Rodent/
160	(rat or rats or rodent* or mouse or mice).ti.
161	or/153-160
162	145 not 161
163	limit 162 to english language
164	limit 163 to yr="2013 -Current"
165	systematic review/
166	meta-analysis/
167	(meta analy* or metanaly* or metaanaly*).ti,ab.
168	((systematic or evidence) adj2 (review* or overview*)).ti,ab.
169	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
170	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
171	(search* adj4 literature).ab.
172	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
173	((pool* or combined) adj2 (data or trials or studies or results)).ab.
174	cochrane.jw.
175	or/165-174
176	random*.ti,ab.

#	Searches
177	factorial*.ti,ab.
178	(crossover* or cross over*).ti,ab.
179	((doubl* or singl*) adj blind*).ti,ab.
180	(assign* or allocat* or volunteer* or placebo*).ti,ab.
181	crossover procedure/
182	single blind procedure/
183	randomized controlled trial/
184	double blind procedure/
185	or/176-184
186	EPIDEMIOLOGY/ or CONTROLLED STUDY/ or exp CASE CONTROL STUDY/ or PROSPECTIVE STUDY/ or RETROSPECTIVE STUDY/ or COHORT ANALYSIS/ or FOLLOW UP/ or CROSS-SECTIONAL STUDY/ or exp CLINICAL TRIAL/ or COMPARATIVE STUDY/
187	(control and study).mp.
188	program.mp.
189	or/186-188
190	exp juvenile/ or Child Behavior/ or Child Welfare/ or Child Health/ or infant welfare/ or "minor (person)"/ or elementary student/
191	(prematur* or pre-matur* or preterm* or pre-term* or infan* or newborn* or new-born* or perinat* or peri-nat* or neonat* or neo-nat* or baby* or babies or toddler*).ti,ab,in,ad,jw.
192	(child* or minor or minors or boy* or girl* or kid or kids or young*).ti,ab,in,ad,jw.
193	exp pediatrics/
194	(pediatric* or paediatric* or peadiatric*).ti,ab,in,ad,jw.
195	exp adolescence/ or exp adolescent behavior/ or adolescent health/ or high school student/ or middle school student/
196	(adolescen* or pubescen* or prepubescen* or pre-pubescen* or pubert* or prepubert* or pre-pubert* or teen* or preteen* or pre-teen* or juvenil* or youth* or under*age*).ti,ab,in,ad,jw.
197	school/ or high school/ or kindergarten/ or middle school/ or primary school/ or nursery school/ or day care/
198	(pre-school* or preschool* or kindergar* or daycare or day-care or nurser* or school* or pupil* or student*).ti,ab,jw.
199	("under 18*" or "under eighteen*" or "under 25*" or "under twenty five*").ti,ab.
200	or/190-199
201	(conference abstract* or conference review or conference paper or conference proceeding).db,pt,su.
202	164 and (175 or 185)
203	164 and 189 and 200
204	or/202-203
205	(conference abstract* or conference review or conference paper or conference proceeding).db,pt,su.
206	204 not 205

Databases: Cochrane Central Register of Controlled Trials; and Cochrane Database of Systematic Reviews

Date of last search: 27/03/2024

#	Searches
#1	MeSH descriptor: [Craniocerebral Trauma] this term only
#2	MeSH descriptor: [Brain Injuries] this term only
#3	MeSH descriptor: [Brain Hemorrhage, Traumatic] explode all trees
#4	MeSH descriptor: [Brain Injuries, Diffuse] explode all trees
#5	MeSH descriptor: [Brain Injuries, Traumatic] explode all trees
#6	MeSH descriptor: [Brain Injury, Chronic] explode all trees
#7	MeSH descriptor: [Shaken Baby Syndrome] this term only
#8	MeSH descriptor: [Brain Damage, Chronic] this term only
#9	MeSH descriptor: [Hypoxia, Brain] this term only
#10	MeSH descriptor: [Intracranial Hemorrhage, Traumatic] explode all trees

#	Searches
#11	MeSH descriptor: [Brain Neoplasms] explode all trees
#12	MeSH descriptor: [Brain Diseases] this term only
#13	MeSH descriptor: [Brain Abscess] this term only
#14	MeSH descriptor: [Brain Diseases, Metabolic] this term only
#15	MeSH descriptor: [Cerebellar Diseases] this term only
#16	MeSH descriptor: [Cerebrovascular Disorders] this term only
#17	MeSH descriptor: [Basal Ganglia Cerebrovascular Disease] this term only
#18	MeSH descriptor: [Cerebrovascular Trauma] this term only
#19	MeSH descriptor: [Intracranial Arteriovenous Malformations] this term only
#20	MeSH descriptor: [Intracranial Embolism and Thrombosis] this term only
#21	MeSH descriptor: [Intracranial Hemorrhages] this term only
#22	MeSH descriptor: [Vascular Headaches] this term only
#23	MeSH descriptor: [Encephalitis] this term only
#24	MeSH descriptor: [Hydrocephalus] this term only
#25	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24
#26	MeSH descriptor: [Stroke] explode all trees
#27	MeSH descriptor: [Dementia] this term only
#28	#26 or #27
#29	#25 NOT #28
#30	((brain* or cereb* or craniocereb* or cranial or intracrani* or neurocognit*) NEAR/2 (injur* or trauma* or damage* or disease* or diseases* or disorder* or infect* or hemorrhag* or haemorrhag* or neoplasm* or cancer* or tumour* or tumor* or insult* or impair* or ischemi* or ischaemi* or infarcti* or hypoxi* or drown*)):ti,ab
#31	(chronic* NEAR/1 trauma* NEAR/2 encephalopath*):ti,ab
#32	((infratentorial* or supratentorial* or hypothalam* or pituitar* or "choroid plexus") NEAR/2 (neoplasm* or cancer* or tumour* or tumor* or carcinom* or adenocarcinom*)):ti,ab
#33	(brain* NEAR/2 abscess*):ti,ab
#34	(carotid arter* NEAR/2 (disease* or injur*)):ti,ab
#35	(("basal ganglia" next disease*) or encephalitis or meningoencephalitis or hydrocephal* or "paraneoplastic cerebellar" next degenerat* or "shaken baby" next syndrome* or "shaking baby" next syndrome*):ti,ab
#36	MeSH descriptor: [Stroke] explode all trees
#37	MeSH descriptor: [Adolescent] this term only
#38	MeSH descriptor: [Minors] this term only
#39	MeSH descriptor: [Child] explode all trees
#40	MeSH descriptor: [Infant] explode all trees
#41	MeSH descriptor: [Pediatrics] explode all trees
#42	MeSH descriptor: [Puberty] explode all trees
#43	#37 or #38 or #39 or #40 or #41 or #42
#44	#36 and #43
#45	((stroke or strokes) NEAR/3 (paediatric* or pediatric* or child* or adolescen* or kid or kids or youth* or youngster* or minor or minors or underage* or "under age" or "under ages" or "under aged" or teen or teens or teenager* or juvenile* or boy or boys or boyhood or girl or girls or girlhood or schoolchild* or "school ages" or "school age" or "school aged" or schoolage* or "under 16" or "under sixteen" or "under sixteens")):ti,ab
#46	MeSH descriptor: [Spinal Cord Injuries] explode all trees
#47	MeSH descriptor: [Spinal Cord Neoplasms] explode all trees
#48	MeSH descriptor: [Epidural Abscess] this term only
#49	MeSH descriptor: [Spinal Cord Diseases] this term only
#50	MeSH descriptor: [Spinal Cord Vascular Diseases] explode all trees
#51	MeSH descriptor: [Spinal Cord Compression] this term only
#52	MeSH descriptor: [Myelitis, Transverse] this term only
#53	((spinal* or spine or spines) NEAR/2 (injur* or trauma* or tumour* or tumor* or neoplasm* or cancer* or infect* or insult* or disease or diseases or disorder* or degenrat* or compress* or vascular* or ischemi* or ischaemi* or infarct* or hemorrhag* or haemorrhag*)):ti,ab

#	Searches
#54	("Central cord" next syndrome* or "transverse myelitis"):ti,ab
#55	(epidural* NEAR/2 (neoplasm* or cancer* or tumour* or tumor* or abscess*)):ti,ab
#56	((spinal* or spine or spines) NEAR/2 (viral* or virus* or polio* or "acquired immunodeficiency syndrome" or AIDS or HIV or bacterial* or neurosyphili* or neuro next syphili* or tubercul*)):ti,ab
#57	MeSH descriptor: [Peripheral Nerve Injuries] this term only
#58	MeSH descriptor: [Cranial Nerve Injuries] explode all trees
#59	MeSH descriptor: [Peripheral Nervous System Neoplasms] this term only
#60	MeSH descriptor: [Cranial Nerve Neoplasms] explode all trees
#61	MeSH descriptor: [Peripheral Nervous System Diseases] explode all trees
#62	MeSH descriptor: [Cranial Nerve Diseases] explode all trees
#63	((periph* or cranial*) NEAR/1 (nerve or nerves or "nervous system") NEAR/2 (injur* or trauma* or disorder* or disease* or damage* or neoplasm* or cancer* or tumour* or tumor* or inflamm* or autoimmun* or paraneoplastic* or neuropath* or syndrome*)):ti,ab
#64	(Guillain* NEAR/1 Barr*):ti,ab
#65	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or "ocular motility" or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) NEAR/1 nerve* NEAR/1 injur*):ti,ab
#66	(optic* NEAR/1 nerve* NEAR/2 (neoplasm* or cancer* or tumour* or tumor*)):ti,ab
#67	(brachial next plexus NEAR/1 (neuropath* or neuritis)):ti,ab
#68	("complex regional pain" next syndrome* or causalgia or mononeuropath* or "nerve compression" next syndrome*):ti,ab
#69	((femoral or median or peroneal or radial or sciatic or tibial or ulnar) NEAR/1 neuropath*):ti,ab
#70	((carpal next tunnel or piriformis next muscle or tarsal next tunnel or thoracic next outlet) NEAR/1 syndrome*):ti,ab
#71	((pudendal next neuralgia) or polyneuropath* or polyradiculoneuropath* or polyradiculopath* or radiculopath*):ti,ab
#72	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or "ocular motility" or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) NEAR/1 nerve* NEAR/1 disease*):ti,ab
#73	(periph* NEAR/2 neuropath*):ti,ab
#74	(((periph* or cranial*) NEAR/2 (nerve or nerves or "nervous system")) and lupus):ti,ab
#75	((multi next focal* or multifocal*) NEAR/2 motor NEAR/1 neuropath*):ti,ab
#76	(((periph* or cranial*) NEAR/2 (nerve or nerves or nervous system)) and alcohol*):ti,ab
#77	#29 or #30 or #31 or #32 or #33 or #34 or #35 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76
#78	MeSH descriptor: [Motor Neuron Disease] explode all trees
#79	MeSH descriptor: [Postpoliomyelitis Syndrome] this term only
#80	MeSH descriptor: [Parkinsonian Disorders] explode all trees
#81	MeSH descriptor: [Muscular Dystrophy, Duchenne] this term only
#82	MeSH descriptor: [Multiple Sclerosis] explode all trees
#83	MeSH descriptor: [Neuromuscular Diseases] this term only
#84	MeSH descriptor: [Spastic Paraplegia, Hereditary] this term only
#85	MeSH descriptor: [Friedreich Ataxia] this term only
#86	MeSH descriptor: [Multiple System Atrophy] explode all trees
#87	MeSH descriptor: [Supranuclear Palsy, Progressive] this term only
#88	MeSH descriptor: [Corticobasal Degeneration] explode all trees
#89	MeSH descriptor: [Leukodystrophy, Metachromatic] this term only
#90	MeSH descriptor: [Mitochondrial Myopathies] explode all trees
#91	MeSH descriptor: [Mucopolysaccharidoses] explode all trees
#92	MeSH descriptor: [Williams Syndrome] this term only
#93	MeSH descriptor: [Genetic Diseases, Inborn] this term only
#94	MeSH descriptor: [Rett Syndrome] this term only
#95	MeSH descriptor: [Fetal Alcohol Spectrum Disorders] this term only
#96	MeSH descriptor: [Dystonic Disorders] this term only
#97	MeSH descriptor: [Hereditary Sensory and Motor Neuropathy] this term only

#	Searches
#98	MeSH descriptor: [Spinal Dysraphism] this term only
#99	(neurolog* NEAR/1 (condition* or disease* or damage* or disorder* or impair*)):ti,ab
#100	((motor next neuron* or gehrig* or charcott* or kennedy*) NEAR/1 disease*):ti,ab
#101	((amyotroph* or primary) NEAR/1 lateral* NEAR/1 sclero*):ti,ab
#102	(bulbar NEAR/1 pals*):ti,ab
#103	((muscular or muscle* or bulbo) NEAR/1 atroph* NEAR/1 spin*):ti,ab
#104	(progressiv* NEAR/1 (muscular or muscle*) NEAR/1 atroph*):ti,ab
#105	((postpolio* or post next polio*) NEAR/1 (syndrome*)):ti,ab
#106	(Parkinson* or duchenne* or multiple next scleros* or sclerosos* or aphasia or creutzfeldt next jakob or huntington* or kluver next bucy):ti,ab
#107	(muscular NEAR/1 dystroph*):ti,ab
#108	((neurolog*) near/1 (condition* or disease* or damage* or disorder* or impair*)):ti,ab
#109	(heredit* NEAR/1 spastic* NEAR/1 parapleg*):ti,ab
#110	(friedreich* next ataxia*):ti,ab
#111	(("multiple system" or olivopontocerebellar) NEAR/1 atroph*):ti,ab
#112	((shy next drager next syndrome*) or striatonigral next degenerat* or batten next disease*):ti,ab
#113	(progressive NEAR/1 supranuclear NEAR/1 pals*):ti,ab
#114	(richardson* NEAR/1 (disease* or syndrome*)):ti,ab
#115	((corticobasal or "cortico basal") NEAR/1 degenerat*):ti,ab
#116	("white matter" NEAR/1 (disorder*)):ti,ab
#117	(metachromatic next leukodystroph* or mitochondrial next myopath* or mucopolysaccharidos*):ti,ab
#118	(lysosomal NEAR/1 storage NEAR/1 disorder*):ti,ab
#119	((genetic or William* or "catch-22" or rett* or congenital or fetal or "foetal alcohol") NEAR/1 (syndrome* or disorder*)):ti,ab
#120	(perinatal NEAR/1 (illness* or hypoxia*)):ti,ab
#121	(primary NEAR/1 (dystonia or dystonias)):ti,ab
#122	(heredit* NEAR/1 motor* NEAR/1 sens* NEAR/1 neuropath*):ti,ab
#123	(spina next (bifida or bifidas) or spinal next (dysraphism or dysraphisms)):ti,ab
#124	MeSH descriptor: [Movement Disorders] this term only
#125	MeSH descriptor: [Motor Disorders] this term only
#126	MeSH descriptor: [Conversion Disorder] this term only
#127	((functional* or psychogenic* or dissociative*) NEAR/1 neurologic* NEAR/1 (disorder* or dysfunction* or difficult*)):ti,ab
#128	((movement* or motor* or convers*) NEAR/1 (disorder* or dysfunct*)):ti,ab
#129	((psychogenic or dissociative or non-epilep* or nonepilep*) NEAR/1 (seizure* or convulsion* or fit or fits or spasm* or attack*)):ti,ab
#130	(pseudo next seizure or pseudoseizure):ti,ab
#131	(medical* NEAR/1 (unexplain* or un next explain*) NEAR/1 (symptom*)):ti,ab
#132	#77 or #78 or #79 or #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93 or #94 or #95 or #96 or #97 or #98 or #99 or #100 or #101 or #102 or #103 or #104 or #105 or #106 or #107 or #108 or #109 or #110 or #111 or #112 or #113 or #114 or #115 or #116 or #117 or #118 or #119 or #120 or #121 or #122 or #123 or #124 or #125 or #126 or #127 or #128 or #129 or #130 or #131
#133	MeSH descriptor: [Upper Extremity] explode all trees
#134	(upper near/2 (limb or limbs or extremit*)):ti,ab
#135	(arm or arms or axilla* or elbow* or forearm* or hand or hands or finger Or fingers or thumb* or phalange* or metacarp* or carpal* or shoulder* or wrist*):ti,ab
#136	(bicep* or tricep* or brachialis or ((abductor* or extensor* or flexor*) near/1 (pollicis or carpi or radialis* or digitorium*))):ti,ab
#137	#133 or #134 or #135 or #136
#138	MeSH descriptor: [Wearable Electronic Devices] this term only
#139	(wear* or worn):ti,ab
#140	((cloth* or strap* or armband* or waistband* or shorts or trousers or splint*) near/3 (neuromuscular* or function* or electric* or stimulat* or NMES or FES)):ti,ab
#141	((smart or sensor*) near/3 system*):ti,ab

#	Searches
#142	"interactive feedback":ti,ab
#143	MeSH descriptor: [Electric Stimulation] this term only
#144	MeSH descriptor: [Electric Stimulation Therapy] this term only
#145	(electric* near/3 (stimulat* or therap*)):ti,ab
#146	MeSH descriptor: [Neural Prostheses] this term only
#147	((neural or neuro) near/3 prosthe*):ti,ab
#148	(neuralprosthe* or neuroprosthe*):ti,ab
#149	MOLLII:ti,ab
#150	MeSH descriptor: [Robotics] this term only
#151	robot*:ti,ab
#152	MeSH descriptor: [Exoskeleton Device] this term only
#153	(exoskeleton* or exo-skeleton*):ti,ab
#154	(Rex near/3 bionic*):ti,ab
#155	EKSO:ti,ab
#156	(rewalk or Indego):ti,ab
#157	(saebo near/3 (reach or glove or flex)):ti,ab
#158	((repetitiv* or repeat* or practice* or practicing) near/3 (task or tasks or skill or skills or train*)):ti,ab
#159	((train* or retrain* or relearn*) near/3 (task or tasks or skill or skills)):ti,ab
#160	#138 or #139 or #140 or #141 or #142 or #143 or #144 or #145 or #146 or #147 or #148 or #149 or #150 or #151 or #152 or #153 or #154 or #155 or #156 or #157 or #158 or #159
#161	(vestibular near/3 (exercis* or compensat* or rehab* or therap*)):ti,ab
#162	((Cawthorne or Cooksey or Brandt or Daroff or Frenkel) near/3 exercis*):ti,ab
#163	((gaz* or postur*) near/3 stabili* near/3 (exercis* or intervention*)):ti,ab
#164	(canalith near/3 reposition*):ti,ab
#165	(optokinetic near/3 train*):ti,ab
#166	(balanc* near/3 (exercis* or rehab* or therap* or train* or retrain* or program*)):ti,ab
#167	((shak* or nod* or stare or staring) near/3 exercis*):ti,ab
#168	((sit* or stand or stands or standing or reach*) near/3 exercis*):ti,ab
#169	(perturb* near/3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program*)):ti,ab
#170	MeSH descriptor: [Gait] this term only
#171	MeSH descriptor: [Exercise Therapy] explode all trees
#172	MeSH descriptor: [Body Weight] this term only
#173	MeSH descriptor: [Robotics] this term only
#174	#171 or #172 or #173
#175	#170 and #174
#176	(gait near/3 (train* or retrain* or relearn* or rehab* or exercis* or treadmill* or robot* or outdoor*)):ti,ab
#177	(train* near/3 (body or bodies or weight) near/3 support*):ti,ab
#178	(calisthenic* or callisthenic*):ti,ab
#179	(backward* near/3 chain*):ti,ab
#180	MeSH descriptor: [Lower Extremity] explode all trees
#181	(lower near/2 (limb or limbs or extremit*)):ti,ab
#182	(ankle* or buttock* or foot or feet or feets or forefoot or forefeet or metatars* or tarsal* or toe or toes or hallux or heel or heels or hip or hips or knee or knees or leg or legs or thigh*):ti,ab
#183	(abductor or adductor or "articularis genu" or "biceps femoris" or "dorsal interosseous" or extensor or fibularis or flexor or "gastrocnemius femur" or gemellus or gluteus or gracilis or iliac* or iliopsoas or lumbricals or obturator or pectineus or peroneus or piriformis or plantaris or popliteus or psoas or quadratus or "rectus femoris" or sartorius or "semimembranosus upper" or "semitendinosus lower" or "soleus posterior" or "superior gemellus" or "tensor fasciae latae" or tibialis or vastus):ti,ab
#184	#180 or #181 or #182 or #183
#185	#138 or #139 or #140 or #141 or #142 or #143 or #144 or #145 or #146 or #147 or #148 or #149 or #150 or #151 or #152 or #153 or #154 or #155 or #156 or #157
#186	((dual* or multi*) near/3 (task or tasks) near/3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)):ti,ab
#187	(multitask* near/3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)):ti,ab

#	Searches
#188	(sensorimotor* near/3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)):ti,ab
#189	neuromodulation:ti,ab
#190	MeSH descriptor: [Transcranial Magnetic Stimulation] this term only
#191	MeSH descriptor: [Transcranial Direct Current Stimulation] this term only
#192	(transcranial near/3 (direct* or current* or magnetic*) near/3 stimulat*):ti,ab
#193	#190 or #191 or #192
#194	MeSH descriptor: [Hydrotherapy] this term only
#195	MeSH descriptor: [Aquatic Therapy] this term only
#196	(hydrotherap* or aquatherap*):ti,ab
#197	((water* or hydro* or aqua* or pool or pools or "ai chi") near/3 (therap* or rehab* or exercis*)):ti,ab
#198	MeSH descriptor: [Exergaming] this term only
#199	(exergam* or gamerci*):ti,ab
#200	((activ* or exercis* or fitness*) near/3 (game* or gaming or gamificat*)):ti,ab
#201	(interact* near/1 (fitness* or exerci*)):ti,ab
#202	MeSH descriptor: [Virtual Reality] this term only
#203	MeSH descriptor: [Augmented Reality] this term only
#204	((virtual* or augment*) near/3 realit*):ti,ab
#205	(exercis* near/3 program* near/5 (stabili* or mobili* or (limb near/1function*) or coordinat*)):ti,ab
#206	((individual* or tailor*) near/5 exercis* near/3 program*):ti,ab
#207	(cough* near/3 augment* near/3 technique*):ti,ab
#208	((manual* or device* or mechanic*) near/3 (assist* or augment*) near/3 cough*):ti,ab
#209	((manual* or ventilat* or mechanical*) near/3 (hyperinflation or insufflator* or exsufflator)):ti,ab
#210	(breath* near/3 stack*):ti,ab
#211	"lung volume recruitment":ti,ab
#212	(inspirat* near/3 muscl* near/3 train*):ti,ab
#213	(rehab* near/5 intervention* near/5 ((limb* NEXT function*) or stabilit* or mobilit*)):ti,ab
#214	#161 or #162 or #163 or #164 or #165 or #166 or #167 or #168 or #169 or #175 or #176 or #177 or #178 or #179 or #186 or #187 or #188 or #189 or #194 or #195 or #196 or #197 or #198 or #199 or #200 or #201 or #202 or #203 or #204 or #205 or #206 or #207 or #208 or #209 or #210 or #211 or #212 or #213
#215	#137 and #160
#216	#184 and #185
#217	(#137 or #184) and #193
#218	#214 or #215 or #216 or #217
#219	#132 and #218
#220	#132 and #218 with Cochrane Library publication date Between Jan 2013 and Mar 2024, in Cochrane Reviews
#221	((clinicaltrials or trialsearch* or trial-registry or trials-registry or clinicalstudies or trialsregister* or trialregister* or trial-number* or studyregister* or study-register* or controlled-trials-com or current-controlled-trial or AMCTR or ANZCTR or ChiCTR* or CRiS or CTIS or CTRI* or DRKS* or EU-CTR* or EUCTR* or EUDRACT* or ICTRP or IRCT* or JAPIC* or JMCTR* or JRCT or ISRCTN* or LBCTR* or NTR* or ReBec* or REPEC* or RPCEC* or SLCTR or TCTR* or UMIN*):so or (ctgov or ictrp)):an
#222	#219 not #221
#223	"conference":pt
#224	#222 not #223
#225	#222 not #223 with Publication Year from 2013 to 2024, in Trials

Databases: PsycInfo

Date of last search: 27/03/2024

#	Searches
1	(exp Brain Injuries/ or anoxia/ or exp brain disorders/ or exp cerebrovascular disorders/ or exp headache/) not (exp Dementia/ or Cerebrovascular Accidents/)

#	Searches
2	((brain* or cereb* or craniocereb* or cranial or intracrani* or neurocognit*) adj2 (injur* or trauma* or damage* or disease*1 or disorder* or infect* or h?emorrhag* or neoplasm* or cancer* or tumo?r* or insult* or impair* or ischemi* or ischaemi* or infarcti* or hypoxi* or drown*)).ti,ab.
3	(chronic* adj1 trauma* adj2 encephalopath*).ti,ab.
4	((infratentorial* or supratentorial* or hypothalam* or pituitar* or choroid plexus) adj2 (neoplasm* or cancer* or tumo?r* or carcinom* or adenocarcinom*)).ti,ab.
5	(brain* adj2 abscess*).ti,ab.
6	(carotid arter* adj2 (disease* or injur*)).ti,ab.
7	("basal ganglia disease*" or encephalitis or meningoencephalitis or hydrocephal* or "paraneoplastic cereb* degenerat*" or "shak* baby syndrome*").ti,ab.
8	Cerebrovascular Accidents/ and (exp childhood development/ or exp adolescent development/ or pediatrics/ or puberty/)
9	(stroke? adj3 (p?ediatric* or child* or adolescen* or kid or kids or youth* or youngster* or minor or minors or underage* or under-age* or "under age*" or teen or teens or teenager* or juvenile* or boy or boys or boyhood or girl or girls or girlhood or schoolchild* or "school age*" or schoolage* or "under 16" or "under sixteen*")).ti,ab.
10	spinal cord injuries/ or (Spinal Cord/ and neoplasms/) or (Cardiovascular Disorders/ and spinal cord/) or exp myelitis/
11	((spinal* or spine?) adj2 (injur* or trauma* or tumo?r* or neoplasm* or cancer* or infect* or insult* or disease? or disorder* or degenrat* or compress* or vascular* or ischemi* or ischaemi* or infarct* or h?emorrhag*)).ti,ab.
12	(Central cord syndrome* or transverse myelitis).ti,ab.
13	(epidural* adj2 (neoplasm* or cancer* or tumo?r* or abscess*)).ti,ab.
14	((spinal* or spine?) adj2 (viral* or virus* or polio* or acquired immunodeficiency syndrome or AIDS or HIV or bacterial* or neurosyphili* or neuro-syphili* or tubercul*)).ti,ab.
15	(exp Peripheral Nervous System/ and (Injuries/ or neoplasms/)) or nervous system disorders/
16	((periph* or cranial*) adj1 (nerve? or nervous system) adj2 (injur* or trauma* or disorder* or disease* or damage* or neoplasm* or cancer* or tumo?r* or inflamm* or autoimmun* or paraneoplastic* or neuropath* or syndrome?)).ti,ab.
17	(Guillain* adj1 Barr*).ti,ab.
18	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 injur*).ti,ab.
19	(optic* adj1 nerve* adj2 (neoplasm* or cancer* or tumo?r*)).ti,ab.
20	(brachial plexus adj1 (neuropath* or neuritis)).ti,ab.
21	(complex regional pain syndrome* or causalgia or mononeuropath* or nerve compression syndrome*).ti,ab.
22	((femoral or median or peroneal or radial or sciatic or tibial or ulnar) adj1 neuropath*).ti,ab.
23	((carpal-tunnel or piriformis-muscle or tarsal-tunnel or thoracic-outlet) adj1 syndrome*).ti,ab.
24	(pudendal neuralgia or polyneuropath* or polyradiculoneuropath* or polyradiculopath* or radiculopath*).ti,ab.
25	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 disease*).ti,ab.
26	(periph* adj2 neuropath*).ti,ab.
27	(((periph* or cranial*) adj2 (nerve? or nervous system)) and lupus).ti,ab.
28	((multi-focal* or multifocal*) adj2 motor adj1 neuropath*).ti,ab.
29	(((periph* or cranial*) adj2 (nerve? or nervous system)) and alcohol*).ti,ab.
30	motor neurons/ or exp muscular disorders/ or exp neuromuscular disorders/ or multiple sclerosis/ or neurodegenerative diseases/ or Progressive Supranuclear Palsy/ or corticobasal degeneration/ or Metabolism Disorders/ or Williams Syndrome/ or genetic disorders/ or rett syndrome/ or fetal alcohol syndrome/ or exp peripheral neuropathy/ or spina bifida/
31	(neurolog* adj1 (condition* or disease* or damage* or disorder* or impair*)).ti,ab.
32	((motor-neuron* or gehrig* or charcott* or kennedy*) adj1 disease*).ti,ab.
33	((amyotroph* or primary) adj1 lateral* adj1 sclero*).ti,ab.
34	(bulbar adj1 pals*).ti,ab.
35	((muscular or muscle* or bulbo) adj1 atroph* adj1 spin*).ti,ab.
36	(progressiv* adj1 (muscular or muscle*) adj1 atroph*).ti,ab.
37	((postpolio* or post-polio*) adj1 syndrome?).ti,ab.
38	(Parkinson* or duchenne* or multiple scleros?s* or aphasia or creutzfeldt-jakob or huntington* or kluver-bucy).ti,ab.

#	Searches
39	(muscular adj1 dystroph*).ti,ab.
40	(neuromusc* adj1 (disease* or disorder?)).ti,ab.
41	(heredit* adj1 spastic* adj1 parapleg*).ti,ab.
42	"friedreich* ataxia*".ti,ab.
43	((multiple system or olivopontocerebellar) adj1 atroph*).ti,ab.
44	(shy-drager syndrome* or striatonigral degenerat* or batten* disease?).ti,ab.
45	(progressive adj1 supranuclear adj1 pals*).ti,ab.
46	(richardson* adj1 (disease? or syndrome?)).ti,ab.
47	((corticobasal or cortico basal) adj1 degenerat*).ti,ab.
48	(white adj1 matter adj1 disorder?).ti,ab.
49	(metachromatic leukodystroph* or mitochondrial myopath* or mucopolysaccharidos*).ti,ab.
50	(lysosomal adj1 storage adj1 disorder?).ti,ab.
51	((genetic or William* or catch-22 or rett* or congenital or f?etal alcohol) adj1 (syndrome or disorder*)).ti,ab.
52	(perinatal illness* or perinatal hypoxia*).ti,ab.
53	(primary adj1 dystonia?).ti,ab.
54	(heredit* adj1 motor* adj1 sens* adj1 neuropath*).ti,ab.
55	(spina bifida? or spinal dysraphism?).ti,ab.
56	conversion disorder/
57	((functional* or psychogenic* or dissociative*) adj1 neurologic* adj1 (disorder* or dysfunction* or difficult*)).ti,ab.
58	((movement* or motor* or convers*) adj1 (disorder* or dysfunct*)).ti,ab.
59	((psychogenic or dissociative or non-epilep* or nonepilep*) adj1 (seizure* or convulsion* or fit or fits or spasm* or attack*)).ti,ab.
60	(pseudo-seizure* or pseudoseizure*).ti,ab.
61	(medical* adj1 (unexplain* or un-explain*) adj1 symptom?).ti,ab.
62	or/1-61
63	(upper adj2 (limb? or extremit*)).ti,ab.
64	(arm? or axilla? or elbow? or forearm? or hand? or finger? or thumb? or phalange* or metacarp* or carpal* or shoulder? or wrist?).ti,ab.
65	(bicep* or tricep* or brachialis or ((abductor* or extensor* or flexor*) adj1 (pollicis or carpi or radialis* or digitorium*))).ti,ab.
66	or/63-65
67	WEARABLE DEVICES/
68	(wear* or worn).ti,ab.
69	((cloth* or strap* or armband? or waistband? or shorts or trousers or splint*) adj3 (neuromuscular* or function* or electric* or stimulat* or NMES or FES)).ti,ab.
70	((smart or sensor?) adj3 system?).ti,ab.
71	interactive feedback.ti,ab.
72	ELECTRICAL STIMULATION/
73	(electric* adj3 (stimulat* or therap*)).ti,ab.
74	((neural or neuro) adj3 prosthe*).ti,ab.
75	(neuralprosthe* or neuroprosthe*).ti,ab.
76	MOLLII.ti,ab.
77	ROBOTICS/
78	robot*.ti,ab.
79	(exoskeleton* or exo-skeleton*).ti,ab.
80	(Rex adj3 bionic*).ti,ab.
81	EKSO.ti,ab.
82	(rewalk or Indego).ti,ab.
83	(saebo adj3 (reach or glove or flex)).ti,ab.
84	((repetitiv* or repeat* or practice? or practicing) adj3 (task? or skill? or train*)).ti,ab.
85	((train* or retrain* or relearn*) adj3 (task? or skill?)).ti,ab.
86	or/67-85

#	Searches
87	(vestibular adj3 (exercis* or compensat* or rehab* or therap*)).ti,ab.
88	((Cawthorne or Cooksey or Brandt or Daroff or Frenkel) adj3 exercis*).ti,ab.
89	((gaz* or postur*) adj3 stabili* adj3 (exercis* or intervention?)).ti,ab.
90	(canalith adj3 reposition*).ti,ab.
91	(optokinetic adj3 train*).ti,ab.
92	(balanc* adj3 (exercis* or rehab* or therap* or train* or retrain* or program*)).ti,ab.
93	((shak* or nod* or stare or staring) adj3 exercis*).ti,ab.
94	((sit* or stand? or standing or reach*) adj3 exercis*).ti,ab.
95	(perturb* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program*)).ti,ab.
96	GAIT/ and (EXERCISE THERAPY/ or BODY WEIGHT/ or ROBOTICS/)
97	(gait adj3 (train* or retrain* or relearn* or rehab* or exercis* or treadmill? or robot* or outdoor?)).ti,ab.
98	(train* adj3 (body or bodies or weight) adj3 support*).ti,ab.
99	cal?isthenic*.ti,ab.
100	(backward? adj3 chain*).ti,ab.
101	(lower adj2 (limb? or extremit*)).ti,ab.
102	(ankle? or buttock? or foot or feet? or forefoot or forefeet or metatars* or tarsal* or toe? or hallux or heel? or hip? or knee? or leg? or thigh?).ti,ab.
103	(abductor or adductor or articularis genu or biceps femoris or dorsal interosseous or extensor or fibularis or flexor or gastrocnemius femur or gemellus or gluteus or gracilis or iliac* or iliopsoas or lumbricals or obturator or pectineus or peroneus or piriformis or plantaris or popliteus or psoas or quadratus or rectus femoris or sartorius or semimembranosus upper or semitendinosus lower or soleus posterior or superior gemellus or tensor fasciae latae or tibialis or vastus).ti,ab.
104	or/101-103
105	or/67-83
106	((dual* or multi*) adj3 task? adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
107	(multitask* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
108	(sensorimotor* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
109	neuromodulation.ti,ab.
110	exp TRANSCRANIAL MAGNETIC STIMULATION/
111	TRANSCRANIAL DIRECT CURRENT STIMULATION/
112	(transcranial adj3 (direct* or current* or magnetic*) adj3 stimulat*).ti,ab.
113	or/110-112
114	HYDROTHERAPY/
115	(hydrotherap* or aquatherap*).ti,ab.
116	((water* or hydro* or aqua* or pool? or ai chi*) adj3 (therap* or rehab* or exercis*)).ti,ab.
117	(exergam* or gamerci*).ti,ab.
118	((activ* or exercis* or fitness*) adj3 (game? or gaming or gamificat*)).ti,ab.
119	(interact* adj1 (fitness* or exerci*)).ti,ab.
120	VIRTUAL REALITY/
121	AUGMENTED REALITY/
122	((virtual* or augment*) adj3 realit*).ti,ab.
123	(exercis* adj3 program* adj5 (stabili* or mobili* or limb function* or coordinat*)).ti,ab.
124	((individual* or tailor*) adj5 exercis* adj3 program*).ti,ab.
125	((manual* or device? or mechanic*) adj3 (assist* or augment*) adj3 cough*).ti,ab.
126	((manual* or ventilat* or mechanical*) adj3 (hyperinflation or insufflator* or exsufflator)).ti,ab.
127	(breath* adj3 stack*).ti,ab.
128	lung volume recruitment.ti,ab.
129	(inspirat* adj3 muscl* adj3 train*).ti,ab.
130	(rehab* adj5 intervention? adj5 (limb? function* or stabilit* or mobilit*)).ti,ab.
131	87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96 or 97 or 98 or 99 or 100 or 106 or 107 or 108 or 109 or 114 or 115 or 116 or 117 or 118 or 119 or 120 or 121 or 122 or 123 or 124 or 125 or 126 or 127 or 128 or 129 or 130

#	Searches
132	66 and 86
133	104 and 105
134	(66 or 104) and 113
135	or/131-134
136	62 and 135
137	(letter or editorial or comment reply).dt. or case report/
138	(letter or comment*).ti.
139	or/137-138
140	exp randomized controlled trial/
141	random*.ti,ab.
142	or/140-141
143	139 not 142
144	animal.po.
145	(rat or rats or rodent* or mouse or mice).ti.
146	or/143-145
147	136 not 146
148	limit 147 to english language
149	limit 148 to yr="2013 -Current"
150	(meta analysis or "systematic review").md.
151	META ANALYSIS/
152	SYSTEMATIC REVIEW/
153	(meta analy* or metanaly* or metaanaly*).ti,ab.
154	((systematic* or evidence*) adj2 (review* or overview*)).ti,ab.
155	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
156	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
157	(search* adj4 literature).ab.
158	((pool* or combined) adj2 (data or trials or studies or results)).ab.
159	(medline or pubmed or cochrane or embase or psychlit or psyclit or cinahl or science citation index or bids or cancerlit).ab.
160	or/150-159
161	clinical trial.md.
162	Clinical trials/
163	Randomized controlled trials/
164	Randomized clinical trials/
165	assign*.ti,ab.
166	allocat*.ti,ab.
167	crossover*.ti,ab.
168	cross over*.ti,ab.
169	((doubl* or singl*) adj blind*).ti,ab.
170	factorial*.ti,ab.
171	placebo*.ti,ab.
172	random*.ti,ab.
173	volunteer*.ti,ab.
174	trial?.ti,ab.
175	or/161-174
176	EPIDEMIOLOGY/ or PROSPECTIVE STUDIES/ or RETROSPECTIVE STUDIES/ or COHORT ANALYSIS/ or FOLLOWUP STUDIES/ or exp CLINICAL TRIALS/
177	(control and study).mp.
178	program.mp.
179	or/176-178
180	(adolescence 13 17 yrs or childhood birth 12 yrs or infancy 2 23 mo or neonatal birth 1 mo or preschool age 2 5 yrs or school age 6 12 yrs).ag.
181	Pediatrics/ or Puberty/ or Adolescence/

#	Searches
182	(child* or adolescen* or baby or babies or boy? or girl? or infan* or juvenile? or kid? or kindergar* or minors or neonat* or newborn? or p?ediatric* or prepubert* or pre pubert* or prepubescen* or pre pubescen* or preschool* or pre school* or preteen* or pre teen* or pubert* or pubescen* or schoolchild* or school age? or teen* or toddler* or young or youth?).ti,ab.
183	(child* or adolescen* or baby or babies or infan* or juvenile? or kindergar* or neonat* or newborn? or p?ediatric* or prepubert* or pre pubert* or pubert* or schoolchild* or school age?).jw.
184	or/180-183
185	149 and (160 or 175)
186	149 and 179 and 184
187	or/185-186
188	limit 187 to ("0100 journal" or "0110 peer-reviewed journal")

Databases: Social policy and practice

Date of last search: 27/03/2024

#	Searches
1	((brain* or cereb* or craniocereb* or cranial or intracrani* or neurocognit*) adj2 (injur* or trauma* or damage* or disease*1 or disorder* or infect* or h?emorrhag* or neoplasm* or cancer* or tumo?r* or insult* or impair* or ischemi* or infarcti* or hypoxi* or drown*)).ti,ab.
2	((brain* or cereb* or craniocereb* or cranial or intracrani* or neurocognit*) and (injur* or trauma* or damage* or disease* or disorder* or infect* or h?emorrhag* or neoplasm* or cancer* or tumo?r* or insult* or impair* or ischemi* or infarcti* or hypoxi* or drown*)).hw.
3	(chronic* adj1 trauma* adj2 encephalopath*).ti,ab.
4	(chronic* and trauma* and encephalopath*).hw.
5	((infratentorial* or supratentorial* or hypothalam* or pituitar* or choroid plexus) adj2 (neoplasm* or cancer* or tumo?r* or carcinom* or adenocarcinom*)).ti,ab.
6	((infratentorial* or supratentorial* or hypothalam* or pituitar* or choroid plexus) and (neoplasm* or cancer* or tumo?r* or carcinom* or adenocarcinom*)).hw.
7	(brain* adj2 abscess*).ti,ab.
8	(brain* and abscess*).hw.
9	(carotid arter* adj2 (disease* or injur*)).ti,ab.
10	(carotid arter* and (disease* or injur*)).hw.
11	("basal ganglia disease*" or encephalitis or meningoencephalitis or hydrocephal* or "paraneoplastic cereb* degenerat*" or "shak* baby syndrome*").ti,ab.
12	("basal ganglia disease*" or encephalitis or meningoencephalitis or hydrocephal* or "paraneoplastic cereb* degenerat*" or "shak* baby syndrome*").hw.
13	(stroke? adj3 (p?ediatric* or child* or adolescen* or kid or kids or youth* or youngster* or minor or minors or underage* or under-age* or "under age*" or teen or teens or teenager* or juvenile* or boy or boys or boyhood or girl or girls or girlhood or schoolchild* or "school age*" or schoolage* or "under 16" or "under sixteen*")).ti,ab.
14	(stroke? and (p?ediatric* or child* or adolescen* or kid or kids or youth* or youngster* or minor or minors or underage* or under-age* or "under age*" or teen or teens or teenager* or juvenile* or boy or boys or boyhood or girl or girls or girlhood or schoolchild* or "school age*" or schoolage* or "under 16" or "under sixteen*")).hw.
15	((spinal* or spine?) adj2 (injur* or trauma* or tumo?r* or neoplasm* or cancer* or infect* or insult* or disease? or disorder* or degenrat* or compress* or vascular* or ischemi* or ischaemi* or infarct* or h?emorrhag*)).ti,ab.
16	((spinal* or spine?) and (injur* or trauma* or tumo?r* or neoplasm* or cancer* or infect* or insult* or disease? or disorder* or degenrat* or compress* or vascular* or ischemi* or ischaemi* or infarct* or h?emorrhag*)).hw.
17	(Central cord syndrome* or transverse myelitis).ti,ab.
18	(Central cord syndrome* or transverse myelitis).hw.
19	(epidural* adj2 (neoplasm* or cancer* or tumo?r* or abscess*)).ti,ab.
20	(epidural* and (neoplasm* or cancer* or tumo?r* or abscess*)).hw.
21	((spinal* or spine?) adj2 (viral* or virus* or polio* or acquired immunodeficiency syndrome or AIDS or HIV or bacterial* or neurosyphili* or neuro-syphili* or tubercul*)).ti,ab.
22	((spinal* or spine?) and (viral* or virus* or polio* or acquired immunodeficiency syndrome or bacterial* or neurosyphili* or neuro-syphili* or tubercul*)).hw.

#	Searches
23	((periph* or cranial*) adj1 (nerve? or nervous system) adj2 (injur* or trauma* or disorder* or disease* or damage* or neoplasm* or cancer* or tumo?r* or inflamm* or autoimmun* or paraneoplastic* or neuropath* or syndrome?)).ti,ab.
24	((periph* or cranial*) and (nerve? or nervous system) and (injur* or trauma* or disorder* or disease* or damage* or neoplasm* or cancer* or tumo?r* or inflamm* or autoimmun* or paraneoplastic* or neuropath* or syndrome?)).hw.
25	(Guillain* adj1 Barr*).ti,ab.
26	(Guillain* and Barr*).hw.
27	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 injur*).ti,ab.
28	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) and nerve* and injur*).hw.
29	(optic* adj1 nerve* adj2 (neoplasm* or cancer* or tumo?r*)).ti,ab.
30	(optic* and nerve* and (neoplasm* or cancer* or tumo?r*)).hw.
31	(brachial plexus adj1 (neuropath* or neuritis)).ti,ab.
32	(brachial plexus and (neuropath* or neuritis)).hw.
33	(complex regional pain syndrome* or causalgia or mononeuropath* or nerve compression syndrome*).ti,ab.
34	(complex regional pain syndrome* or causalgia or mononeuropath* or nerve compression syndrome*).hw.
35	((femoral or median or peroneal or radial or sciatic or tibial or ulnar) adj1 neuropath*).ti,ab.
36	((femoral or median or peroneal or radial or sciatic or tibial or ulnar) and neuropath*).hw.
37	((carpal-tunnel or piriformis-muscle or tarsal-tunnel or thoracic-outlet) adj1 syndrome*).ti,ab.
38	((carpal-tunnel or piriformis-muscle or tarsal-tunnel or thoracic-outlet) and syndrome*).hw.
39	(pudendal neuralgia or polyneuropath* or polyradiculoneuropath* or polyradiculopath* or radiculopath*).ti,ab.
40	(pudendal neuralgia or polyneuropath* or polyradiculoneuropath* or polyradiculopath* or radiculopath*).hw.
41	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) adj1 nerve* adj1 disease*).ti,ab.
42	((abducen* or accessory or facial or glossopharyngeal or hypoglossal or oculomotor or ocular motility or olfactory or optic* or trigeminal or trochlear or vestibulocochlear) and nerve* and disease*).hw.
43	(periph* adj2 neuropath*).ti,ab.
44	(periph* and neuropath*).hw.
45	(((periph* or cranial*) adj2 (nerve? or nervous system)) and lupus).ti,ab.
46	((periph* or cranial*) and (nerve? or nervous system) and lupus).hw.
47	((multi-focal* or multifocal*) adj2 motor adj1 neuropath*).ti,ab.
48	((multi-focal* or multifocal*) and motor and neuropath*).hw.
49	(((periph* or cranial*) adj2 (nerve? or nervous system)) and alcohol*).ti,ab.
50	((periph* or cranial*) and (nerve? or nervous system) and alcohol*).hw.
51	(neurolog* adj1 (condition* or disease* or damage* or disorder* or impair*)).ti,ab.
52	(neurolog* and (condition* or disease* or damage* or disorder* or impair*)).hw.
53	((motor-neuron* or gehrig* or charcott* or kennedy*) adj1 disease*).ti,ab.
54	((motor-neuron* or gehrig* or charcott* or kennedy*) and disease*).hw.
55	((amyotroph* or primary) adj1 lateral* adj1 sclero*).ti,ab.
56	((amyotroph* or primary) and lateral* and sclero*).hw.
57	(bulbar adj1 pals*).ti,ab.
58	(bulbar and pals*).hw.
59	((muscular or muscle* or bulbo) adj1 atroph* adj1 spin*).ti,ab.
60	((muscular or muscle* or bulbo) and atroph* and spin*).hw.
61	(progressiv* adj1 (muscular or muscle*) adj1 atroph*).ti,ab.
62	(progressiv* and (muscular or muscle*) and atroph*).hw.
63	((postpolio* or post-polio*) adj1 syndrome?).ti,ab.
64	((postpolio* or post-polio*) and syndrome?).hw.
65	(Parkinson* or duchenne* or multiple scleros?s* or aphasia or creutzfeldt-jakob or huntington* or kluver-bucy).ti,ab.

#	Searches
66	(Parkinson* or duchenne* or multiple scleros?s* or aphasia or creutzfeldt-jakob or huntington* or kluver-bucy).hw.
67	(muscular adj1 dystroph*).ti,ab.
68	(muscular adj1 dystroph*).hw.
69	(neuromusc* adj1 (disease* or disorder?)).ti,ab.
70	(neuromusc* adj1 (disease* or disorder?)).hw.
71	(heredit* adj1 spastic* adj1 parapleg*).ti,ab.
72	(heredit* and spastic* and parapleg*).hw.
73	"friedreich* ataxia*".ti,ab.
74	"friedreich* ataxia*".hw.
75	((multiple system or olivopontocerebellar) adj1 atroph*).ti,ab.
76	((multiple system or olivopontocerebellar) and atroph*).hw.
77	(shy-drager syndrome* or striatonigral degenerat* or batten* disease?).ti,ab.
78	(shy-drager syndrome* or striatonigral degenerat* or batten* disease?).hw.
79	(progressive adj1 supranuclear adj1 pals*).ti,ab.
80	(progressive and supranuclear and pals*).hw.
81	(richardson* adj1 (disease? or syndrome?)).ti,ab.
82	(richardson* and (disease? or syndrome?)).hw.
83	((corticobasal or cortico basal) adj1 degenerat*).ti,ab.
84	((corticobasal or cortico basal) and degenerat*).hw.
85	(white adj1 matter adj1 disorder?).ti,ab.
86	(white and matter and disorder?).hw.
87	(metachromatic leukodystroph* or mitochondrial myopath* or mucopolysaccharidos*).ti,ab.
88	(metachromatic leukodystroph* or mitochondrial myopath* or mucopolysaccharidos*).hw.
89	(lysosomal adj1 storage adj1 disorder?).ti,ab.
90	(lysosomal and storage and disorder?).hw.
91	((genetic or William* or catch-22 or rett* or congenital or f?etal alcohol) adj1 (syndrome or disorder*)).ti,ab.
92	((genetic or William* or congenital or f?etal alcohol) and (syndrome or disorder*)).hw.
93	(perinatal illness* or perinatal hypoxia*).ti,ab.
94	(perinatal illness* or perinatal hypoxia*).hw.
95	(primary adj1 dystonia?).ti,ab.
96	(primary and dystonia?).hw.
97	(heredit* adj1 motor* adj1 sens* adj1 neuropath*).ti,ab.
98	(heredit* and motor* and sens* and neuropath*).hw.
99	(spina bifida? or spinal dysraphism?).ti,ab.
100	(spina bifida? or spinal dysraphism?).hw.
101	((functional* or psychogenic* or dissociative*) adj1 neurologic* adj1 (disorder* or dysfunction* or difficult*)).ti,ab.
102	((functional* or psychogenic* or dissociative*) and neurologic* and (disorder* or dysfunction* or difficult*)).hw.
103	((movement* or motor* or convers*) adj1 (disorder* or dysfunct*)).ti,ab.
104	((movement* or motor* or convers*) and (disorder* or dysfunct*)).hw.
105	((psychogenic or dissociative or non-epilep* or nonepilep*) adj1 (seizure* or convulsion* or fit or fits or spasm* or attack*)).ti,ab.
106	((psychogenic or dissociative or non-epilep* or nonepilep*) and (seizure* or convulsion* or fit or fits or spasm* or attack*)).hw.
107	(pseudo-seizure* or pseudoseizure*).ti,ab.
108	(pseudo-seizure* or pseudoseizure*).hw.
109	(medical* adj1 (unexplain* or un-explain*) adj1 symptom?).ti,ab.
110	(medical* and (unexplain* or un-explain*) and symptom?).hw.
111	or/1-110
112	(upper adj2 (limb? or extremit*)).ti,ab.
113	(upper and (limb? or extremit*)).hw.

#	Searches
114	(arm? or axilla? or elbow? or forearm? or hand? or finger? or thumb? or phalange* or metacarp* or carpal* or shoulder? or wrist?).ti,ab.
115	(arm? or axilla? or elbow? or forearm? or hand? or finger? or thumb? or phalange* or metacarp* or carpal* or shoulder? or wrist?).hw.
116	(bicep* or tricep* or brachialis or ((abductor* or extensor* or flexor*) adj1 (pollicis or carpi or radialis* or digitorium*))).ti,ab.
117	(bicep* or tricep* or brachialis or ((abductor* or extensor* or flexor*) and (pollicis or carpi or radialis* or digitorium*))).hw.
118	or/112-117
119	(wear* or worn).ti,ab.
120	(wear* or worn).hw.
121	((cloth* or strap* or armband? or waistband? or shorts or trousers or splint*) adj3 (neuromuscular* or function* or electric* or stimulat* or NMES or FES)).ti,ab.
122	((cloth* or strap* or armband? or waistband? or shorts or trousers or splint*) and (neuromuscular* or function* or electric* or stimulat* or NMES or FES)).hw.
123	((smart or sensor?) adj3 system?).ti,ab.
124	((smart or sensor?) and system?).hw.
125	interactive feedback.ti,ab.
126	interactive feedback.hw.
127	(electric* adj3 (stimulat* or therap*)).ti,ab.
128	(electric* and (stimulat* or therap*)).hw.
129	((neural or neuro) adj3 prosthe*).ti,ab.
130	((neural or neuro) and prosthe*).hw.
131	(neuralprosthe* or neuroprosthe*).ti,ab.
132	(neuralprosthe* or neuroprosthe*).hw.
133	MOLLII.ti,ab.
134	MOLLII.hw.
135	robot*.ti,ab.
136	robot*.hw.
137	(exoskeleton* or exo-skeleton*).ti,ab.
138	(exoskeleton* or exo-skeleton*).hw.
139	(Rex adj3 bionic*).ti,ab.
140	(Rex and bionic*).hw.
141	EKSO.ti,ab.
142	EKSO.hw.
143	(rewalk or Indego).ti,ab.
144	(rewalk or Indego).hw.
145	(saebo adj3 (reach or glove or flex)).ti,ab.
146	(saebo and (reach or glove or flex)).hw.
147	((repetitiv* or repeat* or practice? or practicing) adj3 (task? or skill? or train*)).ti,ab.
148	((repetitiv* or repeat* or practice? or practicing) and (task? or skill? or train*)).hw.
149	((train* or retrain* or relearn*) adj3 (task? or skill?)).ti,ab.
150	((train* or retrain* or relearn*) and (task? or skill?)).hw.
151	or/119-150
152	(vestibular adj3 (exercis* or compensat* or rehab* or therap*)).ti,ab.
153	(vestibular and (exercis* or compensat* or rehab* or therap*)).hw.
154	((Cawthorne or Cooksey or Brandt or Daroff or Frenkel) adj3 exercis*).ti,ab.
155	((Cawthorne or Cooksey or Brandt or Daroff or Frenkel) and exercis*).hw.
156	((gaz* or postur*) adj3 stabili* adj3 (exercis* or intervention?)).ti,ab.
157	((gaz* or postur*) and stabili* and (exercis* or intervention?)).hw.
158	(canalith adj3 reposition*).ti,ab.
159	(canalith and reposition*).hw.
160	(optokinetic adj3 train*).ti,ab.
161	(optokinetic and train*).hw.

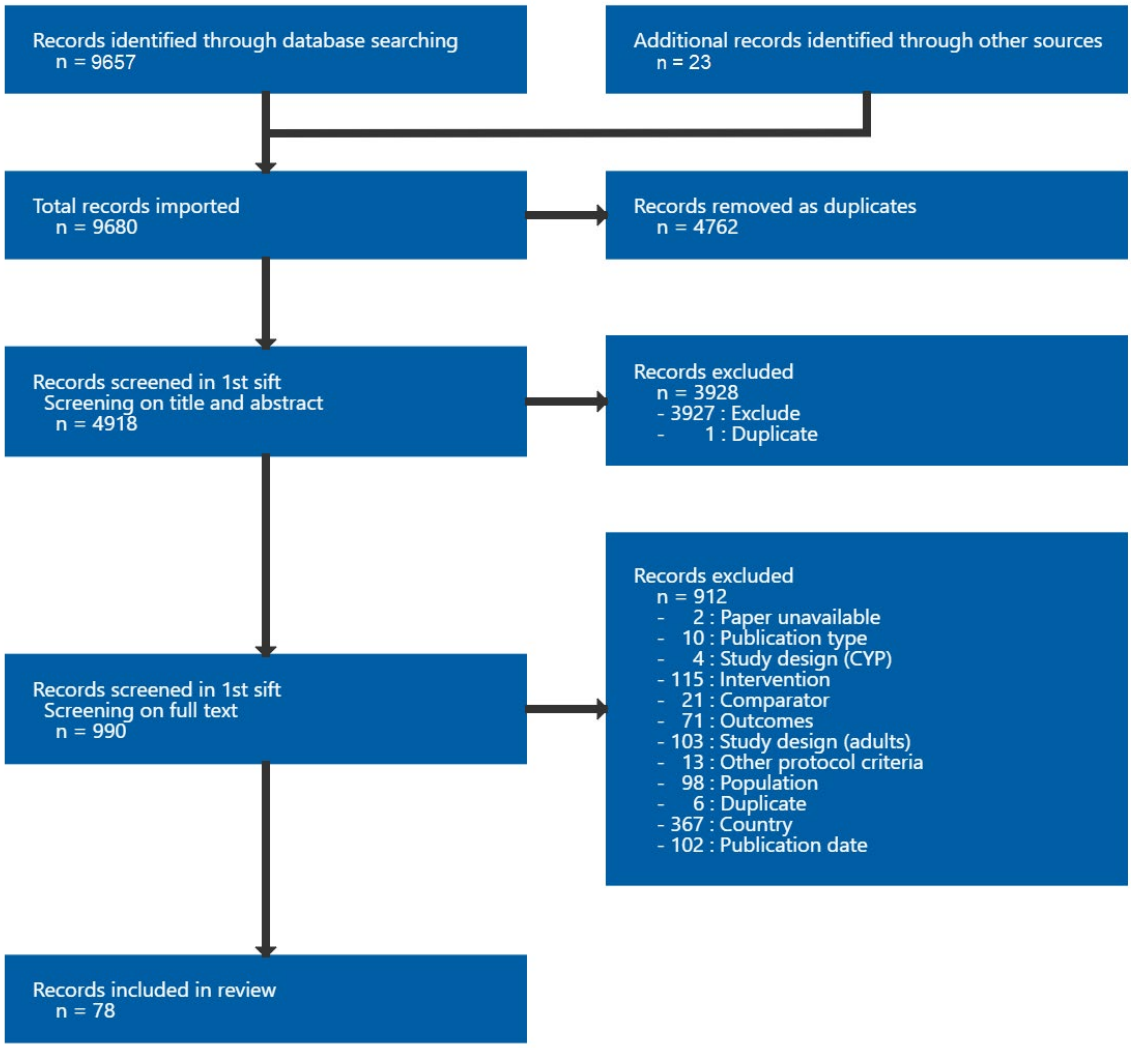
#	Searches
162	(balanc* adj3 (exercis* or rehab* or therap* or train* or retrain* or program*)).ti,ab.
163	(balanc* and (exercis* or rehab* or therap* or train* or retrain* or program*)).hw.
164	((shak* or nod* or stare or staring) adj3 exercis*).ti,ab.
165	((shak* or nod* or stare or staring) and exercis*).hw.
166	((sit* or stand? or standing or reach*) adj3 exercis*).ti,ab.
167	((sit* or stand? or standing or reach*) and exercis*).hw.
168	(perturb* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program*)).ti,ab.
169	(perturb* and (train* or practic* or exercis* or rehab* or therap* or retrain* or program*)).hw.
170	(gait adj3 (train* or retrain* or relearn* or rehab* or exercis* or treadmill? or robot* or outdoor?)).ti,ab.
171	(gait and (train* or retrain* or relearn* or rehab* or exercis* or treadmill? or robot* or outdoor?)).hw.
172	(train* adj3 (body or bodies or weight) adj3 support*).ti,ab.
173	(train* and (body or bodies or weight) and support*).hw.
174	cal?isthenic*.ti,ab.
175	cal?isthenic*.hw.
176	(backward? adj3 chain*).ti,ab.
177	(backward? and chain*).hw.
178	(lower adj2 (limb? or extremit*)).ti,ab.
179	(lower and (limb? or extremit*)).hw.
180	(ankle? or buttock? or foot or feet? or forefoot or forefeet or metatars* or tarsal* or toe? or hallux or heel? or hip? or knee? or leg? or thigh?).ti,ab.
181	(ankle? or buttock? or foot or feet? or forefoot or forefeet or metatars* or tarsal* or toe? or hallux or heel? or hip? or knee? or leg? or thigh?).hw.
182	(abductor or adductor or articularis genu or biceps femoris or dorsal interosseous or extensor or fibularis or flexor or gastrocnemius femur or gemellus or gluteus or gracilis or iliac* or iliopsoas or lumbricals or obturator or pectineus or peroneus or piriformis or plantaris or popliteus or psoas or quadratus or rectus femoris or sartorius or semimembranosus upper or semitendinosus lower or soleus posterior or superior gemellus or tensor fasciae latae or tibialis or vastus).ti,ab.
183	(abductor or adductor or articularis genu or biceps femoris or dorsal interosseous or extensor or fibularis or flexor or gastrocnemius femur or gemellus or gluteus or gracilis or iliac* or iliopsoas or lumbricals or obturator or pectineus or peroneus or piriformis or plantaris or popliteus or psoas or quadratus or rectus femoris or sartorius or semimembranosus upper or semitendinosus lower or soleus posterior or superior gemellus or tensor fasciae latae or tibialis or vastus).hw.
184	or/178-183
185	or/119-146
186	((dual* or multi*) adj3 task? adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
187	((dual* or multi*) and task? and (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).hw.
188	(multitask* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
189	(multitask* and (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).hw.
190	(sensorimotor* adj3 (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).ti,ab.
191	(sensorimotor* and (train* or practic* or exercis* or rehab* or therap* or retrain* or program* or activit*)).hw.
192	neuromodulation.ti,ab.
193	neuromodulation.hw.
194	(transcranial adj3 (direct* or current* or magnetic*) adj3 stimulat*).ti,ab.
195	((transcranial and (direct* or current* or magnetic*)) and stimulat*).hw.
196	or/194-195
197	(hydrotherap* or aquatherap*).ti,ab.
198	(hydrotherap* or aquatherap*).hw.
199	((water* or hydro* or aqua* or pool? or ai chi*) adj3 (therap* or rehab* or exercis*)).ti,ab.
200	((water* or hydro* or aqua* or pool? or ai chi*) and (therap* or rehab* or exercis*)).hw.
201	(exergam* or gamerci*).ti,ab.
202	(exergam* or gamerci*).hw.
203	((activ* or exercis* or fitness*) adj3 (game? or gaming or gamificat*)).ti,ab.

#	Searches
204	((activ* or exercis* or fitness*) and (game? or gaming or gamificat*)).hw.
205	(interact* adj1 (fitness* or exerci*)).ti,ab.
206	(interact* and (fitness* or exerci*)).hw.
207	((virtual* or augment*) adj3 realit*).ti,ab.
208	((virtual* or augment*) and realit*).hw.
209	(exercis* adj3 program* adj5 (stabili* or mobili* or limb function* or coordinat*)).ti,ab.
210	(exercis* and program* and (stabili* or mobili* or limb function* or coordinat*)).hw.
211	((individual* or tailor*) adj5 exercis* adj3 program*).ti,ab.
212	((individual* or tailor*) and exercis* and program*).hw.
213	(cough* adj3 augment* adj3 technique?).ti,ab.
214	(cough* and augment* and technique?).hw.
215	((manual* or device? or mechanic*) adj3 (assist* or augment*) adj3 cough*).ti,ab.
216	((manual* or device? or mechanic*) and (assist* or augment*) and cough*).hw.
217	((manual* or ventilat* or mechanical*) adj3 (hyperinflation or insufflator* or exsufflator)).ti,ab.
218	((manual* or ventilat* or mechanical*) and (hyperinflation or insufflator* or exsufflator)).hw.
219	(breath* adj3 stack*).ti,ab.
220	(breath* and stack*).hw.
221	lung volume recruitment.ti,ab.
222	lung volume recruitment.hw.
223	(inspirat* adj3 muscl* adj3 train*).ti,ab.
224	(inspirat* and muscl* and train*).hw.
225	(rehab* adj5 intervention? adj5 (limb? function* or stabilit* or mobilit*)).ti,ab.
226	(rehab* and intervention? and (limb? function* or stabilit* or mobilit*)).hw.
227	152 or 153 or 154 or 155 or 156 or 157 or 158 or 159 or 160 or 161 or 162 or 163 or 164 or 165 or 166 or 167 or 168 or 169 or 170 or 171 or 172 or 173 or 174 or 175 or 176 or 177 or 186 or 187 or 188 or 189 or 190 or 191 or 192 or 193 or 197 or 198 or 199 or 200 or 201 or 202 or 203 or 204 or 205 or 206 or 207 or 208 or 209 or 210 or 211 or 212 or 213 or 214 or 215 or 216 or 217 or 218 or 219 or 220 or 221 or 222 or 223 or 224 or 225 or 226
228	118 and 151
229	184 and 185
230	(118 or 229) and 196
231	or/227-230
232	111 and 231
233	limit 232 to yr="2013 -Current"

Appendix C Effectiveness study selection

Study selection for: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Figure 1: Study selection flow chart



Appendix D Evidence tables

Evidence tables for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Table 4: Evidence tables

Arntzen, 2020

Bibliographic Reference	Arntzen, Ellen Christin; Straume, Bjorn; Odeh, Francis; Feys, Peter; Normann, Britt; Group-based, individualized, comprehensive core stability and balance intervention provides immediate and long-term improvements in walking in individuals with multiple sclerosis: A randomized controlled trial.; Physiotherapy research international: the journal for researchers and clinicians in physical therapy; 2020; vol. 25 (no. 1); e1798

Study details

Country/ies where study was carried out	Norway
Study type	Randomised controlled trial (RCT)
Study dates	August 2015 - September 2016
Inclusion criteria	- Diagnosis of multiple sclerosis in accordance with McDonald criteria, - Registered at the multiple sclerosis outpatient clinic, - Living in one of the six selected municipalities, - Aged 18 years or older, - Capable of providing signed written informed consent, - Expanded Disability Status Scale value between 1 and 6.5 (1 being minor disability and 6.5 being able to walk 20 metres with or without a walking aid).

Exclusion criteria	- Pregnancy at the time of examination, - Exacerbation within 2 weeks prior to enrolment, - Other acute conditions resulting in compromised balance (such as acute neurological conditions, including stroke).
Patient characteristics	N=80 adults with multiple sclerosis - Core stability and balance programme: n=40 - Standard care: n=40 Age in years [Mean (SD)]: - Core stability and balance programme: 52.2 (12.9) - Standard care: 48 (8.75) Sex (M/F): - Core stability and balance programme: n=12/n=27 - Standard care: n=11/n=29 Time since diagnosis in years [Mean (SD)]: - Core stability and balance programme: 10.04 (7.85) - Standard care: 10.68 (7.27) Chronic neurological disorder category: Progressive neurological diseases

	Note: Data presented relate to number of participants analysed (core stability and balance programme n=39; standard care n=40).
Intervention(s)/control	**Intervention** Name: Core stability and balance programme (GroupCoreDIST) Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Outpatient clinic (group sessions of n=3 participants) and community (participant home) Number/frequency of sessions: Group sessions of 60-minutes, 3x per week in outpatient clinic; and individual sessions of 30 minutes, 2x per week (in participant's own home) Duration: 6 weeks Practitioner(s): Physical therapists Programme comprised of 33 specific exercises (with variations) addressing dynamic core stability. **Control** Name: Standard care Protocol description: Control (usual care) Delivery setting: Community Number/frequency of sessions: Not applicable Duration: 6 weeks Practitioner(s): Not applicable Participants were encouraged to maintain regular activities and told that they could access physical therapy/health care as needed. A number of participants accessed physical therapy during the trial which was provided for free to people with multiple sclerosis in Norway at the time that the study was conducted.

Duration of follow-up	23 weeks follow-up (30 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=80 - Core stability and balance programme: n=40 - Standard care: n=40
Other information	10MWT test also performed at a slow pace but not extracted as does not appear to be validated in these conditions.

N/n: number of participants; RCT: randomised controlled trial; SD: standard deviation; 10MWT: 10 metre walk test

Outcomes

Study timepoints

- Baseline
- Post-intervention (7 weeks from baseline)
- 11 weeks follow-up (18 weeks from baseline)
- 23 weeks follow-up (30 weeks from baseline)

Core stability and balance intervention versus standard care: Gait and balance

Gait and balance as measured by RVGA - Polarity - Lower values are better

Gait as measured by 10MWT - preferred speed - Polarity - Higher values are better

Gait as measured by 10MWT - fast speed - Polarity - Higher values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Outcome	Core stability and balance programme, Post-intervention vs Baseline, N = 39	Core stability and balance programme, 11 weeks follow-up vs Baseline, N = 39	Core stability and balance programme, 23 weeks follow-up vs Baseline, N = 37	Standard care, Post-intervention vs Baseline, N = 40	Standard care, 11 weeks follow-up vs Baseline, N = 36	Standard care, 23 weeks follow-up vs Baseline, N = 37
RVGA Mean (SD)	-1.08 (3.65)	-0.42 (3.66)	-0.04 (3.77)	1.55 (2.87)	1.01 (2.88)	1.38 (2.91)
10MWT - preferred speed Mean (SD)	-0.37 (2.23)	-0.14 (2.19)	-0.3 (2.25)	0.27 (1.25)	0.27 (1.3)	0.27 (1.34)
10MWT - fast speed Mean (SD)	-0.83 (1.83)	-0.77 (1.88)	-0.58 (1.85)	0.09 (1.23)	0.06 (1.26)	0.2 (1.33)
MSWS-12 Mean (SD)	-5.48 (19.98)	-1.97 (20.29)	-0.24 (20.2)	1.1 (19.81)	2.84 (19.89)	0.44 (20.22)

MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; RVGA: Rivermead visual gait assessment; SD: standard deviation; 10MWT: 10 metre walk test

Core stability and balance intervention versus standard care: Exercise capacity

Exercise capacity as measured by 2MWT - Polarity - Higher values are better

Outcome	Core stability and balance programme, Post-intervention vs Baseline, N = 39	Core stability and balance programme, 11 weeks follow-up vs Baseline, N = 39	Core stability and balance programme, 23 weeks follow-up vs Baseline, N = 37	Standard care, Post-intervention vs Baseline, N = 40	Standard care, 11 weeks follow-up vs Baseline, N = 36	Standard care, 23 weeks follow-up vs Baseline, N =37
2MWT Mean (SD)	21.05 (33.7)	22.59 (34.44)	20.77 (33.43)	-1.02 (28.63)	2.13 (29.88)	-1 (31.33)

N/n: number of participants; 2MWT: 2 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(External, web-based randomisation (stratified on the basis of Expanded Disability Status Scale) with electronic concealment was used. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were aware of the assigned intervention and there appear to have been deviations which arose due to the experimental context (20% of participants in the control group accessed physical therapy during the intervention period). Intention-to-treat analysis reported.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Only 1 participant (in the intervention group) was excluded from the final analysis due to missing outcome data.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(All measures validated and commonly used tools. MSWS-12 (high): Likely*

Section	Question	Answer
		that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by unblinded participants and control is not an active intervention. 10MWT (preferred speed), 10MWT (fast speed), RVGA, 2MWT (low): Outcome assessors were blind to allocation such that objective measurements of distance time, and so on were unlikely influenced by knowledge of intervention received.)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Published protocol available; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	MSWS-12 - risk of bias overall rating of high; 10MWT (preferred speed), 10MWT (fast speed), RVGA, 2MWT - risk of bias overall rating of some concerns.

MSWS-12: multiple sclerosis walking scale-12; RVGA: Rivermead visual gait assessment; 2MWT: 2 minute walk test; 10MWT: 10 metre walk test

Bello, 2013

Bibliographic Reference	Bello, O; Sanchez, J A; Lopez-Alonso, V; Marquez, G; Morenilla, L; Castro, X; Giraldez, M; Santos-Garcia, D; Fernandez-del-Olmo, M; The effects of treadmill or overground walking training program on gait in Parkinson's disease.; Gait & posture; 2013; vol. 38 (no. 4); 590-5

Study details

Country/ies where study was carried out	Spain

Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Had Parkinson's disease (no further details about diagnostic requirements), - Able to walk for 10-minutes without stopping, walking aids or assistance.
Exclusion criteria	- Past history of neurological conditions apart from Parkinson's disease, - Orthopaedic or visual disturbance that impacted on walking ability, - Signs of cardiovascular or autonomic dysfunction following graded exercise testing.
Patient characteristics	N=22 adults with Parkinson's disease - Treadmill training: n=11 - Overground training: n=11 Age in years [Mean (SD)]: - Treadmill training: 59.45 (11.32) - Overground training: 58.00 (9.38) Sex (M/F): - Treadmill training: n=7/n=4 - Overground training: n=6/n=5 Time since diagnosis in years [Mean (SD)]:

	- Treadmill training: 4.82 (3.28) - Overground training: 4.95 (2.59) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Treadmill training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Not reported Number/frequency of sessions: 3 sessions per week Duration: 5 weeks Practitioner(s): Supervised by a neurologist and physical therapist Treadmill training which during the first week involved 4 rounds of 4-minute walking on a treadmill with 3-minute breaks between rounds and then a further round of 4 minutes of walking added per week. Walking speed stayed the same throughout based on initial individual preferences at first visit. Treadmill walking was performed without bodyweight support, with a safety harness and hands on handrails at all times. **Control** Name: Overground training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Indoor facility 60 metres long and 10 metres wide Number/frequency of sessions: 3 sessions per week Duration: 5 weeks Practitioner(s): Supervised by a neurologist and physical therapist

	Identical protocol as the intervention apart from the walking speed controlled by audio cues from an MP3 device whereby 10 metres (marked by cones at the side of the walkway) was walked between each audio cue. The pace of the audio cue was altered based on individual speed preferences.
Duration of follow-up	Post-intervention (5 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=22 - Treadmill training: n=11 - Overground training: n=11
Other information	All testing and training were undertaken when participants were on medication. 4-minute walking test (measure of exercise capacity) also reported but not extracted as does not appear to be validated in Parkinson's disease.

MP3: MPEG audio layer-3; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)

Treadmill training versus overground training: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT (maximal speed) - Polarity - Higher values are better

Outcome	Treadmill training, Post-intervention vs Baseline, N = 11	Overground training, Post-intervention vs Baseline, N = 11
TUG Mean (SD)	-1.61 (1.17)	0.13 (0.45)
10MWT (maximal speed) Mean (SD)	0.06 (0.094)	-0.02 (0.066)

m/s: metres per second; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Treadmill training versus overground training: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Treadmill training, Post-intervention vs Baseline, N = 11	Overground training, Post-intervention vs Baseline, N = 11
UPDRS III Mean (SD)	2.63 (1.84)	-3.89 (1.88)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No information provided on allocation randomisation or concealment. Baseline characteristics do not appear to be imbalanced.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(No information provided on whether participants or personnel were blinded, however, there is no reason to suspect any deviation that arose due to the experimental context. No information if intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(It is likely that outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments and objective nature of tasks performed.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Berra, 2018

Bibliographic Reference	Berra, Eliana; De Icco, Roberto; Avenali, Micol; Dagna, Carlotta; Cristina, Silvano; Pacchetti, Claudio; Fresia, Mauro; Sandrini, Giorgio; Tassorelli, Cristina; Body Weight Support Combined With Treadmill in the Rehabilitation of Parkinsonian Gait: A Review of Literature and New Data From a Controlled Study.; Frontiers in neurology; 2018; vol. 9; 1066

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosed with idiopathic Parkinson's disease according to the UK Brain Bank diagnostic criteria, - Hoehn and Yahr disease stage 2 to 3, - Same dosage of dopaminomimetic drugs for 3 months prior to enrolment.
Exclusion criteria	- Moderate to severe cognitive impairment (Mini-Mental State Examination ≤ 21), - Unpredictable motor fluctuations, - Moderate to severe orthopaedic diseases or other pathological conditions (for example, severe postural abnormalities) which could impact gait training.
Patient characteristics	N=36 adults with idiopathic Parkinson's disease - Body-weight supported treadmill training plus traditional physical therapy: n=18 - Overground gait training plus traditional physical therapy: n=18 Age in years [Mean (SD)]: - Body-weight supported treadmill training plus traditional physical therapy: 71.9 (10.2) - Overground gait training plus traditional physical therapy: 71.7 (7.5)

	Sex (M/F): - Body-weight supported treadmill training plus traditional physical therapy: n=6/n=8 - Overground gait training plus traditional physical therapy: n=12/n=10 Time since diagnosis in years [Mean (SD)]: - Body-weight supported treadmill training plus traditional physical therapy: 11.4 (unclear, reported as 11.4) - Overground gait training plus traditional physical therapy: 10.18 (4.8) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were reported based on reallocated numbers after four participants were re-allocated to the comparator arm after a feasibility test (prior to intervention commencement). Reallocated numbers were n=14 for bodyweight supported treadmill n=22 for and overground walking training.
Intervention(s)/control	**Intervention** Name: Body-weight supported treadmill training plus traditional physical therapy Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Neurorehabilitation hospital unit Number/frequency of sessions: Five daily sessions per week Duration: 4 weeks Practitioner(s): Unclear during training, examined by neurologist at start and end of training Sessions involved 40-minutes of traditional physical therapy and 20-minutes of gait training with body-weight support treadmill training.

	Body-weight support treadmill training involved partial weight unload on a treadmill. This consisted of a 10-minute treadmill walk with 20% of body-weight support, a 5-minute break and then 10-minute treadmill walk with 10% of bodyweight support. Initially the speed was 0.5 km/h which increased by 0.5 km/h every minute until a comfortable and tolerated maximum speed of walking was reached, which remained the speed for the remainder of the training. Traditional physical therapy involved passive, active and active assisted isotonic and isometric exercises for major muscles of the limbs and trunk based on Parkinson's disease rehabilitation guidelines and literature evidence. **Control** Name: Overground gait training plus traditional physical therapy Protocol description: Control (standard rehabilitation care alone) Delivery setting: Neurorehabilitation hospital unit Number/frequency of sessions: Five daily sessions per week Duration: 4 weeks Practitioner(s): Unclear during training, examined by neurologist at start and end of training Same protocol as intervention group apart from the 20 minutes involving overground gait training.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=36 - Body-weight supported treadmill training plus traditional physical therapy: n=18 - Overground gait training plus traditional physical therapy: n=18
Other information	Reallocation of the four participants from intervention to the comparator group occurred prior to the intervention starting due to lack of tolerability during a 20-minute feasibility and tolerability test single session of body-weight supported treadmill. One participant reported an increase in pre-existing hip pain, 2 with pre-existing spondyloarthrosis reported low back pain, 1 reported anxiety.

km/h: kilometres per hour; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Body-weight supported treadmill training plus traditional physical therapy versus overground gait training plus traditional physical therapy: Gait and balance

Gait as measured by 10MWT - Polarity - Lower values are better

Outcome	Bodyweight supported treadmill training plus traditional physical therapy, Post-intervention vs Baseline, N = 14	Overground gait training plus traditional physical therapy, Post-intervention vs Baseline, N = 22
10MWT Mean (SD)	0.1 (0.141)	0.1 (0.2)

N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Bodyweight supported treadmill training plus traditional physical therapy versus overground gait training plus traditional physical therapy: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Bodyweight supported treadmill training plus traditional physical therapy, Post-intervention vs Baseline, N = 14	Overground gait training plus traditional physical therapy, Post-intervention vs Baseline, N = 22
UPDRS III Number of items not reported, scale 0–108. Mean (SD)	-10.1 (7.62)	-7.6 (8.1)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Bodyweight supported treadmill training plus traditional physical therapy versus overground gait training plus traditional physical therapy: Functioning

Functioning as measured by FIM - Polarity - Higher values are better

Outcome	Bodyweight supported treadmill training plus traditional physical therapy, Post-intervention vs Baseline, N = 14	Overground gait training plus traditional physical therapy, Post-intervention vs Baseline, N = 22
FIM 18 items, scale 18-126. Mean (SD)	7.5 (8.22)	10.5 (11.23)

N/n: number of participants; SD: standard deviation; FIM: functional independence measure

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No information provided on randomisation or allocation concealment. Baseline*

Section	Question	Answer
		characteristics were presented for the intervention and comparator after reassignment of 4 participants into the comparator group such that it was unclear whether there were baseline differences between groups following randomisation.)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(No information was available on whether participant or personnel were blinded. Deviations from the intervention occurred after a feasibility test of the intervention and related to lack of tolerability of the intervention. It is unclear whether the feasibility test was pre-planned (and therefore not a result of the trial context) as the protocol was not available. An 'as treated' analysis was only performed and as 11% of participants transferred from intervention to the comparator arm there is a chance that this may have had a substantial impact on the results.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments and objective nature of tasks performed.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Berriozabalgoitia, 2021

Bibliographic Reference	Berriozabalgoitia, Rakel; Bidaurrazaga-Letona, Iraia; Otxoa, Erika; Urquiza, Miriam; Irazusta, Jon; Rodriguez-Larrad, Ana; Overground Robotic Program Preserves Gait in Individuals With Multiple Sclerosis and Moderate to Severe Impairments: A Randomized Controlled Trial.; Archives of physical medicine and rehabilitation; 2021; vol. 102 (no. 5); 932-939

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)
Study dates	January 2019 - April 2019
Inclusion criteria	- Aged 18 years or above, - Diagnosed with multiple sclerosis from the McDonald criteria, - Had moderate to severe gait impairments based on Expanded Disability Status Scale score of 4.5 to 7 and required one or two canes or crutches to aid walking outside.
Exclusion criteria	- Neurologic pathology other than multiple sclerosis, - Musculoskeletal disorder that would restrict hip and knee extension or plantar ankle flexion, - multiple sclerosis relapse within the 3 months before commencing the study,

	- Inconsistent pharmacological treatment or if any treatments were thought to change throughout the study, - Had botulinum toxin treatment within 12 weeks before starting the study.
Patient characteristics	N=36 adults with multiple sclerosis - Robot-assisted gait training (Ekso) plus standard rehabilitation: n=18 - Standard rehabilitation: n=18 Age in years [Mean (SD)]: - Robot-assisted gait training (Ekso) plus standard rehabilitation: 49.83 (7.26) - Standard rehabilitation: 52.00 (10.25) Sex (M/F): - Robot-assisted training (Ekso) plus standard rehabilitation: n=9/n=9 - Standard rehabilitation: n=10/n=4 Time since diagnosis in years [Mean (SD)]: - Robot-assisted gait training (Ekso) plus standard rehabilitation: 12.94 (8.11) - Standard rehabilitation: 15.71 (10.01) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=18 for robot-assisted gait training (Ekso) plus standard rehabilitation programme and n=14 for standard rehabilitation).

Intervention(s)/control	**Intervention** Name: Overground robotic gait training (Ekso) plus standard rehabilitation Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Outpatient setting Number/frequency of sessions: Twice weekly progressing to maximum 40-minutes per session and once weekly 1-hour standard physical therapy Duration: 3 months Practitioner(s): Physical therapists trained and certified in Ekso driving Individualised and progressive gait training through Ekso overground robotic wearable exoskeleton with actuated hips and knees which aids the lower limbs when moving. Each session involved two modalities 1) PreGait to exercise static balance and weight shifts to begin with and 2) ProStepPlus to train gait whereby steps were prompted by lateral weight shift. The speed, cadence, stride, robotic assistance was tailored based on motor skill and limb joint ability. Sessions progressively increased to maximum 40-minutes based on tolerance. Sessions were stopped at sign of fatigue or participant request. End of session cryotherapy on knee extensors and ankle plantar flexors in supine position was performed for 10-minutes. The overground robotic programme was undertaken in addition to standard physical therapy sessions which commenced after the sessions (see control group for details). **Control** Name: Standard rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient setting Number/frequency of sessions: Weekly 1-hour sessions Duration: 3 months Practitioner(s): Physical therapists

	One-hour individualised sessions aimed at controlling spasticity, maintaining articular range of motion, exercise balance and gait training.
Duration of follow-up	Post-intervention (3 months from baseline)
Sources of funding	Not industry funded
Sample size	N=36 - Exoskeleton-assisted gait training (Ekso) plus standard physical therapy: n=18 - Standard physical therapy: n=18

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (3 months from baseline)

Robot-assisted gait training (Ekso) plus standard rehabilitation versus standard rehabilitation: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Lower values are better

Outcome	Robot-assisted gait training (Ekso) plus standard rehabilitation, Post-intervention vs Baseline, N = 18	Standard rehabilitation, Post-intervention vs Baseline, N = 14
TUG	-2.5 (8.08)	1.35 (7.54)

Outcome	Robot-assisted gait training (Ekso) plus standard rehabilitation, Post-intervention vs Baseline, N = 18	Standard rehabilitation, Post-intervention vs Baseline, N = 14
Mean (SD)		
10MWT Mean (SD)	0.59 (5.29)	1.22 (6.49)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Robot-assisted gait training (Ekso) plus standard rehabilitation versus standard rehabilitation: Limb/joint/muscle functioning

Lower limb functioning as measured by SPPB - Polarity - Higher values are better

Outcome	Robot-assisted gait training (Ekso) plus standard rehabilitation, Post-intervention vs Baseline, N = 18	Standard rehabilitation, Post-intervention vs Baseline, N = 14
SPPB 3 items, scale 0-12. Mean (SD)	0.28 (1.59)	-0.79 (1.59)

N/n: number of participants; SD: standard deviation; SPPB: short physical performance battery

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation and allocation sequence was performed through sealed opaque envelopes and coin-tossing sequence generation. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of assigned intervention, however, there were no apparent deviations that arose due to the trial context. Modified intention-to-treat analysis likely performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Missing outcomes for 22% (4/18) of the control arm participants who dropped out mainly due to health reasons such that it is possible that missingness in the outcome was influenced by its true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(A protocol with pre-planned statistical analyses was available via separate prior publication and registered on Australian and New Zealand Clinical Trials Registry (ANZCTR) trial registry prior to outcome data availability; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Brichetto, 2013

Bibliographic Reference	Brichetto, G.; Spallarossa, P.; De Carvalho, M.L.L.; Battaglia, M.A.; The effect of Nintendo Wii on balance in people with multiple sclerosis: A pilot randomized control study; Multiple Sclerosis Journal; 2013; vol. 19 (no. 9); 1219-1221

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Multiple sclerosis defined following McDonald criteria, - Fear of falling and/or a history of falls (at least one fall within the last year), - Stable phase (without relapses or worsening in last 3 months), - Able to walk with minimal aids (such as a cane or single crutch), - Expanded Disability Status Scale equal to or lower than 6, - Ambulation Index equal to or lower than 4.
Exclusion criteria	- Psychiatric disorders,

	- Blurred vision, - Severe cognitive impairment.
Patient characteristics	N=36 adults with multiple sclerosis - Exergame-based balance exercises (Nintendo Wii) n=18 - Traditional balance rehabilitation n=18 Age in years [Mean (SD)]: - Exergame-based balance exercises (Nintendo Wii): 40.7 (11.5) - Traditional balance rehabilitation: 43.2 (10.6) Sex (M/F): - Exergame-based balance exercises (Nintendo Wii): n=8/n=10 - Traditional balance rehabilitation: n=6/n=12 Time since diagnosis in years [Mean (SD)]: - Exergame-based balance exercises (Nintendo Wii): 11.2 (6.4) - Traditional balance rehabilitation: 12.3 (7.2) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention**

	Name: Exergame-based balance exercises (Nintendo Wii) Protocol intervention group: Rehabilitation interventions to address stability - Balance exercises Delivery setting: Not reported Number/frequency of sessions: 3x 60-minutes per week, totalling 12 sessions Duration: 4 weeks Practitioner(s): Not reported Supervised use of Nintendo Wii Balance Board® using in built techniques such as 'slalom skiing', and 'tightrope walking'. These were presented randomly at each session. **Control** Name: Traditional balance rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Not reported Number/frequency of sessions: 12 sessions (3x 60-minutes per week) Duration: 4 weeks Practitioner(s): Not reported Participants in the control group were given static and dynamic exercises using both single-leg and double-leg stances, with and without an equilibrium board, as well as half-kneeling exercises of increasing difficulty. These were tailored to each participants ability level.
Duration of follow-up	Post-intervention (4 weeks from baseline)

Sources of funding	Not industry funded
Sample size	N=36 - Exergame-based balance exercises (Nintendo Wii): n=18 - Traditional balance rehabilitation: n=18

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Exergame-based balance exercises (Nintendo Wii) versus traditional balance rehabilitation: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Exergame-based balance exercises (Nintendo Wii), Post-intervention vs Baseline, N = 18	Traditional balance rehabilitation, Post-intervention vs Baseline, N = 18
BBS Mean (SD)	5 (3.56)	1 (2.61)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No details on allocation concealment, however, authors report the randomisation method (adaptive biased coin randomisation) and absence of any significant differences between groups at baseline.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of the assigned intervention, however, there were no apparent deviations that arose due to the experimental context and it appears that the analysis was on the basis of intention-to-treat.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data for all participants randomised appear to be complete.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Brichetto, 2015

Bibliographic Reference	Brichetto, Giampaolo; Piccardo, Elisa; Pedulla, Ludovico; Battaglia, Mario Alberto; Tacchino, Andrea; Tailored balance exercises on people with multiple sclerosis: A pilot randomized, controlled study.; Multiple sclerosis (Houndmills, Basingstoke, England); 2015; vol. 21 (no. 8); 1055-63

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	January 2011 - March 2012
Inclusion criteria	- Multiple sclerosis according to McDonald criteria, - 18 years or older, - Stable phase of disease without relapses or deterioration in last 3 months, - Fear of falling or a history of falls (at least 1 fall in the last year), - Berg Balance Scale composite lower than 72 and maximum of 50, - Medical Research Council scale (0 to 5 grades) at the proximal and distal lower limb segments (hip, knee and ankle), with at least grade 4 in all muscle groups or grade 3 in no more than 1 joint.
Exclusion criteria	- Psychiatric disorders, - Blurred vision, - Severe cognitive impairment, - Severely impaired upright postural control or limited ability to participate in a rehabilitation programme, - Cardiovascular and respiratory disorders.

Patient characteristics	N=32 adults with multiple sclerosis - Tailored balance exercises: n=16 - Traditional balance rehabilitation: n=16 Age in years [Mean (SD)]: - Tailored balance exercises: 50.1 (13.5) - Traditional balance rehabilitation: 51.0 (8.9) Sex (M/F): - Tailored balance exercises: n=4/n=11 - Traditional balance rehabilitation: n=5/n=12 Time since diagnosis in years [Mean (SD)]: - Tailored balance exercises: 9.5 (6.6) - Traditional balance rehabilitation: 12 (6.2) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Tailored balance exercises Protocol intervention group: Rehabilitation interventions to address stability - Balance exercises

	Delivery setting: Not reported Number/frequency of sessions: 3x 1-hour sessions per week, totalling 12 sessions Duration: 4 weeks Practitioner(s): Not reported Rehabilitation treatments tailored to the prevalent sensory system impairments in each person (visual, somatosensory or vestibular). **Control** Name: Traditional balance rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Not reported Number/frequency of sessions: 3x 1-hour sessions per week, totalling 12 sessions Duration: 4 weeks Practitioner(s): Not reported Standardised rehabilitation treatment for balance disorders. Participants in the control group were given static and dynamic exercises using both single-leg and double-leg stances, as well as half-kneeling exercises of increasing difficulty. These were tailored to each participants ability level.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=32

	- Tailored balance exercises: n=16 - Traditional balance rehabilitation: n=16
Other information	Computerised dynamic posturography (measure of balance) also reported but not extracted as measurement data rather than validated scale.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Tailored balance exercises versus traditional balance rehabilitation: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Tailored balance exercises, Baseline vs Baseline, N = 16	Traditional balance rehabilitation, Baseline vs Baseline, N = 16
BBS Mean (SD)	6.3 (2.38)	2 (4.51)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Although randomisation method is not reported, the authors include details on allocation concealment. They also report that there were no significant differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although participants and personnel were probably aware of assigned intervention, there was no reason to suspect any deviations that arose due to the experimental context and analysis appears to have been based on intention-to-treat.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data appear complete for all participants and analysis appears to be based on intention-to-treat.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were independent to the study and blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Bunn, 2015

Bibliographic Reference	Bunn, Lisa M; Marsden, Jonathan F; Giunti, Paola; Day, Brian L; Training balance with opto-kinetic stimuli in the home: a randomized controlled feasibility study in people with pure cerebellar disease.; Clinical rehabilitation; 2015; vol. 29 (no. 2); 143-53

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- With pure cerebellar disease, spinocerebellar type 6, - Age over 18 years, - Had no current or past medical conditions affecting balance.
Exclusion criteria	- Unable to stand with eyes closed for 40 s with feet 16 cm apart, - Taking drugs causing dizziness, drowsiness, or muscle weakness, - Had impure ataxia phenotypes based on the inventory of non-ataxia symptoms.
Patient characteristics	N=12 adults with Spinocerebellar ataxia type 6 pure cerebellar disease - Home-based optokinetic training n=6 - Usual care n=6 Age in years [Mean (SD)]: - Home-based optokinetic training: 60.2 (10.5)

	- Usual care: 58.3 (14.5) Sex (M/F): - Home-based optokinetic training: n=3/n=3 - Usual care: n=1/n=5 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Home-based optokinetic training Protocol intervention group: Rehabilitation interventions to address stability - Vestibular exercise, including optokinetic training Delivery setting: Home Number/frequency of sessions: 15-minutes/session, 5 sessions/week Duration: 8 weeks Practitioner(s): Physiotherapist Participants performed balance activities whilst looking ahead at eye level projected images of black dots (2.5 centimetres diameter) on a white background (1 metre x 50 centimetres) which had unpredictable movements. Participants stood on a soft material and the movies streamed from a Pico projector 2 metres behind the screen. The images were activated when the participant pressed a button on an iPod. The therapy was designed to aid balance control in a range of functionally relevant everyday balance settings while aiming to avoid visual cues that were not based on self-motion. Participants with mild–moderate disease severity (Scale for Assessment and Rating of Ataxia score 1–25) also performed simple balance exercises independently at home.

	Control Name: Usual care Protocol description: Control (usual care) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Duration: Not applicable Practitioner(s): Not applicable Participants did not receive any intervention. No further details reported.
Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=12 - Home-based optokinetic training: n=6 - Usual care: n=6
Other information	FIM (measure of functioning) also reported but not extracted as authors amended the original scale for the purposed of the study, voiding validity. SARA-Bal (measure of balance) also reported but not extracted as sub-domain of SARA and not a global measure.

N/n: number of participants; FIM: functional independence measure; SARA: scale for the assessment and rating of ataxia; SD: standard deviation

Outcomes

Study timepoints

- Baseline

- Post-intervention (8 weeks from baseline)

Home-based optokinetic training versus usual care: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Home-based optokinetic training, Post-intervention vs Baseline, N = 6	Usual care, Post-intervention vs Baseline, N = 6
BBS Mean (SD)	1.7 (3.9)	1.8 (1.9)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Participants were randomised using a pre-filled envelope technique. No information on allocation concealment. More females in the control arm, which is compatible with chance due to low numbers. No other significant differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although participants and personnel were aware of assigned intervention, there were no deviations arising from the experimental context. Modified intention-to-treat analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(There was 1/6 (20%) participant lost to follow-up in the control group due to scheduling difficulties, however, BBS outcome data was collected for this participant. Authors also attempted to control for missing post-intervention BBS*

Section	Question	Answer
		data for 1/5 (20%) participant that did not receive all of the allocated intervention due to illness (ear infection, reported to be exacerbated by training). Missing post-intervention data recorded as 0 (no change). This approach is unlikely to remove bias if missingness in outcome depends on true value, unless there is no change in the outcome after the last time it was measured. Missingness likely to depend on true value, however, no information provided on outcome after last time of measurement.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were aware of allocation. While there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments and objective nature of tasks performed.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale

Cabrera-Martos, 2020

Bibliographic Reference	Cabrera-Martos, Irene; Jimenez-Martin, Ana Teresa; Lopez-Lopez, Laura; Rodriguez-Torres, Janet; Ortiz-Rubio, Araceli; Valenza, Marie Carmen; Effects of a core stabilization training program on balance ability in persons with Parkinson's disease: a randomized controlled trial.; Clinical rehabilitation; 2020; vol. 34 (no. 6); 764-772

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)
Study dates	January 2018 - November 2018
Inclusion criteria	- 30 years or older, - Diagnosed with Parkinson's disease according to UK Brain Bank criteria for idiopathic Parkinson's disease with a disease severity rating of stage 2 or 3 on the Hoehn and Yahr scale, - Stable medication use.
Exclusion criteria	- Significant dyskinesias (score higher than 2 on the Modified Dyskinesia Rating Scale), - Clinically significant orthostatic hypotension, - Neurological condition other than Parkinson's disease, - History of neurosurgery, - Significant musculoskeletal or cardiopulmonary disease, - Communication or cognitive impairments with a score less than 24 in the Mini-Mental State Examination, - Comorbidities affecting motor performance such as vestibular, visual, or somatosensory disturbances that could influence postural control; or inability to walk without walking aids.
Patient characteristics	N=44 adults with idiopathic Parkinson's disease - Core stabilisation training: n=22 - Standard rehabilitation: n=22

	Age in years [Mean (SD)]: - Core stabilisation training: 77.22 (6.22) - Standard rehabilitation: 75.87 (1.19) Sex (M/F): - Core stabilisation training: n=7/n=15 - Standard rehabilitation: n=11/n=11 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Core stabilisation training Protocol intervention group: Rehabilitation interventions to address stability - Balance exercises Delivery setting: Community (Parkinson's Association facility) Number/frequency of sessions: 3x 45-minute sessions per week (groups of 5-6 participants) Duration: 8 weeks Practitioner(s): Physical therapist Programme followed principles of motor relearning and skill acquisition and included tailored functional exercises in contexts that would promote transfer of these principles to functional activity.

	Control Name: Standard rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Community (Parkinson's Association facility) Number/frequency of sessions: 3x 45-minute sessions per week (groups of 5-6 participants) Duration: 8 weeks Practitioner(s): Physical therapist Included active joint mobilisation, muscle stretching, and motor coordination exercises. The exercises were tailored according to ability and increased in complexity (for example, progressing from a supine position to sitting and standing positions.
Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=44 - Core stabilisation training: n=22 - Standard rehabilitation: n=22
Other information	Posturography (measure of balance) also reported but not extracted as measurement data rather than validated scale.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline

- Post-intervention (8 weeks from baseline)

Core stabilisation training versus active joint mobilisation, muscle stretching, and motor coordination exercises: Gait and balance

Gait and balance as measured by Mini-BESTest - Polarity - Higher values are better

Outcome	Core stablisation training, Post-intervention vs Baseline, N = 22	Standard rehabilitation, Post-intervention vs Baseline, N = 22
Mini-BESTest Mean (SD)	2.75 (1.8)	0.38 (2.15)

Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer generated randomisation carried out by a researcher not involved with the trial, allocation concealment was provided using opaque envelopes. Groups appear balanced in baseline characteristics and testing shows there were no significant differences.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(No information provided on whether participants or personnel were blinded, however, there do not appear to have been any deviations due to the experimental context and analysis seems to have been conducted on an intention-to-treat basis.)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data appear to be complete for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Although the protocol was registered on a clinical trials registry, no information regarding analysis plans provided.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Capecci, 2019

Bibliographic Reference	Capecci, Marianna; Pournajaf, Sanaz; Galafate, Daniele; Sale, Patrizio; Le Pera, Domenica; Goffredo, Michela; De Pandis, Maria Francesca; Andrenelli, Elisa; Pennacchioni, Mauro; Ceravolo, Maria Gabriella; Franceschini, Marco; Clinical effects of robot-assisted gait training and treadmill training for Parkinson's disease. A randomized controlled trial.; Annals of physical and rehabilitation medicine; 2019; vol. 62 (no. 5); 303-312

Study details

Country/ies where study was carried out	Italy

Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosed with idiopathic Parkinson's disease according to UK Brain Bank criteria, - Hoehn and Yahr stage ≥ 2, - Aged 50 to 80 years, - Ability to stand upright for a minimum of 20-minutes, without any assistance, - Walking difficulty related to Parkinson's disease such as having Unified Parkinson's Disease Rating Scale [UPDRS] part II, item 15 score of 1–3, - Able to walk independently for 10 metres, - Consistent medications for symptoms one month prior to enrolment, - Informed consent.
Exclusion criteria	- Unable to understand study instructions (Informed Consent Test of Comprehension), - Cognitive impairment with Mini-Mental State Examination score < 24, - Alcohol or drug abuse (including dopamine dysregulation syndrome), - Active depression, anxiety or psychosis that would disrupt equipment use or testing, - Other disabling neurological or orthopaedic disorders, - Prior brain surgery (including pallidotomy, thalamotomy or deep brain stimulation), - Cardiovascular or lung disease that might interfere with tolerance to high intensity training, - Involved in other trials in the 6 months prior to enrolment.
Patient characteristics	N=96 adults with idiopathic Parkinson's disease

	- Robotic-assisted gait training (G-EO system™): n=60 - Treadmill training: n=50 Age in years [Mean (SD)]: - Robot-assisted gait training (G-EO system™): 68.1 (9.8) - Treadmill training: 67.0 (7.6) Sex (M/F): - Robot-assisted gait training (G-EO system™): n=19/n=29 - Treadmill training: n=24/n=24 Time since diagnosis in years [Mean (SD)]: - Robot-assisted gait training (G-EO system™): 8.9 (5.3) - Treadmill training: 8.9 (4.3) Chronic neurological disorder category: Progressive neurological diseases Note: Study characteristics were presented for those analysed in each arm (n=48 in each arm)
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training (G-EO system™) Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Outpatient, neurorehabilitation facilities

	Number/frequency of sessions: 5x 45-minute sessions per week, totalling 20 sessions Duration: 4 weeks Practitioner(s): Physiotherapist Participants underwent robotic assisted gait training and used end-effector robotic device G-EO system™ (Reha Technology AG; Olten, Switzerland). Walking was assisted by robots at different speeds for 45-minutes and with some bodyweight support. In the initial session, 30-40% of bodyweight support was used at 1.5 kilometres per hour and then gradually increased to a maximum of 2.2-2.5 kilometres per hour with bodyweight support eventually decreased up to 20% based on tolerance. **Control** Name: Treadmill training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient, neurorehabilitation facilities Number/frequency of sessions: 5x 45-minute sessions per week totalling 20 sessions Duration: 4 weeks Practitioner(s): Physiotherapist Treadmill training involving walking on the treadmill without bodyweight support for 45-minutes. Initially, walking speed at each session was 0.8 to 1 kilometre per hour and then to 2.0 kilometres per hour or greater based on tolerance. *Both groups: Heart rate and blood pressure were recorded at the start and end of each session for both groups and heart rate was also monitored throughout training. Training was always performed on the "ON" phase of treatment.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=96 - Robot-assisted gait training (G-EO system™): n=60

	- Treadmill training: n=50
Other information	Participants that missed a session without re-attending the session or interrupted treatment for over 3 days in a row were excluded from the study. UPDRS II (activities of daily living) also reported but not extracted as not a global measure of functioning.

N/n: number of participants; SD: standard deviation; UPDRS II: unified Parkinson's disease rating scale part 2

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Robot-assisted gait training (G-EO system™): Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training (G-EO system™), Post-intervention vs Baseline, N = 48	Treadmill training, Post-intervention vs Baseline, N = 48
TUG Mean (SD)	-1.4 (5.2)	-3.1 (4.4)
10MWT	0.1 (0.2)	0.15 (0.2)

Outcome	Robot-assisted gait training (G-EO system™), Post-intervention vs Baseline, N = 48	Treadmill training, Post-intervention vs Baseline, N = 48
Mean (SD)		

N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Robot-assisted gait training (G-EO system™): Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training (G-EO system™), Post-intervention vs Baseline, N = 48	Treadmill training, Post-intervention vs Baseline, N = 48
6MWT Mean (SD)	18.2 (87)	46.8 (48.4)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Robot-assisted gait training (G-EO system™): Limb/joint/muscle functioning

Limb/joint/muscle functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Robot-assisted gait training (G-EO system™), Post-intervention vs Baseline, N = 48	Treadmill training, Post-intervention vs Baseline, N = 48
UPDRS III	-2.8 (4.2)	-3.6 (5.6)

Outcome	Robot-assisted gait training (G-EO system™), Post-intervention vs Baseline, N = 48	Treadmill training, Post-intervention vs Baseline, N = 48
Mean (SD)		

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Block randomisation with stratification was performed with allocation to treatment reported to be concealed and based on a customised purpose-built software. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Participants and those delivering the intervention were aware of the allocations. A naïve per-protocol analysis was undertaken as two participants in the intervention arm were removed from the analysis due to protocol violations. Impact on the results were unclear as this was 4% (2/48) of the intervention arm analysed and there were no reasons provided for the protocol violations.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcome data was not available for for 16.7% (10/60) and 4% (2/50) in the intervention and control arms, respectively due to changes in medication (n=4 intervention), moved to other hospitals for clinical complications or infections (n=3 intervention) or loss to follow-up due to lung infection (n=1 intervention), lower back pain (n=1 intervention, n=1 control) or moving to another hospital (n=1 intervention, n=1 control). The study did not use analysis methods or*

Section	Question	Answer
		sensitivity analysis to check for bias related to missing outcome and there is a chance that missingness in the outcome was related to true value due to reasons for withdrawal from the study from worsening health conditions.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome measurement was standard and appropriate with outcome assessors blind to group assignment. All assessors undertook a preliminary course to increase consistency of methods and inter-rater reliability.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-planned protocol with analysis plan provided in clinicaltrials.gov; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Cattaneo, 2018

Bibliographic Reference	Cattaneo, Davide; Rasova, Kamila; Gervasoni, Elisa; Dobrovodska, Gabriela; Montesano, Angelo; Jonsdottir, Johanna; Falls prevention and balance rehabilitation in multiple sclerosis: a bi-centre randomised controlled trial.; Disability and rehabilitation; 2018; vol. 40 (no. 5); 522-526

Study details

Country/ies where study was carried out	Czech Republic and Italy
Study type	Randomised controlled trial (RCT)
Study dates	March 2011 - October 2013
Inclusion criteria	- Ability to walk (with or without aid) for 6 metres, - Ability to maintain standing position with open eyes for at least 30 seconds.
Exclusion criteria	- Inability to maintain single leg standing position for 10 seconds, - Inability to maintain tandem stance for 30 seconds, - Cognitive disorders impeding execution of exercises and/or assessment.
Patient characteristics	N=119 adults with multiple sclerosis - Exercises to improve balance and mobility: n=78 - Standard balance rehabilitation: n=41 Age in years [Mean (SD)]: - Exercises to improve balance and mobility: 48.9 (11.1) - Standard balance rehabilitation: 46.7 (11.4) Sex (M/F): - Exercises to improve balance and mobility: n=24/n=54 - Standard balance rehabilitation: n=12/n=29

	Time since diagnosis in years [Mean (SD)]: - Exercises to improve balance and mobility: 14.0 (8.6) - Standard balance rehabilitation: 12.9 (10.4) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Exercises to improve balance and mobility Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Not reported Number/frequency of sessions: 2 or 3 sessions per week of 45-minutes each, totalling 20 sessions Duration: 7-10 weeks Practitioner(s): Physical therapist Participants in the experimental group received at least 25-45 minutes of balance treatment (based on published best practice recommendations). The goal of treatment was to improve postural control, and control of movements of the core during static, dynamic and transitional tasks. **Control** Name: Standard balance rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Not reported

	Number/frequency of sessions: 20 sessions (2 or 3 sessions per week of 45-minutes each) Duration: 7-10 weeks Practitioner(s): Physical therapist Focused on reducing limitations at body function and activity levels. Treatment for balance disorders was restricted to a maximum of 10-minutes per session.
Duration of follow-up	2 months follow-up (time since baseline not reported)
Sources of funding	Not industry funded
Sample size	N=119 - Exercises to improve balance and mobility: n=78 - Standard balance rehabilitation: n=41

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (Time since baseline not reported)
- 2 months follow-up (Time since baseline not reported)

Exercises to improve balance and mobility versus standard balance rehabilitation: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by DGI - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Exercises to improve balance and mobility, Post-intervention vs Baseline, N = 69	Exercises to improve balance and mobility, 2 months follow-up vs Baseline, N = 58	Standard balance rehabilitation, Post-intervention vs Baseline, N = 36	Standard balance rehabilitation, 2 months follow-up vs Baseline, N = 26
TUG Mean (SD)	-0.8 (6.6)	0.5 (6.68)	-1.5 (6.76)	-2.4 (9.08)
DGI Mean (SD)	1.2 (3.61)	0.5 (3.58)	1.1 (4.02)	0 (4.28)
BBS Mean (SD)	2.6 (6.15)	1.2 (6.34)	3 (7.74)	1.9 (7.25)

BBS: Berg balance scale; DGI: dynamic gait index scoring form; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation method not reported, however, group allocation was carried out by a researcher who was not involved with the trial and allocation was concealed. Baseline characteristics between groups were reported to be comparable.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(No information provided on whether participants or personnel were blinded, however, there is no reason to suspect any deviations due to the experimental context and analysis was on the basis of intention-to-treat.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(In total, 35 participants were lost to follow-up with reasons not differentiated per arm and collectively cited as new comorbidities (n=10), lack of motivation (n=3), long holiday (n=2) and other/unknown reasons (n=20). No discussion of methods to correct for missing outcome data and missingness may depend on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Authors report that analysis was pre-planned however no details are provided to enable checks on this.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Ciatto, 2023

Bibliographic Reference	Ciatto, Laura; Pullia, Massimo; Tavilla, Graziana; Dauccio, Biagio; Messina, Daniela; De Cola, Maria Cristina; Quartarone, Angelo; Cellini, Roberta; Bonanno, Mirjam; Calabro, Rocco Salvatore; Do Patients with Parkinson's Disease Benefit from Dynamic Body Weight Support? A Pilot Study on the Emerging Role of Rysen.; Biomedicines; 2023; vol. 11 (no. 8)

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	October 2021 - December 2022
Inclusion criteria	- Diagnosed with Parkinson’s disease per Movement Disorder Society criteria, - Aged 50 to 70, - Moderate to advanced disease (Hoehn and Yahr stage 2 to 4), - Able to walk independently.
Exclusion criteria	- Had cognitive, visual, or auditory deficits impairing exercise comprehension/execution, - Comorbidities preventing upright posture and walking, - Refusal or inability to provide informed consent, - Contraindications to the use of technological equipment (weight >135 kilograms or height >200 centimetres), - Open lesions or bandages in the harness contact area.
Patient characteristics	N=30 adults with Parkinson’s disease - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): n=15 - Standard rehabilitation: n=15

	Age in years [Mean (SD) not reported] [Median (IQR)]: - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): 68 (8.5) - Standard rehabilitation: 68 (8.5) Sex (M/F): - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): n=10/n=5 - Standard rehabilitation: n=5/n=10 Time since diagnosis in years [Mean (SD) not reported] [Median (IQR)]: - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): 8 (9.5) - Standard rehabilitation: 13 (7.5) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) Protocol intervention group: Mixed (Rehabilitation interventions to address stability – Balance exercises; Rehabilitation interventions to address mobility – Gait training) Delivery setting: Parkinson's disease neurorehabilitation unit Number/frequency of sessions: 5x 40-minute sessions per week Duration: 4 weeks

	Practitioner(s): Physiotherapist Participants performed the same amount of training as the control group but used the Rysen system, a 3D bodyweight support system. The Rysen system is designed to enhance balance reactions and maintain natural gait patterns. It includes a harness with safety buckles to prevent falls and allow physiotherapists to personalise assistive forces, simulating various terrains and real-life conditions with different exercise modes: - Stand up: Initiates training by aiding postural alignment, - Walking: Performs gait exercises with adjustable supports, - Static and dynamic balance: Shifts weight to find equilibrium within virtual boundaries, - Stairs: Simulates stair climbing with lateral resistance for balance support, - Sit down: Returns the participants to a sitting position at the session's end or as an exercise. **Control** Name: Standard rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Parkinson’s disease neurorehabilitation unit Number/frequency of sessions: 5x 40-minute sessions per week Duration: 4 weeks Practitioner(s): Physiotherapist Participants underwent a conventional rehabilitation programme including obstacle navigation, tandem and slalom walking, gait training, sit-to-stand exercises for core stability, weight-shifting in an upright position, and monopodal and bipodal balance exercises. These exercises aimed to improve postural control, walking ability, and balance, similar to those in the experimental group but tailored to individual needs. Physiotherapists supervised all sessions to prevent falls.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded

Sample size	N=30 - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system): n=15 - Standard rehabilitation: n=15

IQR: interquartile range; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) versus standard rehabilitation: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) vs Standard rehabilitation, Post-intervention vs Baseline, N2 = 15, N1 = 15
TBG Mean (SD)	1.32 (1.88), p=0.487
BBS	3.60 (2.19), p=0.112

Outcome	Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) vs Standard rehabilitation, Post-intervention vs Baseline, N2 = 15, N1 = 15
Mean (SD)	

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait

Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) versus standard rehabilitation: Functioning

Functioning as measured by FIM - Polarity - Higher values are better

Outcome	Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) vs Standard rehabilitation, Post-intervention vs Baseline, N2 = 15, N1 = 15
FIM	12.36 (3.36), p=0.001
Mean (SD)	

FIM: functional independence measure; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Block randomisation using web-based app, no further information on randomisation process or allocation concealment. No statistical differences in baseline characteristics.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(No information provided on whether participants or personnel were blinded, however, there is no reason to suspect any deviations due to the experimental context. No information if intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(There is no report of loss to follow-up or withdrawal from the study, however, outcome data were likely available for all or nearly all participants randomised as figure 3 provides data points that account for all individuals in each group for FIM (and for an additional scale measurement not considered in this review) which was collected at the same timepoint as TBG and BBS.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; FIM: functional independence measure; TBG: Tinetti balance and gait

Clerici, 2017

Bibliographic Reference	Clerici, Ilaria; Ferrazzoli, Davide; Maestri, Roberto; Bossio, Fabiola; Zivi, Ilaria; Canesi, Margherita; Pezzoli, Gianni; Frazzitta, Giuseppe; Rehabilitation in progressive supranuclear palsy: Effectiveness of two multidisciplinary treatments.; PloS one; 2017; vol. 12 (no. 2); e0170927

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	April 2014 - December 2015
Inclusion criteria	- Diagnosed with progressive supranuclear palsy based on the The National Institute of Neurological Disorders and Stroke and Society for Progressive Supranuclear Palsy International Criteria, - Able to walk unaided for a minimum of least 6 metres, - Consistent dopaminergic drugs dosage in the month prior to enrolment.
Exclusion criteria	- Other major neurological or orthopaedic disorder, - Osteoarthritis, osteoporosis, cutaneous lesions and/or other pressure wounds, - Weighing 135 kilograms or higher corresponding to the maximum weight limit for Lokomat, - Respiratory and cardiovascular diseases.
Patient characteristics	N=24 adults with progressive supranuclear palsy - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: n=12 - 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: n=12 Age in years [Mean (SD)]:

	- Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: 69.9 (5.2) - 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: 72.5 (6.1) Sex (M/F): - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: n=5/n=7 - 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: n=7/n=5 Time since diagnosis in years [Mean (SD)]: - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: 4.1 (1.4) - 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: 4.0 (1.2) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Hospital Number/frequency of sessions: 5x 20-minutes per week for robotic-assisted gait training and 4x 60-minute intensive rehabilitation sessions over 5 days Duration: 4 weeks Practitioner(s): Physiotherapist for the robotic assisted gait training treadmill component and Neurologists, Physiatrist, Physiotherapists, Occupational therapists, Speech therapists, Nurses, Neuropsychologist and Nutritionist for multidisciplinary intensive rehabilitation

	The robot gait assisted group underwent 20-minutes of Lokomat training every day which is a driven-gait orthosis enabling gait on a treadmill by mimicking human physiological stride patterns. The maximum speed was set to tolerance for each participant capping at 2.5 kilometres per hour. The intervention was part of the second session of multidisciplinary intensive rehabilitation which was aerobic, motor-cognitive and goal based in nature. It ran over the 4 weeks with four daily 1-hour sessions, including recovery period, for five days each week. Exercise intensity was 70-80% of heart rate. The first daily session was a one-on-one session with a physical therapist, the second session involved aerobic and repetitive activities for gait balance using the Lokomat, cycloergometer, crossover and posturographic platform with visual feedback, the third session was occupational therapy and last session was speech therapy. **Control** Name: 'Treadmill plus' training plus multidisciplinary intensive rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Hospital Number/frequency of sessions: 5x 20-minutes per week for ‘treadmill plus’ and 4x 60-minute intensive rehabilitation sessions over 5 days Duration: 4 weeks Practitioner(s): Physiotherapist for the treadmill component and Neurologists, Physiatrist, Physiotherapists, Occupational therapists, Speech therapists, Nurses, Neuropsychologist and Nutritionist for multidisciplinary intensive rehabilitation The comparator group underwent 20-minutes of 'treadmill-plus' training every day with maximum speed tolerance determined during the first session (initially at 1.0-1.5 kilometres per hour). Over sessions, speed gradually increased to a maximum of 2.5 kilometres per hour based on tolerance. Visual and auditory cues were used during training. The participant had to reach a visual target each stride noted by two horizontal lines and was individualised based on gender, height and age. Alternate right and left footprints were shown on the screen, with feedback messages when the feet successfully fell within the two lines and auditory cues were music beats mapped with the visual cues.

	The intervention was part of the second daily session of multidisciplinary intensive rehabilitation as described above, except on the second daily session participants in this group used the 'treadmill-plus' instead of Lokomat.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=24 - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation: n=12 - 'Treadmill plus' training plus multidisciplinary intensive rehabilitation: n=12
Other information	PSPRS-gait (measure of gait) and PSPRS-limb (measure of limb/joint/muscle function) also reported but not extracted as sub-domain of PSPRS and not a global measure.

N/n: number of participants; PSPRS: progressive supranuclear palsy rating scale; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation versus 'treadmill plus' training plus multidisciplinary intensive rehabilitation: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12	'Treadmill plus' training plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12
BBS Median (IQR)	9.5 (6.5 to 19)	10.5 (8 to 20.5)

BBS: Berg balance scale; IQR: interquartile range; N/n: number of participants

Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation versus 'treadmill plus' training plus multidisciplinary intensive rehabilitation: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12	'Treadmill plus' training plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12
6MWT Median (IQR)	32.5 (19.5 to 99.5)	55.5 (-3 to 67.5)

IQR: interquartile range; N/n: number of participants; 6MWT: 6 minute walk test

Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation versus 'treadmill plus' training plus multidisciplinary intensive rehabilitation: Functioning

Functioning as measured by PSPRS - Polarity - Lower values are better

Outcome	Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12	'Treadmill plus' training plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12
PSPRS	-5 (-5.5 to -3.5)	-8 (-9.5 to -5)

Outcome	Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12	'Treadmill plus' training plus multidisciplinary intensive rehabilitation, Post-intervention vs Baseline, N = 12
Median (IQR)		

IQR: interquartile range; N/n: number of participants; PSPRS: progressive supranuclear palsy rating scale

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No information provided on allocation concealment. Otherwise, allocation was random by computer generated sequence and no reason to indicate baseline characteristics differed between groups with no statistically significant differences reported.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were probably aware of allocation, however, there were no apparent deviations due to the experimental context. Intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Clinical trials protocol was available prior to study conduct with pre-specified outcomes listed; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	Some concerns

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Conradsson, 2015

Bibliographic Reference	Conradsson, David; Lofgren, Niklas; Nero, Hakan; Hagstromer, Maria; Stahle, Agneta; Lokk, Johan; Franzen, Erika; The Effects of Highly Challenging Balance Training in Elderly With Parkinson's Disease: A Randomized Controlled Trial.; Neurorehabilitation and neural repair; 2015; vol. 29 (no. 9); 827-36

Study details

Country/ies where study was carried out	Sweden
Study type	Randomised controlled trial (RCT)
Study dates	2012 - 2013 (no further details reported)
Inclusion criteria	- Community-dwelling individuals with a clinical diagnosis of idiopathic Parkinson's disease (Queens Square Brain Bank criteria), - Impaired balance, such as instability during postural transfers and gait impairments (determined through clinical assessment), - Hoehn and Yahr stage 2 to 3, - Aged 60 years or older, - Ability to independently ambulate indoors without a walking aid,

	- 3 weeks or more of stable anti-Parkinson's medication.
Exclusion criteria	- Mini-Mental State Examination score of lower than 24, - Other medical conditions that would substantially influence balance performance or participation in the intervention.
Patient characteristics	N=100 adults with idiopathic Parkinson's disease - Hi Balance training programme: n=51 - Usual care: n=49 Age in years [Mean (SD)]: - Hi Balance training programme: 72.9 (6.0) - Usual care: 73.6 (5.3) Sex (M/F): - Hi Balance training programme: n=28/n=19 - Usual care: n=23/n=22 Time since diagnosis in years [Mean (SD)]: - Hi Balance training programme: 6.0 (5.1) - Usual care: 5.6 (5.0) Chronic neurological disorder category: Progressive neurological diseases

	Note: Baseline characteristics were only reported for participants analysed (n=47 for Hi Balance training programme and n=44 for usual care).
Intervention(s)/control	**Intervention** Name: Hi Balance training programme Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Community - community hospital, group based (4-7 participants) Number/frequency of sessions: 3x 60-minute sessions per week Duration: 10 weeks Practitioner(s): Physiotherapists Based on motor-learning principles (specificity, progressive overload, and variation) and tailored to ability. Dual tasking exercises were gradually integrated to the balance exercises to address cognitive impairments, for example, by adding cognitive tasks such as counting, or remembering items; and/or motor tasks such as carrying and/or manipulating objects. The programme was also designed to address balance deficits specific to Parkinson's disease. Participants in both groups were advised to maintain their normal level of exercise throughout the intervention period. **Control** Name: Usual care Protocol description: Control (usual care) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s): Not applicable

	Participants in the control group were encouraged to maintain normal physical activity and were not restricted from participating in ongoing rehabilitation programs. Participants in both groups were advised to maintain their normal level of exercise throughout the intervention period.
Duration of follow-up	Post-intervention (10 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=100 people with Parkinson's disease - Hi Balance training programme: n=51 - Usual care: n=49
Other information	Mini-BESTest scores reported in the article as mean change (95% CI). Converted to mean (SD) using agreed calculations for this report.

CI: confidence interval; Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (10 weeks from baseline)

Hi Balance training programme versus usual care: Gait and balance

Gait and balance as measured by Mini-BESTest – Polarity – Higher values are better

Outcome	Hi Balance training programme, Post-intervention vs Baseline, N = 47	Usual care, Post-intervention vs Baseline, N = 44
Mini-BESTest Mean (SD)	3 (2.38)	0.9 (2.8)

Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation carried out using web-based software and allocation concealment achieved through use of sealed envelopes. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Blinding was not possible and 1 participant from each arm dropped out and was excluded from analysis due to either not liking the intervention or not liking the control group allocation. Authors state that a per-protocol approach was used. These dropouts were unlikely to substantially impact results (<5% in each arm).)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Missing outcome data was 7.8% and 10% in the intervention and control arm, respectively with reasons relating to changed health status (n=2 intervention, n=3 control), did not like intervention or group allocation (n=1 each arm), family issues (n=1 each arm). Authors state that intention-to-treat and per-protocol results were similar, however, this does not substitute a sensitivity analysis and it is possible that missingness relates to true value as details relating to health status were unclear.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Published protocol with pre-specified analysis plan as well as pre-registration on clinicaltrials.gov. The protocol was submitted for publication in May 31 2012 and data collection was reported to begin in Spring 2012. The protocol analysis plan did not mention analysis intentions relating to intention-to-treat or per-protocol methods whilst methods in the paper state the selection of a per-protocol over intention-to-treat analysis as results between the two analyses were found to be similar when viewed by the authors (intention-to-treat data not presented). Trial registration and protocol reports plans of 6 and 12 month follow-up which are not reported in the current paper but unlikely selected on basis of results as these were reported in a separate paper (Wallén 2018).)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Coote, 2015

Bibliographic Reference	Coote, Susan; Hughes, Lonan; Rainsford, Gary; Minogue, Conor; Donnelly, Alan; Pilot randomized trial of progressive resistance exercise augmented by neuromuscular electrical stimulation for people with multiple sclerosis who use walking aids.; Archives of physical medicine and rehabilitation; 2015; vol. 96 (no. 2); 197-204

Study details

Country/ies where study was carried out	Ireland
Study type	Randomised controlled trial (RCT)
Study dates	2010 (specific dates not reported)
Inclusion criteria	- Use a walking aid "... most of the time ...", - Able to walk at least 10 metres unaided.
Exclusion criteria	- Contraindications to electrical stimulation, - Had participated in an exercise programme in the last month, - Had a relapse or commenced steroids in the previous 3 months.
Patient characteristics	N=37 adults with multiple sclerosis - Neuromuscular electrical stimulation plus progressive resistance training: n=19 - Progressive resistance training: n=18 Age in years [Mean (SD)]: - Neuromuscular electrical stimulation plus progressive resistance training: 51.8 (12.6) - Progressive resistance training: 51.8 (12.1) Sex (n): - Neuromuscular electrical stimulation plus progressive resistance training: n=4/n=11

	- Progressive resistance training: n=4/n=6 Time since diagnosis in years [Mean (SD)]: - Neuromuscular electrical stimulation plus progressive resistance training: 11.8 (5.5) - Progressive resistance training: 12.2 (4) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=15 for neuromuscular electrical stimulation plus progressive resistance training and n=10 for progressive resistance training).
Intervention(s)/control	**Intervention** Name: Neuromuscular electrical stimulation plus progressive resistance training Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics. Delivery setting: Community, participant's home Number/frequency of sessions: 30 sessions (2x per week for the first 6 weeks and 3x per week from week 7 to 12) Duration: 12 weeks Practitioner(s): Participant directed (provision of initial training not reported in detail) The 'Kneehab' is a synthetic garment consisting of 4 electrodes placed on the thigh with the aim of activating the quadriceps muscle. It is worn on the weaker leg for the quadricep exercises, with strength testing used to determine this. **Control** Name: Progressive resistance training

	Protocol description: Control (standard rehabilitation care alone) Delivery setting: Community, participant's home 30 sessions (2x per week for the first 6 weeks and 3x per week from week 7 to 12) Duration: 12 weeks Practitioner(s): Participant directed (provision of initial training not reported in detail) Six lower limb exercises using stable surfaces to reduce fall risk.
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=37 - Neuromuscular electrical stimulation plus progressive resistance training n=19 - Progressive resistance training n=18

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Neuromuscular electrical stimulation plus progressive resistance training versus progressive resistance training: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Neuromuscular electrical stimulation plus progressive resistance training, Post-intervention vs Baseline, N = 15	Progressive resistance training, Post-intervention vs Baseline, N = 10
TUG Median (SIQR)	-1.6 (3.6)	-0.6 (8.6)
MSWS-12 Median (SIQR)	-6.5 (15.8)	-5 (14.5)
BBS Median (SIQR)	3.5 (6)	5 (4.5)

BBS: Berg balance scale; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SIQR: semi-interquartile range; TUG: timed up and go test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Adequate randomisation and concealment methods. Unable to determine potential imbalances between randomised participants at baseline as characteristics areonly presented for participants analysed rather than randomised.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *('Naïve per-protocol' analysis was used with 2/18 (11%) participants excluded from the intervention due to experiencing muscle spasm during electrical stimulation and 1/19 (5%) participant in the control excluded for non-compliance.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(8/18 (44%) and 4/19 (21%) in the intervention and comparator, respectively dropped out of the trial and were not included in the analysis. Reasons for dropping out were muscle spasm with device use (n=2 intervention), non-compliance (n=1 both arms), medical problem (n=1 intervention), relapse (n=3 control), multiple sclerosis-related fatigue (n=2 control). There is no discussion of impact of missing data or details regarding methods to control for bias due to missing outcome data. Results probably biased by missing data and likely that missingness relates to true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(All measures validated and commonly used tools. MSWS-12 (high): Likely that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by probably unblinded participants and control is not an active intervention. TUG, BBS (low): Outcome assessors were blinded to allocation such that objective measurements of distance time, and so on were unlikely influenced by knowledge of intervention received.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; TUG: timed up and go test

Coulter, 2017

Bibliographic Reference	Coulter, E H; McLean, A N; Hasler, J P; Allan, D B; McFadyen, A; Paul, L; The effectiveness and satisfaction of web-based physiotherapy in people with spinal cord injury: a pilot randomised controlled trial.; Spinal cord; 2017; vol. 55 (no. 4); 383-389

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	October 2014 - June 2015
Inclusion criteria	- Spinal cord injured, - Aged >18, - Mobilising independently using a manual wheelchair or walking with/without aids, - Access to a laptop, personal computer, or tablet device and the internet, - Living in central/west Scotland, - Able to read and understand English.
Exclusion criteria	- Already exercising regularly twice per week, - Pregnant, - Significant comorbidity preventing exercise participation.

Patient characteristics	N=24 adults with spinal cord injury - Web-based individualised physiotherapy programme: n=16 - Waitlist control: n=8 Age in years [Mean (SD)]: - Web-based individualised physiotherapy programme: 51.5 (13.0) - Waitlist control: 48.1 (10.6) Sex (M/F): - Web-based individualised physiotherapy programme: n=9/n=7 - Waitlist control: n=5/n=3 Time since injury in years [Mean (SD)]: - Web-based individualised physiotherapy programme: 13 (11.6) - Waitlist control: 15.7 (9.7) Chronic neurological disorder category: Acquired spinal cord injury
Intervention(s)/control	**Intervention** Name: Web-based individualised physiotherapy programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes

	Delivery setting: Home Number/frequency of sessions: 2x 30-minute sessions per week Duration: 8 weeks Practitioner(s): Physiotherapist (online) The website www.webbasedphysio.com was used to deliver individualised exercise programs. The site included exercise, exercise diary, advice, and education sections, with each exercise page featuring a video, a written explanation, and an audio description. Adapted with health professionals and people with spinal cord injury, the website featured exercises specifically for spinal cord injury individuals, who were filmed and uploaded to the exercise catalogue. Physiotherapists prescribed personalised exercise programs including aerobic, strengthening, stretching, and balance exercises, tailored to participants' abilities. Participants received a personal login and were advised to complete their online exercise diary. Diaries were reviewed remotely by physiotherapists every 2 weeks, with progress discussed and exercise programs updated as necessary. **Control** Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Community Number/frequency of sessions: Not applicable Duration: 8 weeks Practitioner(s): Not described Participants received usual care, consisting of self-management of their condition. They were asked to continue any current exercise routines, such as home-based exercises, gym sessions, or exercise classes, and to keep an exercise diary noting their activities. At the end of the study, participants were offered access to the web-based intervention.
Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded

Sample size	N=24 - Web-based individualised physiotherapy programme: n=16 - Waitlist control: n=8
Other information	The website, www.webbasedphysio.com, was developed by two of the authors at the University of Glasgow.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)

Web-based individualised physiotherapy programme versus waitlist control: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Exercise capacity as measured by 6MPT - Polarity - Higher values are better

Note: Participants completed whichever test was suited to their primary mode of mobility. Scores have been combined for analysis.

Outcome	Web-based individualised physiotherapy programme, Post-intervention vs Baseline, N = 7	Waitlist control, Post-intervention vs Baseline, N = 3
6MWT Mean (SD)	14.4 (26.2)	10.9 (55.8)

Outcome	Web-based individualised physiotherapy programme, Post-intervention vs Baseline, N = 7	Waitlist control, Post-intervention vs Baseline, N = 3
6MPT Mean (SD)	57.8 (74.1)	-5.7 (5.3)

N/n: number of participants; SD: standard deviation; 6MPT: 6 minute push test; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Participants were randomised at a 2:1 ratio using a random number sequence generated in Microsoft Excel by an independent researcher. Random numbers were concealed in opaque envelopes. No statistical differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were aware of assigned intervention, however, due to nature of intervention blinding most likely not possible. There were no deviations based on the experimental context. No information if intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(9/16 (56.3%) and 5/8 (62.5%) of participants in the intervention and control groups, respectively were lost to follow-up. Reason for attrition was issues with the wheelchair, skin allergy and family commitments; other reasons related to exercise capacity were unknown. There is no information on whether missingness depends on true value. No sensitivity analyses conducted.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to allocation. Assessment of outcome*

Section	Question	Answer
		could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible.)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(The study states that there is no published protocol.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Curcio, 2020

Bibliographic Reference	Curcio, A; Temperoni, G; Tramontano, Marco; De Angelis, S; Iosa, M; Mommo, F; Cochi, G; Formisano, R; The effects of aquatic therapy during post-acute neurorehabilitation in patients with severe traumatic brain injury: a preliminary randomized controlled trial.; Brain injury; 2020; vol. 34 (no. 12); 1630-1635

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	September 2019 - April 2020
Inclusion criteria	- Aged between 15 to 65 years,

	- Glasgow Coma Scale of 8 or lower, - Level of Cognitive Functioning score of 7 or above, - Can understand verbal instructions.
Exclusion criteria	- Prior traumatic brain injury, - Cognitive impairments challenging comprehension of instructions with Mini-Mental State Examination score of greater than 24, - Severe unilateral spatial neglect as determined from a test battery containing the Letter Cancellation test, Barrage test, Sentence Reading test, and the Wundt–Jastrow Area Illusion Test, - Severe aphasia diagnosed from neuropsychological assessment, - Other concurrent neurological and psychiatric conditions, - Concurrent cutaneous and mycosis infections, open wounds, eczema, skin ulcers, decubitus lesions or severe burns, - Percutaneous Endoscopic Gastrostomy, - Tracheostomy, - Urinary or fecal incontinence, - Otitis, - Orthopedic or cardiac conditions that would prevent any form of participation in training.
Patient characteristics	N=22 adults with traumatic brain injury - Aquatic training plus multidisciplinary neurorehabilitation: n=11 - Land-based training plus multidisciplinary neurorehabilitation: n=11 Age in years [Mean (SD)]:

	- Aquatic training plus multidisciplinary neurorehabilitation: 37.4 (15.3) - Land-based training plus multidisciplinary neurorehabilitation: 43.0 (14.1) Sex (M/F): - Aquatic training plus multidisciplinary neurorehabilitation: n=4/n=6 - Land-based training plus multidisciplinary neurorehabilitation: n=5/n=5 Time since injury in months [Mean (SD)]: - Aquatic training plus multidisciplinary neurorehabilitation: 5.8 (2.6) - Land-based training plus multidisciplinary neurorehabilitation: 4.8 (2.7) Chronic neurological disorder category: Acquired brain injury Note: Baseline characteristics only presented for participants receiving the intervention rather than randomised (n=10 for both arms).
Intervention(s)/control	**Intervention** Name: Aquatic training plus multidisciplinary neurorehabilitation Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy Delivery setting: Inpatient at neurorehabilitation hospital Number/frequency of sessions: 3x 45-minute sessions per week, totalling 12 sessions Duration: 4 weeks Practitioner(s): Physiotherapist for aquatic therapy training, otherwise multidisciplinary

	Sessions occurred in a rehabilitation pool with depth from 1.1 to 1.5 metres with temperature between 30 to 32 degrees. Immersion varied by participant based on height and exercise challenges. Water-based training was focused on dynamic and postural stability. There was an initial 5-minute warm up with arm movement and breathing exercises, 20-minutes of repetitive exercise beginning in kneeling, then sitting and supine position and then 20-minutes of gait step exercises using a step and two floating aids. The gait exercises utilised upper limbs which were placed on two floating aids and then a dual-motor task (catching a ball from the physiotherapist). Both arms also received multidisciplinary neurorehabilitation using exercises based on individual rehabilitation protocols and involved speech and cognitive therapy, swallowing and respiratory rehabilitation, and occupational therapy. **Control** Name: Land-based training plus multidisciplinary neurorehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Inpatient Number/frequency of sessions: 3x 45-minute sessions per week, totalling 12 sessions Duration: 4 weeks Practitioner(s): Not specified for conventional training, otherwise multidisciplinary Standard land-based therapy lasting 45-minutes per session with individualised exercises to improve static and dynamic postural stability. Exercises involved active-assisted mobilisation, the muscle stretching the postural transition, the balance, and the gait training. This was in addition to multidisciplinary neurorehabilitation as described above.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=22 - Aquatic training plus multidisciplinary neurorehabilitation: n=11 - Land-based training plus multidisciplinary neurorehabilitation: n=11

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Aquatic therapy training plus multidisciplinary neurorehabilitation versus land-based training plus multidisciplinary neurorehabilitation: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Aquatic training plus multidisciplinary neurorehabilitation, Post-intervention vs Baseline, N = 10	Land-based training plus multidisciplinary neurorehabilitation, Post-intervention vs Baseline, N = 10
TBG Mean (SD)	2.1 (2.94)	1.4 (5.94)
BBS Mean (SD)	3.1 (6.08)	3.6 (13.01)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait

Aquatic therapy training plus multidisciplinary neurorehabilitation versus land-based training plus multidisciplinary neurorehabilitation: Limb/joint/muscle function

Spasticity as measured by MAS - Polarity - Lower values are better

Outcome	Aquatic training plus multidisciplinary neurorehabilitation, Post-intervention vs Baseline, N = 10	Land-based training plus multidisciplinary neurorehabilitation, Post-intervention vs Baseline, N = 10
MAS Mean (SD)	-0.12 (0.35)	-0.04 (0.28)

MAS: modified Ashworth scale; N/n: number of participants; SD: standard deviation

Aquatic therapy training plus multidisciplinary neurorehabilitation versus land-based training plus multidisciplinary neurorehabilitation: Functioning

Functioning as measured by DRS - Polarity - Lower values are better

Outcome	Aquatic training plus multidisciplinary neurorehabilitation, Post-intervention vs Baseline, N = 10	Land-based training plus multidisciplinary neurorehabilitation, Post-intervention vs Baseline, N = 10
DRS Mean (SD)	-0.3 (1.1)	-0.2 (1.92)

DRS: disability rating scale; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer generated block randomisation with person managing randomisation independent from the trial. The same independent researcher*

Section	Question	Answer
		placed the randomisation list on a secure web-based storage platform. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of assigned intervention, however, there were no apparent deviations due to experimental context and likely that modified intention-to-treat analysis used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Missing outcome data were present for 1/11 (9%) participant in each arm. These participants were discharged prior to intervention and baseline assessment and not included in the analysis and it is possible but unlikely that the missingness in the outcome depended on it's true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and unlikely to have differed between groups.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Donkers, 2020

Bibliographic Reference	Donkers, Sarah J; Nickel, Darren; Paul, Lorna; Wiegers, Shyane R; Knox, Katherine B; Adherence to Physiotherapy-Guided Web-Based Exercise for Persons with Moderate-to-Severe Multiple Sclerosis: A Randomized Controlled Pilot Study.; International journal of MS care; 2020; vol. 22 (no. 5); 208-214

Study details

Country/ies where study was carried out	Canada
Study type	Randomised controlled trial (RCT)
Study dates	March 2017 - October 2018
Inclusion criteria	- Clinically definite multiple sclerosis, - Moderate-to-severe disability (Patient-Determined Disease Steps scale score of 2 to 7), - Aged 18 years or older, - Ability to access the internet from their current living environment, - For non-clinic recruits: consent to access medical records to confirm multiple sclerosis diagnosis.
Exclusion criteria	- Current participation in exercise twice a week or more, - Residence more than 300 kilometres from Saskatoon, Saskatchewan, Canada, - Severe cognitive impairment, - Inability to provide informed consent, as judged by the research physiotherapists.
Patient characteristics	N=48 adults with multiple sclerosis - Web-based tailored physiotherapy programme: n=32 - Standardised physiotherapy programme: n=16

	Age in years [Mean (SD)]: - Web-based tailored physiotherapy programme: 54.6 (11.9) - Standardised physiotherapy programme: 53.8 (12.2) Sex (M/F): - Web-based tailored physiotherapy programme: n=12/n=20 - Standardised physiotherapy programme: n=5/n=11 Time since diagnosis in years [Mean (SD)]: - Web-based tailored physiotherapy programme: 20.0 (11.3) - Standardised physiotherapy programme: 18.4 (10.7) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Web-based tailored physiotherapy programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes Delivery setting: Home Number/frequency of sessions: 2x sessions per week with duration not reported Duration: 26 weeks

	Practitioner(s): Physiotherapist Participants had their exercise programme and diary set up during the baseline visit on www.giraffehealth.com (formerly webbasedphysio.com). The website offers exercises with videos, text, and audio descriptions, prescribed by a physiotherapist. The physiotherapist reviewed electronic diaries and made remote adjustments based on feedback. The exercise and educational materials were developed with input from individuals with mild-to-moderate multiple sclerosis in the UK. For this pilot study, a focus group including 2 advanced multiple sclerosis patient advisors, a psychiatrist, and 4 experienced physiotherapists, including the creator of webbasedphysio, developed additional exercises for more advanced disabilities, including seated versions and new core and upper extremity exercises. Participants were informed that their physiotherapist would review and adjust their exercise programme remotely every 2 weeks, based on their online exercise diary. They were also encouraged to contact their physiotherapist for any changes needed. Online exercise diaries were continuously collected. **Control** Name: Standardised physiotherapy programme Protocol description: Control (standard rehabilitation care alone) Delivery setting: Home Number/frequency of sessions: Not reported Duration: 26 weeks Practitioner(s): Physiotherapist Participants received a written, home-based exercise programme aligned with standard outpatient physiotherapy practices. They were required to keep a paper exercise diary, which was mailed to the study coordinator at 3 and 6 months. Physiotherapists did not review these diaries, but participants could email their physiotherapist for programme adjustments if needed.
Duration of follow-up	Post-intervention (26 weeks from baseline)
Sources of funding	The study was partially funded by Hermes Canada
Sample size	N=48

	- Web-based tailored physiotherapy programme: n=32 - Standardised physiotherapy programme: n=16
Other information	One of the authors is co-inventor of the Web-based physiotherapy platform but was not involved in data collection or analysis.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (26 weeks from baseline)

Web-based tailored physiotherapy programme versus standardised physiotherapy programme: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Web-based tailored physiotherapy programme, Post-intervention vs Baseline, N = 18	Standardised physiotherapy programme, Post-intervention vs Baseline, N = 8
TUG Mean (SD)	-2.5 (9.26)	-2.9 (12.9)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Web-based tailored physiotherapy programme versus standardised physiotherapy programme: Gait and balance

Gait as measured by T25FWT - Polarity - Lower values are better

Outcome	Web-based tailored physiotherapy programme, Post-intervention vs Baseline, N = 17	Standardised physiotherapy programme, Post-intervention vs Baseline, N = 8
T25FWT Mean (SD)	-0.1 (4.51)	-4.4 (21.29)

N/n: number of participants; SD: standard deviation; T25FWT: timed 25 foot walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Participants were randomised at a 2:1 ratio using an online service (www.random.org). No further information on randomisation process or allocation concealment. No statistical differences between baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although participants and personnel were aware of assigned intervention, there were no deviations due to the experimental context. Baseline assessments were conducted before the physiotherapist knew the participant's random assignment. Intention-to-treat analyses were performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(15/32 (46.9%) (14/32 (43.8%) for outcome measured by TUG) and 8/16 (50%) of participants in the intervention and control groups, respectively were lost to follow-up. Analysis conducted by replacing missing values with 0. There is no evidence on whether the results were biased by missing outcome data. There is no information on whether the missing data depends on the true value.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

TUG: timed up and go test

Esclarín-Ruz, 2014

Bibliographic Reference	Esclarín-Ruz, Ana; Alcobendas-Maestro, Monica; Casado-Lopez, Rosa; Perez-Mateos, Guillermo; Florido-Sanchez, Miguel Angel; Gonzalez-Valdizan, Esteban; Martin, Jose Luis R; A comparison of robotic walking therapy and conventional walking therapy in individuals with upper versus lower motor neuron lesions: a randomized controlled trial.; Archives of physical medicine and rehabilitation; 2014; vol. 95 (no. 6); 1023-31

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)

Study dates	November 2007 - December 2010
Inclusion criteria	- C2 to T11 spinal cord injury upon entry with American Spinal Injury Association Impairment Scale grades C and D and only upper motor neuron findings, - T12 to L3 spinal cord injury upon entry with American Spinal Injury Association Impairment Scale grades C and D and only lower motor neuron findings, - Traumatic and nontraumatic, nonprogressive lesions, - Onset less than 6 months, - Age 16 to 70 years, - Able to stand with assistance throughout the previous week at minimum (includes outside support, without orthostatic clinical signs but can still walk), - Informed consent.
Exclusion criteria	- Orthopedic injuries which are not stable, - Osteoporosis with great risk of pathological fracture, - Cutaneous lesions and/or pressure ulcers located where the harness of the Lokomat or thigh straps will be placed, - Joint rigidity, - Asymmetry of lower extremity length of over 2 centimetres, - Pulmonary or heart disease which would need to be monitored during fitness training, - Weighing over 150 kilograms, - History of spinal injury.
Patient characteristics	N=88 adults with spinal cord injury (lower motor neuron or upper motor neuron injuries) - Robotic-assisted gait training (Lokomat) plus standard physical treatment: n=44

	- Lower motor neuron injuries: n=22 - Upper motor neuron injuries: n=22 - Conventional overground gait training plus standard physical treatment - Lower motor neuron injuries: n=22 - Upper motor neuron injuries: n=22 Age in years [Mean (SD)]: - Robotic-assisted gait training (Lokomat) plus standard physical treatment: Lower motor neuron injuries 36.4 (12); upper motor neuron injuries 43.6 (12) - Conventional overground gait training plus standard physical treatment: Lower motor neuron injuries 42.7 (18); upper motor neuron injuries 44.9 (7) Sex (M/F): - Robotic-assisted gait training (Lokomat) plus standard physical treatment: Lower motor neuron injuries n=14/n=6; upper motor neuron injuries n=15/n=6 - Conventional overground gait training plus standard physical treatment: Lower motor neuron injuries n=17/4; upper motor neuron injuries n=13/n=8 Time since injury in days [Mean (SD)]: - Robotic-assisted gait training (Lokomat) plus standard physical treatment: Lower motor neuron injuries 117.9 (25.6); upper motor neuron injuries 125.6 (65.2) - Conventional overground gait training plus standard physical treatment: Lower motor neuron injuries 109 (50.5); upper motor neuron injuries 140.3 (45.5)

	Chronic neurological disorder category: Acquired spinal cord injury Note: Study characteristics at baseline presented by spinal injury group (lower versus upper motor neuron injuries) and for participants analysed (n=21 for each subgroup arm apart from intervention group with lower motor neuron injuries (n=20)).
Intervention(s)/control	**Intervention** Name: Robotic-assisted gait training (Lokomat) plus standard physical treatment Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Specialist spinal cord injury hospital Number/frequency of sessions: 40x 60-minute sessions (30-minutes robotic-assisted gait training, 30-minutes standard physical treatment), 5 days per week Duration: 8 weeks Practitioner(s): Physiotherapist Participants underwent 30-minutes of robot-assisted gait training with Lokomat, a driven gait orthosis which automates locomotion therapy, was performed on a treadmill at a comfortable speed (based on preference) with partial bodyweight. Orthoses were individualised to injury level and motor function ability. Bodyweights were set at first 60% of bodyweight and reduced based on load tolerance with minimum 25% support. Participants also received 30-minutes of standard physical treatment, including joint mobilisation below the area of the spinal injury, strengthening, muscle stretching, postural relaxation techniques, trunk stabilisation, rotation work and self-care skill training. **Control** Name: Conventional overground gait training plus standard physical treatment Protocol description: Control (standard rehabilitation) Delivery setting: Specialist spinal cord injury hospital Number/frequency of sessions: 40x 60-minute sessions (30-minutes conventional overground training, 30-minutes standard physical treatment), 5 days per week

	Duration: 8 weeks Practitioner(s): Physiotherapist Participants underwent 30-minutes of standard physical treatment (as described above) and 30-minutes of overground walking gait training.
Duration of follow-up	Post-intervention (time since baseline not reported)
Sources of funding	Not reported
Sample size	N=88 - Robotic-assisted gait training (Lokomat) plus standard physical treatment: 44 (22 with lower motor neuron injuries, 22 with upper motor neuron injuries) - Conventional overground gait training plus standard physical treatment: 44 (22 with lower motor neuron injuries, 22 with upper motor neuron injuries)
Other information	The study included data from the 20-session mark for the 7 participants lost to follow-up (2 in intervention and 5 in control arm) so that they could be included in intention-to-treat analysis.

C: cervical; N/n: number of participants; SD: standard deviation; T: thoracic

Outcomes

Study timepoints

- Baseline
- Post-intervention (time from baseline not reported)

Robotic-assisted gait training (Lokomat) plus standard physical treatment versus conventional overground gait training plus standard physical treatment: Gait and balance

Gait as measured by 10MWT - Polarity - Higher values are better

Outcome	Robotic-assisted gait training (Lokomat) plus standard physical treatment, Post-intervention vs Baseline, N = 36	Conventional overground gait training plus standard physical treatment, Post-intervention vs Baseline, N = 36
10MWT Mean (SD)	0.17 (0.19)	0.11 (0.24)

m/s: metres per second; N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Robotic-assisted gait training (Lokomat) plus standard physical treatment versus conventional overground gait training plus standard physical treatment: Gait and balance

Gait as measured by WISCI II - Polarity - Higher values are better

Outcome	Robotic-assisted gait training (Lokomat) plus standard physical treatment, Post-intervention vs Baseline, N = 41	Conventional overground gait training plus standard physical treatment, Post-intervention vs Baseline, N = 42
WISCI II Mean (SD)	7.02 (3.28)	5.97 (3.17)

N/n: number of participants; SD: standard deviation; WISCII: walking index for spinal cord injury

Robotic-assisted gait training (Lokomat) plus standard physical treatment versus conventional overground gait training plus standard physical treatment: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robotic-assisted gait training (Lokomat) plus standard physical treatment, Post-intervention vs Baseline, N = 33	Conventional overground gait training plus standard physical treatment, Post-intervention vs Baseline, N = 31
6MWT Mean (SD)	76.07 (67.5)	39.88 (74.38)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Robotic-assisted gait training (Lokomat) plus standard physical treatment versus conventional overground gait training plus standard physical treatment: Limb/joint/muscle function

Lower limb functioning as measured by LEMS - Polarity - Higher values are better

Outcome	Robotic-assisted gait training (Lokomat) plus standard physical treatment, Post-intervention vs Baseline, N = 41	Conventional overground gait training plus standard physical treatment, Post-intervention vs Baseline, N = 42
LEMS Mean (SD)	7.38 (8.29)	3.93 (8.09)

LEMS: lower extremity motor score; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Centrally computerised allocated randomisation was performed. Unable to determine potential imbalances between randomised participants at baseline*

Section	Question	Answer
		as characteristics are only presented for participants analysed rather than randomised.)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were aware of assigned intervention and there was no information about deviations due to the experimental context. Authors excluded 3/44 (7%) and 2/44 (5%) in intervention and control arms, respectively who withdrew after randomisation but before intervention commencement. Reasoning for withdrawal were not reported and these participants were excluded from analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Authors attempted to control for missing outcome data for 2/44 (5%) in intervention and 5/44 in (11%) control arms by last observation carried forward which would be unlikely to remove any bias related to missingness. Otherwise, there was missing outcome data for those who withdrew from the study after randomisation and prior to intervention commencement (3/44 (7%) and 2/44 (5%) in intervention and control arms, respectively) as they were not included in the analysis. Reasons for loss to follow-up or withdrawal were not reported and therefore it is unclear whether missingness in the outcome depended on the true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Ferri, 2019

Bibliographic Reference	Ferri, Alessandra; Lanfranconi, Francesca; Corna, Giovanni; Bonazzi, Riccardo; Marchese, Samuele; Magnoni, Andrea; Tremolizzo, Lucio; Tailored Exercise Training Counteracts Muscle Disuse and Attenuates Reductions in Physical Function in Individuals With Amyotrophic Lateral Sclerosis.; Frontiers in physiology; 2019; vol. 10; 1537

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Participants diagnosed with amyotrophic lateral sclerosis less than 48 months ago, - Capable of pedalling on a cycle ergometer.
Exclusion criteria	- Acute cardiopulmonary and infectious diseases.
Patient characteristics	N=16 adults with amyotrophic lateral sclerosis - Tailored exercise programme: n=8 - Usual care: n=8

	Age in years [Mean (SE)]: - Tailored exercise programme: 50.7 (3.3) - Usual care: 55.5 (5.95) Sex (M/F): - Tailored exercise programme: n=6/n=2 - Usual care: n=6/n=2 Time since diagnosis in months [Mean (SE)]: - Tailored exercise programme: 20.5 (20.3) - Usual care: 13.4 (6.6) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Tailored exercise programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes Delivery setting: Rehabilitation and physical therapy clinic Number/frequency of sessions: 3x 60-minute sessions per week Duration: 12 weeks Practitioner(s): Sport scientists, a medical doctor, and a medical student

	Participants visited gym in the clinic 3 times a week. Each session was supervised by 2 sport scientists, a medical doctor, and a medical student, with a 1:1 participant/therapist ratio. The training programme included: - 15-minutes of cycling at 80% of the intensity between baseline and gas exchange threshold from cardiopulmonary exercise test. - 25-minutes of strength exercises at 60% of maximal strength, including three sets of 10 repetitions of upper (biceps curl, arm lateral raise) and lower body (squat, calf raise, leg extension) exercises using dumbbells and resistance bands, avoiding eccentric phases to reduce muscle damage. Exercises were alternated weekly. - 10-minutes of proprioceptive exercises, mostly on the BOSU® Pro balance trainer. - 10-minutes of upper and lower extremity stretching on a Pancafit®. Safety parameters (blood pressure, heart rate, oxygen saturation) and training intensity were recorded in a participant diary. After 6 weeks, the 10RM test was repeated to adjust the load to maintain 60% of maximal strength (1RM). Participants received a 200 mL hyperproteic supplement (300 kcal, 12 g proteins, 37 g carbohydrates, 12 g fat, 0.1 g fibres, 12 g minerals) and 200 mL of water (thickened if needed) immediately after each session. **Control** Name: Usual care Protocol control: Control (usual care) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Duration: 12 weeks Practitioner(s): Not reported Participants maintained their usual daily activities, passive manual therapy and received the same supplement as the intervention group 3 times a week for 12 weeks.
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded

Sample size	N=16 - Tailored exercise programme: n=8 - Usual care: n=8
Other information	Most participants (70%) were on riluzole therapy (100 miligrams daily) for an average of 6 months and continued this medication throughout the intervention period.

g: grams; kcal: kilocalories; mL: millilitres; N/n: number of participants; RM: repetition maximum; SE: standard error

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Tailored exercise programme versus usual care: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Tailored exercise programme, Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 4
TUG Mean (SD)	-9.1 (5.5)	56.8 (18.5)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Tailored exercise programme versus usual care: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Tailored exercise programme, Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 4
6MWT Mean (SD)	4.5 (7.9)	-10.7 (10.2)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Tailored exercise programme versus usual care: Functioning

Functioning as measured by ALSFRS-R - Polarity - Higher values are better

Functioning as reported by ALS-SS - Polarity - Higher values are better

Outcome	Tailored exercise programme, Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 4
ALSFRS-R Mean (SD)	-4.7 (2.6)	-23 (5.6)
ALS-SS Mean (SD)	-2.2 (2.1)	-12.4 (4.4)

ALSFRS-R: amyotrophic lateral sclerosis functional rating scale (revised); ALS-SS: amyotrophic lateral sclerosis survival score; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Participants were randomly assigned based on age, sex, body mass index,*

Section	Question	Answer
		and time since diagnosis. No information on allocation concealment. No statistical differences between baseline characteristics.)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were probably aware of interventions allocated, however due to nature of intervention blinding most likely not possible. There were no deviations due to the experimental context. No information if intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(1/8 (12.5%) and 4/8 (50%) of participants in the intervention and control groups, respectively were lost to follow-up. The reasons for attrition were worsening or lack of improvement of the condition, depression, the requirement for percutaneous endoscopic gastrostomy, and difficulty in coming to the hospital. Loss to follow-up not balanced between groups so missingness may depend on true value. No sensitivity analyses conducted.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments (all measures) and objective nature of tasks performed (TUG and 6MWT).)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

TUG: timed up and go test; 6MWT: 6 minute walk test

Flynn, 2021

Bibliographic Reference	Flynn, Allyson; Preston, Elisabeth; Dennis, Sarah; Canning, Colleen G; Allen, Natalie E; Home-based exercise monitored with telehealth is feasible and acceptable compared to centre-based exercise in Parkinson's disease: A randomised pilot study.; Clinical rehabilitation; 2021; vol. 35 (no. 5); 728-739

Study details

Country/ies where study was carried out	Australia
Study type	Randomised controlled trial (RCT)
Study dates	May 2017 - July 2019
Inclusion criteria	- Required to maintain stable Parkinson's medication for at least 2 weeks before the baseline measurement.
Exclusion criteria	- Had substantial cognitive deficits (Mini-Mental State Examination <24) or a medical condition interfering with measurement or intervention, - Provided written informed consent before the trial.
Patient characteristics	N=40 adults with Parkinson’s disease - Home-based and centre-based individualised exercise programme: n=20 - Centre-based individualised exercise programme: n=20 Age in years [Mean (SD)]: - Home-based and centre-based individualised exercise programme: 72 (7.3)

	- Centre-based individualised exercise programme: 71 (6.6) Sex (M/F): - Home-based and centre-based individualised exercise programme: n=15/n=5 - Centre-based individualised exercise programme: n=15/n=5 Time since diagnosis in years [Mean (SD)]: - Home-based and centre-based individualised exercise programme: 5.2 (5.4) - Centre-based individualised exercise programme: 4.7 (4.5) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Home-based and centre-based individualised exercise programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes Delivery setting: University physiotherapy clinic + home-based Number/frequency of sessions: 3x 60-minute sessions per week Duration: 10 weeks Practitioner(s): Physiotherapist Individualised exercise programs were prescribed by a physiotherapist specialising in Parkinson's disease, focusing on balance, gait, hypokinesia, bradykinesia, and postural instability. Exercises were selected from a menu of 107 Parkinson's disease-specific exercises available at www.physiotherapyexercises.com, which provides detailed

	instructions, illustrations, and precautions. The programme was tailored to each participant's level and could be delivered via an app or on paper. Exercises were completed during the participants' 'ON' medication phase. In Block 1 (weeks 1-5), the programme was primarily center-based, with 2 group sessions at a university clinic and 1 home session per week. Group sessions included a warm-up, 45-minutes of individually prescribed exercises, and a cool down. Equipment such as treadmills, steps, weights, and sports gear were used. Participants also engaged in a 15-minute self-management programme after center-based classes to enhance exercise self-efficacy and management skills. In Block 2 (weeks 6-10), participants switched to a home-based programme monitored via telehealth. Home-based participants completed similar exercises independently, with adjustments for safety and available equipment. Equipment such as weight vests and visual cues was loaned to them. Physiotherapists monitored progress remotely through phone calls in weeks 7 and 9, addressing any barriers to adherence. **Control** Name: Centre-based individualised exercise programme Protocol description: Control (same intervention, different setting) Delivery setting: University physiotherapy clinic Number/frequency of sessions: 3x 60-minute sessions per week Duration: 10 weeks Practitioner(s): Physiotherapist Participants followed the same pre-block and Block 1 programme as those in the intervention arm. In Block 2 (weeks 6-10), participants continue the center-based exercise program.
Duration of follow-up	Post-intervention (10 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=40 - Home-based and centre-based individualised exercise programme: n=20

	- Centre-based individualised exercise programme: n=20
Other information	During the trial, there was minimal change in the daily levodopa equivalent dose for both groups: home-based (baseline mean 659 mg, SD 472; post-test mean 663 mg, SD 483) and center-based (baseline mean 512 mg, SD 308; post-test mean 526 mg, SD 269). All exercises were completed during the 'ON' phase of medication.

mg: miligrams; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (10 weeks from baseline)

Home-based and centre-based individualised exercise programme versus centre-based individualised exercise programme: Gait and balance

Gait and balance as measured by Mini-BESTest - Polarity - Higher values are better

Gait as measured by 10MWT - preferred - Polarity - Higher values are better

Gait as measured by 10MWT - fast - Polarity - Higher values are better

Outcome	Home-based and centre-based individualised exercise programme, Post-intervention vs Baseline, N = 19	Centre-based individualised exercise programme, Post-intervention vs Baseline, N = 20
Mini-BESTest Mean (SD)	1.1 (2.7)	1.3 (3.2)

Outcome	Home-based and centre-based individualised exercise programme, Post-intervention vs Baseline, N = 19	Centre-based individualised exercise programme, Post-intervention vs Baseline, N = 20
10MWT - preferred Mean (SD)	0.2 (0.17)	0.21 (0.17)
10MWT - fast Mean (SD)	0.13 (0.19)	0.17 (0.19)

m/s: metres per second; Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer-generated randomisation using permuted blocks of 2, 4, and 6; performed remotely. Results concealed in opaque envelopes. No statistical differences between baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Personnel were probably aware of assigned interventions, however, due to nature of intervention blinding most likely not possible. There were no deviations due to experimental context. Modified intention-to-treat analysis was likely performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(1/20 (5%) participant in the intervention arm withdrew after randomisation and did not receive the programme nor was included in the analysis. Reason for withdrawal was cited as unrelated medical complication. Data available for 95% of participants in the intervention arm and missingness is probably not related to true value.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments and objective nature of tasks performed.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Forsberg, 2016

Bibliographic Reference	Forsberg, Anette; von Koch, Lena; Nilsagard, Ylva; Effects on Balance and Walking with the CoDuSe Balance Exercise Program in People with Multiple Sclerosis: A Multicenter Randomized Controlled Trial.; Multiple sclerosis international; 2016; vol. 2016; 7076265

Study details

Country/ies where study was carried out	Sweden
Study type	Cross-over randomised controlled trial

Study dates	August 2012 - June 2013
Inclusion criteria	- People with multiple sclerosis diagnosed by a neurologist, - Able to walk 100 metres (use of assistive walking device was allowed), - Able to get up from the floor with minor support but unable to maintain tandem stance heel-toe with arms alongside the body for 30 seconds.
Exclusion criteria	- Cognitive or linguistic difficulties that prohibited filling in self-report questionnaires.
Patient characteristics	N=87 adults with multiple sclerosis - Balance exercise programme (CoDuSe): n=44 - Waitlist control: n=43 Age in years [Mean (SD)]: - CoDuSe balance exercise programme: 52 (10) - Waitlist control: 56.3 (11) Sex (M/F): - CoDuSe balance exercise programme: n=7/n=28 - Waitlist control: n=7/n=31 Time since diagnosis in years [Mean (SD)]: - CoDuSe balance exercise programme: 15 (9) - Waitlist control: 16 (11)

	Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=35 for CoDuSe balance exercise programme and n=38 for waitlist control).
Intervention(s)/control	**Intervention** Name CoDuSe balance exercise programme. Protocol intervention group: Rehabilitation interventions to address stability - Balance exercises. Delivery setting: Group based (4-7 participants), location not reported Number/frequency of sessions: 2x 35-45-minute sessions per week Duration: 7 weeks Practitioner(s): Physical therapist The intervention targeted visual, somatosensory, and vestibular aspects of balance. Each session included 20-minutes of core stability exercises 15–20 minutes of dual-task exercises and 15–20 minutes of exercises challenging different sensory strategies. Participants were encouraged to maintain focus on core stability during the whole session. Each session ended with 5-minutes of stretching and relaxing. **Control** Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s): Not applicable Participants were under waitlist control until they crossed over into the intervention arm (not considered in this review).

Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=87 - CoDuSe balance exercise programme: n=44 - Waitlist control: n=43
Other information	Crossover randomised controlled trial design - only outcomes from first time period included and analysed. Outcomes at 16 weeks and 64 weeks follow-up have not been.

CoDuSe: core stability, dual task training, and sensory strategies; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)

CoDuSe balance exercise programme versus waitlist control: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by FGA - Polarity - Higher values are better

Gait and balance as measured by FSST - Polarity - Lower values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	CoDuSe balance exercise programme, Post-intervention vs Baseline, N = 35	Waitlist control, Post-intervention vs Baseline, N = 38
TUG Mean (SD)	0.5 (8.5)	-1 (3.8)
FGA Mean (SD)	2.7 (4.2)	0.7 (2)
FSST Mean (SD)	-0.5 (11)	3.5 (10)
MSWS-12 Mean (SD)	-3.4 (5)	-0.1 (5.2)
BBS Mean (SD)	2.6 (4.1)	1.6 (4.1)

BBS: Berg balance scale; CoDuSe: core stability, dual task training, and sensory strategies; FGA: functional gait assessment; FSST: four-square step test; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

CoDuSe balance exercise programme versus waitlist control: Exercise capacity

Exercise capacity as measured by 10XSST - Polarity - Lower values are better

Outcome	CoDuSe balance exercise programme, Post-intervention vs Baseline, N = 35	Waitlist control, Post-intervention vs Baseline, N = 38
10XSST Mean (SD)	-3.6 (8.2)	-4.1 (9.8)

CoDuSe: core stability, dual task training, and sensory strategies; N/n: number of participants; SD: standard deviation; 10XSST: 10-repetition sit-to-stand test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Adequate methods of randomisation and concealment (computer generated by an independent statistician). Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Although participants and personnel were not blinded to group allocation it is unlikely that any deviations from the intended interventions arose due to the experimental context. Authors reported 9/44 (20%) from the intervention and 5/43 (12%) from the control that withdrew after randomisation and before the intervention began with reasons cited as due to "insufficient practical information" such as scheduling difficulties. These participants were excluded from the study and analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(At post intervention (follow-up 8 weeks from baseline) outcome data was not available for the 9/44 (20%) and 5/43 (12%) in intervention and control groups, respectively, that declined further participation. No methods reported to control for missing data and while there was an imbalance in missing data between arms, missingness in the outcome unlikely to depend on the true value.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(All measures validated and commonly used tools. MSWS-12 (high): Likely that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by unblinded participants and control is not an active intervention. TUG, FGA, FSST, BBS, 10XSST (low): Outcome assessors were blind to allocation such that objective measurements of distance time, and so on were unlikely influenced by knowledge of intervention received..)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; FGA: functional gait assessment; FSST: four-square step test; MSWS-12: multiple sclerosis walking scale-12; TUG: timed up and go test; 10XSST: 10-repetition sit-to-stand test

Gandolfi, 2015

Bibliographic Reference	Gandolfi, Marialuisa; Munari, Daniele; Geroin, Christian; Gajofatto, Alberto; Benedetti, Maria Donata; Midiri, Alessandro; Carla, Fontana; Picelli, Alessandro; Waldner, Andreas; Smania, Nicola; Sensory integration balance training in patients with multiple sclerosis: A randomized, controlled trial.; Multiple sclerosis (Houndmills, Basingstoke, England); 2015; vol. 21 (no. 11); 1453-62

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	March 2010 - December 2011
Inclusion criteria	- Relapsing–remitting multiple sclerosis, - Aged 65 years or older, - Expanded Disability Status Scale score 1.5 to 6.0, - Mini-Mental State Evaluation score 24 or higher, - Subjective symptoms of balance impairments, - Fear of falling and/or history of falls, as defined by at least one fall within the last year retrospectively determined by participant and caregiver interviews, - Retropulsive pull test requiring three or more steps backward to recover and avoid falling.
Exclusion criteria	- Multiple sclerosis relapse during 3 months prior to recruitment, - Disease modifying and symptomatic therapy for multiple sclerosis not well defined for adherence and/or changed during study period, - Presence of paroxysmal vertigo, - Concurrent neurological or orthopaedic disorders involving lower limbs and/or interfering with the standing position, - Any type of rehabilitation in month prior to recruitment.
Patient characteristics	N=80 adults with relapsing-remitting multiple sclerosis - Sensory integration balance training: n=39 - Conventional rehabilitation: n=41

	Age in years [Mean (SD)]: - Sensory integration balance training: 47.21 (6.9) - Conventional rehabilitation: 49.56 (6.85) Sex (M/F): - Sensory integration balance training: n=11/n=28 - Conventional rehabilitation: n=10/n=31 Time since diagnosis in years [Mean (SD)]: - Sensory integration balance training: 12.25 (7.23) - Conventional rehabilitation: 15.24 (7.33) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Sensory integration balance training Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery: Community (gym at an outpatient rehabilitation unit) Number/frequency of sessions: 3x 50-minute sessions per week Duration: 5 weeks Practitioner(s): Physical therapist

	The programme aimed to address proprioceptive and central processing deficits. Each session consisted of graded exercises in static and dynamic positions with 3 levels of sensory input (free vision, blindfolded to eliminate visual input, or wearing a visual-conflict dome to produce inaccurate inputs). Treatments were tailored to each individual according to ability and complexity increased as condition improved. During the intervention period, participants were not allowed to receive other rehabilitation but no other restrictions on other physical activity were made. **Control** Name: Conventional rehabilitation Protocol description: Control (standard rehabilitation) Delivery setting: Community (gym at an outpatient rehabilitation unit) Number/frequency of sessions: 3x 50-minute sessions per week Duration: 5 weeks Practitioner(s): Physical therapist Training in the control group consisted of passive and active lower limb joint mobilisation, muscle stretching, and strengthening exercises according to multiple sclerosis specific rehabilitation guidelines. Treatments were tailored to each individual according to ability and complexity increased as condition improved. Each session included exercises of the same frequency and duration of those received in the intervention group. During the intervention period, participants were not allowed to receive other rehabilitation but no other restrictions on other physical activity were made.
Duration of follow-up	1 month follow-up (9 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=80

	- Sensory integration balance training: n=39 - Conventional rehabilitation: n=41

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)
- 1 month follow-up (9 weeks from baseline)

Sensory integration balance training versus conventional rehabilitation: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Sensory integration balance training, Post-intervention vs Baseline, N = 39	Sensory integration balance training, 1 month follow-up vs Baseline, N = 39	Conventional rehabilitation, Post-intervention vs Baseline, N = 41	Conventional rehabilitation, 1 month follow-up vs Baseline, N = 41
BBS Mean (SD)	4.8 (3.28)	4.95 (3.31)	1.3 (4.06)	1.84 (3.97)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Adequate methods of randomisation and concealment used (computer generated random number tables/blinded practitioner); and groups appear comparable at baseline with no significant differences reported.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were not blinded to intervention status, however, there were no apparent deviations from the intended interventions and it is unlikely that these would have arisen due to the experimental context. Intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(No information on the extent of missing data is reported. The authors state that the last observation carried forward method was used to deal with missing data, however, this does not control for bias due to missing data. No other methods for controlling for missing data are reported.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessment methods were appropriate and unlikely to have differed between groups and outcome assessors were blinded to intervention status.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Gandolfi, 2017

Bibliographic Reference	Gandolfi, Marialuisa; Geroin, Christian; Dimitrova, Eleonora; Boldrini, Paolo; Waldner, Andreas; Bonadiman, Silvia; Picelli, Alessandro; Regazzo, Sara; Stirbu, Elena; Primon, Daniela; Bosello, Christian; Gravina, Aristide Roberto; Peron, Luca; Trevisan, Monica; Garcia, Alberto Carreno; Menel, Alessia; Bloccari, Laura; Vale, Nicola; Saltuari, Leopold; Tinazzi, Michele; Smania, Nicola; Virtual Reality Telerehabilitation for Postural Instability in Parkinson's Disease: A Multicenter, Single-Blind, Randomized, Controlled Trial.; BioMed research international; 2017; vol. 2017; 7962826

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	December 2013 - December 2015
Inclusion criteria	- Aged over 18 years, - Modified Hoehn and Yahr stage 2.5 to 3, - Stable medication usage in previous month, - Ability to perform postural transfer and maintain upright standing posture for at least 10-minutes, - Presence of a caregiver.
Exclusion criteria	- Cardiovascular, orthopaedic, and otovestibular disorders (dizziness), - Visual or other neurological conditions that could interfere with balance, - Severe dyskinesias or on-off fluctuations, - Mini-Mental State Examination score lower than 24, - Severe depression as measured on the Geriatric Depression Scale.

Patient characteristics	N=76 adults with Parkinson's disease - Virtual reality-based balance training: n=38 - Sensory integration balance training: n=38 Age in years [Mean (SD)]: - Virtual reality-based balance training: 67.45 (7.18) - Sensory integration balance training: 69.84 (9.41) Sex (M/F): - Virtual reality-based balance training: n=23/n=15 - Sensory integration balance training: n=28/n=10 Time since diagnosis in years [Mean (SD)]: - Virtual reality-based balance training: 6.16 (3.81) - Sensory integration balance training: 7.47 (3.90) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Virtual reality-based balance training (Nintendo Wii) Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Community (participant's home)

	Number/frequency of sessions: 3x 50-minute sessions per week, totalling 21 sessions Duration: 7 weeks Practitioner(s): Physiotherapist (remotely supervising 2 participants at once) Sessions consisted of warm up and stretching and Nintendo Wii Fit® system (TeleWii) with Nintendo Wii Balance Board® based exercises such as table tilt and skateboarding. Participants were asked to train when on the "ON" stage of medication. Games were selected by the physiotherapist based on the participant's condition and improvements. During the intervention period, participants were not allowed to receive any other type of rehabilitation, however no other restrictions on physical activity were set. **Control** Name: Sensory integration balance training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient (in rehabilitation unit) Number/frequency of sessions: 3x 50-minute sessions per week, totalling 21 sessions Duration: 7 weeks Practitioner(s): Physiotherapist Sessions consisted of warm up and stretching, static and dynamic balance exercises under different sensory conditions (for example, blindfolded), and destabilisation exercises on a progressive basis according to ability. Participants were asked to train when on the "ON" stage of medication. During the intervention period, participants were not allowed to receive any other type of rehabilitation, however no other restrictions on physical activity were set.
Duration of follow-up	1 month follow-up (11 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=76 - Virtual reality-based balance training (Nintendo Wii): n=38

	- Sensory integration balance training (Nintendo Wii): n=38

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (7 weeks from baseline)
- 1 month follow-up (11 weeks from baseline)

Virtual reality-based balance training (Nintendo Wii) versus sensory integration balance training: Gait and balance

Gait and balance as measured by DGI - Polarity - Higher values are better

Gait as measured by 10MWT - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Virtual reality-based balance training (Nintendo Wii), Post-intervention vs Baseline, N = 36	Virtual reality-based balance training (Nintendo Wii), 1 month follow-up vs Baseline, N = 36	Sensory integration balance training (Nintendo Wii), Post-intervention vs Baseline, N = 34	Sensory integration balance training (Nintendo Wii), 1 month follow-up vs Baseline, N = 34
DGI Mean (SD)	0.85 (1.81)	0.93 (1.91)	1.84 (1.67)	1.71 (1.91)
10MWT	0.03 (0.33)	-0.02 (0.33)	0.14 (0.31)	0.06 (0.28)

Outcome	Virtual reality-based balance training (Nintendo Wii), Post-intervention vs Baseline, N = 36	Virtual reality-based balance training (Nintendo Wii), 1 month follow-up vs Baseline, N = 36	Sensory integration balance training (Nintendo Wii), Post-intervention vs Baseline, N = 34	Sensory integration balance training (Nintendo Wii), 1 month follow-up vs Baseline, N = 34
Mean (SD)				
BBS Mean (SD)	3.74 (4.42)	3.21 (4.18)	4.21 (5.28)	4.05 (5.31)

BBS: Berg balance scale; DGI: dynamic gait index scoring form; m/s: metres per second; N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Although adequate randomisation methods were used (computer generated random number tables), there is no information regarding allocation concealment. The groups appear comparable at baseline and significance testing/values are reported.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Participants and personnel were aware of assigned intervention, however, it is unlikely that deviations arose due to the experimental context. Approaches to analysis are not discussed, however, participants who did not receive their allocated intervention were excluded from the final analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(No information regarding the extent of missing data is included, however, the authors report that missing data were handled by using single*

Section	Question	Answer
		imputation which may have introduced bias and no other methods for controlling for missing data are reported.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Methods of outcome measurement were appropriate and unlikely to have differed between groups. Outcome assessors were blinded to intervention status.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Gandolfi, 2018

Bibliographic Reference	Gandolfi, Marialuisa; Vale, Nicola; Dimitrova, Eleonora Kirilova; Mazzoleni, Stefano; Battini, Elena; Benedetti, Maria Donata; Gajofatto, Alberto; Ferraro, Francesco; Castelli, Matteo; Camin, Maruo; Filippetti, Mirko; De Paoli, Carola; Chemello, Elena; Picelli, Alessandro; Corradi, Jessica; Waldner, Andreas; Saltuari, Leopold; Smania, Nicola; Effects of High-intensity Robot-assisted Hand Training on Upper Limb Recovery and Muscle Activity in Individuals With Multiple Sclerosis: A Randomized, Controlled, Single-Blinded Trial.; Frontiers in neurology; 2018; vol. 9; 905

Study details

Country/ies where study was carried out	Italy

Study type	Randomised controlled trial (RCT)
Study dates	March 2014 - March 2017
Inclusion criteria	- Confirmed multiple sclerosis diagnosis, - Age between 18 and 65 years, - Expanded Disability Status Scale score 1.5 ≤ x ≤ 8, - Mini-Mental State Evaluation score ≥24/30, - Modified Ashworth Scale score <2 evaluated at the elbow, wrist, and fingers, - Nine Hole Peg Test score between 30 and 300 seconds.
Exclusion criteria	- Relapse or relapse-related treatments in the 3 months before entering the study, - Musculoskeletal impairments or visual analog scale for pain score > 7/10 in any joint that could interfere with the training program, - Severe visual dysfunction, - Any type of rehabilitation in the month prior to recruitment, - Other concomitant neurological or orthopaedic diseases involving the upper limb and interfering with their function.
Patient characteristics	N=44 adults with multiple sclerosis - Robot-assisted hand training: n=23 - Non-robotic hand training: n=21 Age in years [Mean (SD)]: - Robot-assisted hand training: 51.96 (10.87)

	- Non-robotic hand training: 50.67 (10.80) Sex (M/F): - Robot-assisted hand training: n=10/n=13 - Non-robotic hand training: unclear, reported incorrectly in paper as 41487 Time since diagnosis in years [Mean (SD)]: - Robot-assisted hand training: 13.48 (7.82) - Non-robotic hand training: 14.19 (9.78) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Robot-assisted hand training Protocol intervention group: Rehabilitation interventions to address upper limb functioning – robotics and repetitive task training Delivery setting: Outpatient neurorehabilitation unit Number/frequency of sessions: 2x 50-minute sessions per week Duration: 5 weeks Practitioner(s): Physiotherapist The participant was seated comfortably with the arm strapped into a stabilizing splint attached to a robotic device. The wrist was in a neutral position, forearm pronated, and stabilised with a spring-loaded hinge allowing passive flexion and

	extension. The device was adjusted to a 30° elbow flexion angle. Each finger was attached to a robotically driven slide using magnets on the distal phalanx. Three training modes were used: - Continuous passive motion for 10-minutes, passively stimulating finger flexion and extension. - Assistive therapy for 10-minutes, actively training the hand at the participant's performance limit. - Interactive therapy for 10-minutes, using virtual therapy games where the participant exerted isometric force in flexion or extension to avoid obstacles or reach targets, producing proportional movement of a virtual figure. Task difficulty was adjusted by the physiotherapist based on performance. Exercises were repeated and complexity increased as performance improved. All exercises and any adverse events were recorded on the participant's chart. **Control** Name: Non-robotic hand training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient neurorehabilitation unit Number/frequency of sessions: 2x 50-minute sessions per week Duration: 5 weeks Practitioner(s): Physiotherapist The upper limb rehabilitation protocol, based on the neurodevelopmental technique, included limb mobilisation of the shoulder girdle, elbow, wrist, and fingers joints, movement facilitation, and active tasks selected from 15 challenging exercises. The focus was on improving muscle strength, dexterity, and motor control. At the end of each session, the participant received feedback on their performance, including the number of errors and comments on movement execution.
Duration of follow-up	1 month follow-up (9 weeks from baseline)
Sources of funding	Not industry funded

Sample size	N=44 - Robot-assisted hand training: n=23 - Non-robotic hand training: n=21
Other information	Non-robotic hand training not explicitly stated as usual care but description is congruent with standard upper limb rehabilitation. Fugl-Meyer Assessment Scale - upper extremity section (measures of upper limb function) and Motricity Index (measures of upper limb function) also reported but not extracted as does not appear to be validated in the multiple sclerosis population (only in stroke). Motor Activity Log (measure of upper limb function) also reported but not extracted as only sub-domain scores reported.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)
- 1 month follow-up (9 weeks from baseline)

Robot-assisted hand training versus non-robotic hand training: Limb/joint/muscle function

Upper limb function as measured by ARAT - Polarity - Higher values are better

Upper limb function as measured by FMA-UE - Polarity - Higher values are better

Upper limb function as measured by MI-UE - Polarity - Higher values are better

Hand function as measured by 9HPT - pegs - Polarity - Higher values are better

Outcome	Robot-assisted hand training, Post-intervention vs Baseline, N = 21	Robot-assisted hand training, 1 month follow-up vs Baseline, N = 21	Non-robotic hand training, Post-intervention vs Baseline, N = 18	Non-robotic hand training, 1 month follow-up vs Baseline, N = 18
ARAT Mean (SD)	4.95 (10.51)	4.19 (10.88)	3.56 (9.97)	3.89 (10.14)
FMA-UE Mean (SD)	2.85 (10.17)	3.9 (10.1)	4.44 (8.55)	3.44 (8.85)
MI-UE Mean (SD)	3.7 (11.4)	4.08 (11.47)	4 (9.69)	3.45 (9.95)
9HPT - pegs Mean (SD)	0.02 (0.075)	0.03 (0.08)	0.03 (0.086)	0.05 (0.086)

ARAT: action research arm test; FMA-UE: Fugl-Meyer assessment for upper extremity; MI-UE: motricity index - upper extremity; N/n: number of participants; SD: standard deviation; 9HPT: 9 hole peg test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Participants were assigned to the groups by a simple randomisation scheme using an automated randomisation system. Group allocation was kept concealed. There were no differences at baseline that suggested a problem with randomisation.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Participants and personnel were not aware of assigned intervention, there were no deviations based on the experimental context. There were 2/23 (9%) in intervention and 3/21 (14%) in control that withdrew and did not receive the intervention after randomisation and were not included in the analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcome data were not available for all or nearly all randomised. The study included participants lost to follow-up in the analysis (2/23 (9%) intervention, 3/21 (14%) control) but not those that withdrew after randomisation (2/23 (9%) in intervention and 3/21(14%) in control). Analysis methods addressing missing outcomes and reasons for withdrawal or loss to follow-up were not described.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and relevant outcomes were measured by the same blinded examiner at each session.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Gandolfi, 2019

Bibliographic Reference	Gandolfi, Marialuisa; Tinazzi, Michele; Magrinelli, Francesca; Busselli, Giulia; Dimitrova, Eleonora; Polo, Niccolo; Manganotti, Paolo; Fasano, Alfonso; Smania, Nicola; Geroin, Christian; Four-week trunk-specific exercise program decreases forward

trunk flexion in Parkinson's disease: A single-blinded, randomized controlled trial.; Parkinsonism & related disorders; 2019; vol. 64; 268-274

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	June 2017 - June 2018
Inclusion criteria	- Aged 18 years or older, - Clinical diagnosis of Parkinson's disease according to current diagnostic criteria, - Mini-Mental State Examination score of 24 or higher, - At least 5 degrees of forward trunk flexion during standing and walking and completely subside in the recumbent position, - Hoehn and Yahr stage 4 or lower in the “ON” medication phase and on usual antiparkinsonian treatment.
Exclusion criteria	- Severe dyskinesia or “on-off" fluctuations, - Parkinson's disease medication modification in 3 months preceding enrolment, - History of major spinal surgery or muscle and/or skeletal spine diseases, - Need for assistive devices to rise from a chair or bed, - Other neurological (such as, vertigo, vestibular disorders), orthopaedic or cardiovascular comorbidities that could interfere with postural control.
Patient characteristics	N=37 adults with Parkinson’s disease - Trunk-specific exercise programme: n=19

	- Standard rehabilitation: n=18 Age in years [Mean (SD)]: - Trunk-specific exercise programme: 72.42 (6.40) - Standard rehabilitation: 70.72 (6.60) Sex (M/F): - Trunk-specific exercise programme: n=9/n=10 - Standard rehabilitation: n=15/n=3 Time since diagnosis in years [Mean (SD)]: - Trunk-specific exercise programme: 8.01 (5.90) - Standard rehabilitation: 6.57 (4.29) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Trunk-specific exercise programme Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Outpatient (neurorehabilitation unit) and community (3 sessions performed as 'self-practice' in participants home including telephone contact with physiotherapist) Number/frequency of sessions: 2x 60-minute sessions per week

	Duration: 4 weeks Practitioner(s): Physiotherapist Each session was comprised of three parts: 1) Active self-correction exercises (20-minutes) - graded exercises repeated under different sensory conditions with visual feedback (mirror), proprioceptive feedback (electromyography), or without any feedback. 2) Trunk stabilisation exercises (20-minutes) - muscle trunk elongation and active graded exercises aimed at strengthening the trunk muscles and stability and improvement of the ability of the central nervous system to coordinate all muscle actions. 3) Functional tasks were used as a 'distraction' (through dual-task exercises) to engage the participants attention and foster subconscious control of self-correction and trunk stabilisation thereby reducing functional impairment. **Control** Name: Standard rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient (neurorehabilitation unit) and community (3 sessions performed as 'self-practice' in participants home including telephone contact with physiotherapist). Number/frequency of sessions: 2x 60-minute sessions per week Duration: 4 weeks Practitioner(s): Physiotherapist Sessions consisted of: joint mobilisation (20-minutes), muscle strengthening and stretching (20 minutes), gait training and balance exercises (20-minutes).
Duration of follow-up	1 month follow-up (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=37

	- Trunk-specific exercise programme: n=19 - Standard rehabilitation: n=18
Other information	Abstract quotes session frequency for both arms as 5 days per week, whereas in the methods, it is listed as 2 days per week.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)
- 1 month follow-up (8 weeks from baseline)

Trunk-specific exercise programme versus standard rehabilitation: Gait and balance

Gait and balance as measured by Mini-BESTest - Polarity - Higher values are better

Outcome	Trunk-specific exercise programme, Post-intervention vs Baseline, N = 19	Trunk-specific exercise programme, 1 month follow-up vs Baseline, N = 19	Standard rehabilitation, Post-intervention vs Baseline, N = 18	Standard rehabilitation, 1 month follow-up vs Baseline, N = 18
Mini-BESTest Mean (SD)	5.11 (4.07)	5.16 (4.07)	2.61 (3.99)	2.33 (4.03)

Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation

Trunk-specific exercise programme versus standard rehabilitation: Limb/joint/muscle functioning

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Trunk-specific exercise programme, Post-intervention vs Baseline, N = 18	Trunk-specific exercise programme, 1 month follow-up vs Baseline, N = 18	Standard rehabilitation, Post-intervention vs Baseline, N = 18	Standard rehabilitation, 1 month follow-up vs Baseline, N = 18
UPDRS III Mean (SD)	-4.89 (9.21)	-4.94 (9.24)	-4.44 (9.71)	-3.56 (9.25)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Adequate randomisation and concealment methods reported (external, web based). Some significant between group differences at baseline (sex p-value=0.038, percentage difference of sway area p-value=0.038, PDQ-8 p-value=0.004 with worse performance in the intervention group for the latter two characteristics) which are compatible with chance whereas most characteristics showed no significant differences between groups.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although participants and practitioners were not blinded to group allocation and deviations are not discussed specifically, it is unlikely that any deviations arose due to the experimental context and an appropriate intention-to-treat approach to analysis was taken.)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(The authors report using last observation carried forward methods in their analysis, however, this is not considered to be an appropriate method to control for missing data. In addition, no details regarding the extent of any missing data are included and no other more appropriate methods of controlling for missing data (such as sensitivity analyses) are reported.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Methods used to measure outcomes were appropriate and unlikely to vary between group, and outcome assessors were blinded to group allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants; PDQ: Parkinson's disease questionnaire

Gasner, 2019

Bibliographic Reference	Gasner, Heiko; Steib, Simon; Klamroth, Sarah; Pasluosta, Cristian F; Adler, Werner; Eskofier, Bjoern M; Pfeifer, Klaus; Winkler, Jurgen; Klucken, Jochen; Perturbation Treadmill Training Improves Clinical Characteristics of Gait and Balance in Parkinson's Disease.; Journal of Parkinson's disease; 2019; vol. 9 (no. 2); 413-426

Study details

Country/ies where study was carried out	Germany
Study type	Randomised controlled trial (RCT)
Study dates	See Steib 2017
Inclusion criteria	See Steib 2017
Exclusion criteria	See Steib 2017
Patient characteristics	N=43 adults with multiple sclerosis - Perturbation treadmill training: n=21 - Conventional treadmill training: n=22 Age in years: See Steib 2017 Se: See Steib 2017 Time since diagnosis: See Steib 2017 Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	See Steib 2017
Duration of follow-up	3 months follow-up (5 month from baseline)

Sources of funding	See Steib 2017
Sample size	See Steib 2017
Other information	Postural instability and gait difficulty (measure of gait and balance) also reported but not extracted as sub-domain scores of UPDRS III.

UPDRS III: unified Parkinson's disease rating scale part 3

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)
- 3 months follow-up (5 months from baseline)

Perturbation treadmill training versus conventional treadmill training: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Perturbation treadmill training, Post-intervention vs Baseline, N = 18	Perturbation treadmill training, 3 months follow-up vs Baseline, N = 16	Conventional treadmill training, Post-intervention vs Baseline, N = 20	Conventional treadmill training, 3 months follow-up vs Baseline, N = 19
UPDRS III Mean (SD)	-6.7 (6.1)	-6.2 (4.7)	-4.1 (8.1)	-3.8 (8.1)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer-generated block randomisation (block size of 6) was used and allocation concealment preserved. No statistical differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Personnel and participants were probably aware of interventions allocated. 12/21 (57.1%) of participants in the perturbation group disclosed their group allocation during the visits. 1/22 (4.5%) participants received control instead of experimental condition due to orthopaedic advice. A naïve per-protocol analysis was used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(3/21 (14.3%) and 2/22 (9.1%) of participants in the intervention and control groups, respectively were not analysed post-intervention, and 5/21 (23.8%) and 3/22 (13.6%) at 3 months follow-up. Reasons for attrition were change of medications, assessment not possible due to health condition, unavailable participant, and related/non-related adverse event. It is possible that the missingness in the outcome depended on it's true value. No information if sensitivity analyses were conducted.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-specified analysis plan was published; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Gil-Agudo, 2023

Bibliographic Reference	Gil-Agudo, Angel; Megia-Garcia, Alvaro; Pons, Jose Luis; Sinovas-Alonso, Isabel; Comino-Suarez, Natalia; Lozano-Berrio, Vicente; Del-Ama, Antonio J; Exoskeleton-based training improves walking independence in incomplete spinal cord injury patients: results from a randomized controlled trial.; Journal of neuroengineering and rehabilitation; 2023; vol. 20 (no. 1); 36

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Complete spinal cord injury with less than 12 months since injury, - Aged 16 to 70 years, - C2-L4 injury with American Spinal Cord Injury Association Impairment Scale C or D, - Able to use walker or crutches (tricepts brachial muscle balance ≥3), - Can tolerate standing, - Spasticity in lower limb muscles ≤2 based on the Modifed Ashworth scale,

	- Informed consent.
Exclusion criteria	- Pregnant, - Other neurological condition present, - Recent lower extremity fracture within 12 months, - Irreducible contracture or arthrodesis in the lower limb joints, - Any ulcer sores where the exoskeleton would be used.
Patient characteristics	N=23 adults with complete spinal cord injury - Robot-assisted gait training (HANK): n=12 - Conventional gait training: n=11 Age in years [Mean (SD)]: - Robot-assisted gait training (HANK): 41 (12.39) - Conventional gait training: 51.8 (11.93) Sex (M/F): - Robot-assisted gait training (HANK): n=7/n=4 - Conventional gait training: n=8/n=2 Time since injury in months [Mean (SD)]: - Robot-assisted gait training (HANK): 4.82 (1.3)

	- Conventional gait training: 5.55 (2.3) Chronic neurological disorder category: Acquired spinal cord injury Note: Baseline characteristics were only reported for participants analysed (n=11 for robot-assisted gait training (HANK) and n=10 for conventional gait training).
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training (HANK) Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Indoors in a physiotherapy room Number/frequency of sessions: 3x 60-minute sessions on non-consecutive days per week totalling 15 sessions Duration: 5 weeks Practitioner(s): Physiotherapist Each session was 1-hour in length with 20-minutes for setting up the exoskeleton, 30-minutes of robotic ambulatory gait training with lower limb exoskeleton "HANK" (updated version of Exo-H2 exoskeleton), 5-minutes of rest and 5-minutes for registering variables assessed. There was access to external support based on ability and preference such as parallel bars, walker or crutches. The physiotherapist and engineer for control of the exoskeleton was also on hand for support. The physiotherapist included feedback during each session on walking pace as well as after each session on distance walked. **Control** Name: Conventional gait training Protocol description: Control (standard rehabilitation) Delivery setting: Not reported

	Number/frequency of sessions: 3x 30-minute sessions per week totalling 15 sessions Duration: 5 weeks Practitioner(s): Not reported Each rehabilitation session was 30-minutes long comprising traditional gait training with analytical mobilisation, strengthening for the lower limb and gait re-education where able by using parallels. *None of the participants in either group modified their usual medication or rehabilitation programs outside of the study.
Duration of follow-up	Post-intervention (5 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=23 - Robot-assisted gait training (HANK): n=12 - Conventional gait training: n=11

C: cervical; L: lumbar; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)

Robot-assisted gait training (HANK) versus conventional gait training: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Higher values are better

Gait as measured by WISCI II - Polarity - Higher values are better

Outcome	Robot-assisted gait training (HANK), Post-intervention vs Baseline, N = 11	Conventional gait training, Post-intervention vs Baseline, N = 10
TUG Mean (SD)	-13.23 (7.71)	-6.9 (7.22)
10MWT Mean (SD)	0.19 (0.16)	0.12 (0.17)
WISCI II Mean (SD)	3.54 (2.65)	0.7 (1.49)

m/s: metres per second; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; WISCII: walking index for spinal cord injury; 10MWT: 10 metre walk test

Robot-assisted gait training (HANK) versus conventional gait training: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training (HANK), Post-intervention vs Baseline, N = 11	Conventional gait training, Post-intervention vs Baseline, N = 10
6MWT Mean (SD)	68.79 (67.55)	48.1 (48.58)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Robot-assisted gait training (HANK) versus conventional gait training: Limb/joint/muscle function

Lower limb functioning as measured by LEMS - Polarity - Higher values are better

Outcome	Robot-assisted gait training (HANK), Post-intervention vs Baseline, N = 11	Conventional gait training, Post-intervention vs Baseline, N = 10
LEMS Mean (SD)	4.45 (5.37)	3 (2.66)

N/n: number of participants; SD: standard deviation; LEMS: lower extremity motor score

Robot-assisted gait training versus conventional gait training: Functioning

Functioning as measured by SCIM3 - Polarity - Higher values are better

Outcome	Robot-assisted gait training (HANK), Post-intervention vs Baseline, N = 11	Conventional gait training, Post-intervention vs Baseline, N = 10
SCIM3 Mean (SD)	2.18 (3.37)	2.4 (2.7)

N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Randomisation was performed via randomisation website, allocation concealment was unclear. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and practitioners were likely aware of allocation, however, there was no indication of deviations from protocol and analysis was modified intention-to-treat.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(More than 5% in each arm were lost to follow-up (1/12, 8% in intervention and 1/11, 9% in control arm. One participant in the intervention arm was lost to follow-up due to urinary infection and one in the control arm due to early discharge (no reason provided). These participants were not included in the analysis. It is possible but unlikely that the missingness in the outcome depended on it's true value for the participant with early discharge.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(SCIM3 (high): It is likely that assessment outcome could be influenced by knowledge of allocation as is a participant-reported measure by unblinded participants. Same time points and measurement tools used. LEMS, TUG, WISCII, 6MWT, 10MWT (low): Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Protocol published on clinicaltrials.gov but unclear whether statistical analysis finalised before unblinded outcome data availability and therefore whether the numerical result was selected from multiple eligible analyses; outcome data unlikely selected from multiple timepoints.)*
Overall bias and Directness	Risk of bias judgement	High

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	SCIM3 – overall rating of high risk of bias; LEMS, TUG, WISCII, 6MWT, 10MWT – overall rating of some concerns risk of bias

LEMS: lower extremity motor score; TUG: timed up and go test; SCIM3: spinal cord independence measure 3rd revision; WISCII: walking index for spinal cord injury; 6MWT: 6 minute walk test; 10MWT: 10 metre walk test

Gryfe, 2022

Bibliographic Reference	Gryfe, Pearl; Sexton, Andrew; McGibbon, Chris A; Using gait robotics to improve symptoms of Parkinson's disease: an open-label, pilot randomized controlled trial.; European journal of physical and rehabilitation medicine; 2022; vol. 58 (no. 5); 723-737

Study details

Country/ies where study was carried out	Canada
Study type	Randomised controlled trial (RCT)
Study dates	September 2018 - October 2019
Inclusion criteria	- Aged 50-85, - Diagnosed with Parkinson’s disease and Hoehn and Yahr stage 1 to 4, - Able to provide informed consent, - Willing and available to comply with all study procedures, - Able to walk 10 meters independently (with usual assistive devices),

	- Montreal Cognitive Assessment score ≥16.
Exclusion criteria	- Uncorrected visual impairment (legally blind), - Current treatment with another investigational drug or intervention, - New medications started within the previous 4 weeks, - Skin conditions contraindicating the use of orthotics or support braces, - Lower-extremity amputation (above or below the knee), - Uncontrolled orthostatic hypotension, - Other neurological or musculoskeletal disorders impairing gait and balance, - Psychiatric disorders, - Inability to wear the exoskeleton device due to body stature.
Patient characteristics	N=41 adults with Parkinson's disease - Exercise programme with exoskeleton: n=13 - Exercise programme without exoskeleton: n=15 - Waitlist control: n=13 Age in years [Mean (SD)]: - Exercise programme with exoskeleton: 67.6 (5.9) - Exercise programme without exoskeleton: 70.7 (7.3) - Waitlist control: 69.3 (8.0)

	Sex (M/F): - Exercise programme with exoskeleton: n=4/n=9 - Exercise programme without exoskeleton: n=7/n=7 - Waitlist control: n=10/n=3 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=13 for exercise programme with exoskeleton, n=14 for exercise programme without exoskeleton, and n=13 for waitlist control).
Intervention(s)/control	**Intervention** Name: Exercise programme with exoskeleton Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Wearable garments, technology (for example MOLLII) and exoskeletons Delivery setting: Assistive Technology and Movement Disorders outpatient clinics Number/frequency of sessions: 2x 60-minute sessions per week Duration: 8 weeks Practitioner(s): Physiotherapy research assistants trained by physiotherapists Participants in the exercise with the exoskeleton group completed sessions included a walking warm-up, core strength exercises, aerobic walking, functional mobility tasks, ankle strength exercises, and balance/posture activities. Repetitions increased until week 5 and were then maintained. The exoskeleton was used during all sessions. The programme was co-developed by the lead author and Assistive Technology Clinic physiotherapists, who trained and supervised two research assistants in delivering the programme and operating the exoskeleton.

	Intervention Name: Exercise programme without exoskeleton **Control** Name: Exercise programme without exoskeleton Protocol description: Control (standard rehabilitation care alone) Delivery setting: Assistive Technology and Movement Disorders outpatient clinics Number/frequency of sessions: 2x 60-minute sessions per week Duration: 8 weeks Practitioner(s): Physiotherapy research assistants trained by physiotherapists Participants in the exercise programme without exoskeleton group completed the same programme as those in the exercise programme with exoskeleton group. The only difference was that the group without the exoskeleton did not use the device during sessions. Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Duration: 8 weeks Practitioner(s): Not applicable The wait-list control group underwent baseline and 8-week post-intervention assessments and received weekly calls but did not take part in the exercise interventions. They were offered free exercise training after the study.
Duration of follow-up	Post-intervention (8 weeks from baseline)

Sources of funding	Not industry funded
Sample size	N=41 - Exercise programme with exoskeleton: n=13 - Exercise programme without exoskeleton: n=15 - Waitlist control: n=13

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)

Exercise programme with exoskeleton versus exercise programme without exoskeleton versus waitlist control: Gait and balance

Gait and balance as measured by B-BESTest - Polarity - Higher values are better

Outcome	Exercise programme with exoskeleton, Post-intervention vs Baseline, N = 13	Exercise programme without exoskeleton, Post-intervention vs Baseline, N = 14	Waitlist control, Post-intervention vs Baseline, N = 13
B-BESTest Mean (SD)	-0.6 (2.1)	0.6 (3)	-1 (3.8)

B-BESTest: brief balance evaluation systems test; N/n: number of participants; SD: standard deviation

Exercise programme with exoskeleton versus exercise programme without exoskeleton versus waitlist control: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Exercise programme with exoskeleton, Post-intervention vs Baseline, N = 13	Exercise programme without exoskeleton, Post-intervention vs Baseline, N = 14	Waitlist control, Post-intervention vs Baseline, N = 13
6MWT Mean (SD)	34.8 (17.6)	-1.4 (20.4)	-3.8 (40.5)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Exercise programme with exoskeleton versus exercise programme without exoskeleton versus waitlist control: Limb/joint/muscle function

Motor functioning as measured by UPDRS III (worst side only) - Polarity - Lower values are better

Outcome	Exercise programme with exoskeleton, Post-intervention vs Baseline, N = 13	Exercise programme without exoskeleton, Post-intervention vs Baseline, N = 14	Waitlist control, Post-intervention vs Baseline, N = 13
UPDRS III (worst side only) Mean (SD)	2.2 (4.1)	1.5 (5.2)	2.4 (5.2)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Allocation codes were pre-generated by an external investigator and assigned sequentially by staff who were not involved in the interventions. To maintain equal group sizes, block randomisation in cohorts of 9 (3 per treatment group) was used. No information on allocation concealment provided. Baseline characteristics were presented for analysed rather than randomised participants. Numbers randomised to analysed differed for the exercise programme without exoskeleton group (1 participant not analysed) such that potential imbalances between this arm and the others were unclear.*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were aware of interventions allocated, there were no deviations from intended interventions. 1/15 (6.7%) participant in the control I arm (exercise programme without exoskeleton) did not have a baseline assessment or receive the programme after randomisation and was not included in the analysis. 1/15 (6.7%) and 1/13 (7.7%) of participants in the control I (exercise programme without exoskeleton) and control II (waitlist control) groups, respectively who withdrew during the intervention period were included in the analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(B-BESTest and UPDRS III (high): missing outcome data for 1/15 (6.7%) participant in the control I arm that did not have a baseline assessment after randomisation. No methods to control for missing outcome data and no information on whether the missing data depends on the true value. 6MWT (high): missing data occurred for 3/13 (23%) in the exoskeleton group, 4/15 (26.7%) in control I and 3/13 (23%) in control II group. No methods to control for missing outcome data and no information on whether the missing data depends on the true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was*

Section	Question	Answer
		influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments and objective nature of tasks performed.)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

B-BESTest: brief balance evaluation systems test; p: p-value; UPDRS III: unified Parkinson's disease rating scale part 3; 6MWT: 6 minute walk test

Hind, 2017

Bibliographic Reference	Hind, Daniel; Parkin, James; Whitworth, Victoria; Rex, Saleema; Young, Tracey; Hampson, Lisa; Sheehan, Jennie; Maguire, Chin; Cantrill, Hannah; Scott, Elaine; Epps, Heather; Main, Marion; Geary, Michelle; McMurchie, Heather; Pallant, Lindsey; Woods, Daniel; Freeman, Jennifer; Lee, Ellen; Eagle, Michelle; Willis, Tracey; Muntoni, Francesco; Baxter, Peter; Aquatic therapy for boys with Duchenne muscular dystrophy (DMD): an external pilot randomised controlled trial.; Pilot and feasibility studies; 2017; vol. 3; 16

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	October 2014 - June 2015

Inclusion criteria	- Boys aged 7-16 years, - Genetically confirmed Duchenne muscular dystrophy, - North Star Ambulatory Assessment of 8 or over, - Undergoing corticosteroid therapy (predinisolone or deflazacort) for at least 6 months with no large disruptions to drug (changing from prednisolone to deflazacort or vice versa), dosage (dose increase with weight was acceptable) or frequency (from daily to alternate day or other non-daily regimen, or vice versa) for at least 3 months prior to the initial assessment.
Exclusion criteria	- Taking part in another clinical trial, - Over 20% variation between screening and baseline North Star Ambulatory Assessment scores, - Could not attend the scheduled frequency and time length of therapy according to protocol, - Any contraindications or precautions to Aquatic therapy.
Patient characteristics	N=12 children and young people with Duchenne muscular dystrophy - Aquatic therapy and land-based training: n=8 - Land-based training: n=4 Age in years [Mean (SD)]: - Aquatic therapy and land-based training: 8.0 (0.9) - Land-based training: 9.8 (2.5) Sex (M/F): - Aquatic therapy and land-based training: n=8/n=0

	- Land-based training: n=4/n=0 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Aquatic therapy and land-based training Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy Delivery setting: NHS hydrotherapy pool Number/frequency of sessions: 2x 30-minute sessions per week, up to 52 sessions Duration: 6 months Practitioner(s): Physiotherapist (aquatic therapy trained with specialist knowledge of Duchenne muscular dystrophy) Each session was delivered for 30-minutes in a pool with 34 to 36 degrees temperature. Aquatic therapy involved active assisted or passive stretching targeting main muscle groups, simulated or real functional activities such as sit to standing, running, jumping, hopping and sub-maximal water exercise. The exercises were tailored based on ability and presenting clinical problems. At the initial appointment standard land- based therapy stretches and exercises were provided by a specialist physiotherapist and participants were asked to undertake land-based therapy on four of the other five days of the week. **Control** Name: Land-based training Protocol description: Control Delivery setting: Local services

	Number/frequency of sessions: 6 days per week, length of sessions not reported Duration: 6 months Practitioner(s): Local research and community physiotherapists (usually community pediatric physiotherapist) Land-based training based upon usual individualised physiotherapy intervention. Length of sessions were not reported. This typically followed best practice guidance including regular stretching targeting main muscle groups as well as advice towards directed exercise or regular activity. Prescription towards therapy would usually be adjusted every two to three months dependent on progress.
Duration of follow-up	Post-intervention (6 months from baseline)
Sources of funding	Not industry funded
Sample size	N=12 - Aquatic therapy and land-based training: n=8 - Land-based training: n=4
Other information	Forced vital capacity (measure of respiratory function) also reported but not extracted as no follow-up data available for comparator group. Activity Limitations Measures (measure of activity limitations for participants with upper and/or lower limb impairments) also reported by not extracted as not a global measure of functioning.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6 months from baseline)

Aquatic therapy and land-based training versus land-based training: Gait and balance

Gait and balance as measured by NSAA - Polarity - Higher values are better

Outcome	Aquatic therapy and land-based training, Post-intervention vs Baseline, N = 8	Land-based training, Post-intervention vs Baseline, N = 2
NSAA Mean (SD)	-2.72 (5.67)	-5 (12.52)

N/n: number of participants; NSAA: north star ambulatory assessment; SD: standard deviation

Aquatic therapy and land-based training versus land-based training: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Aquatic therapy and land-based training, Post-intervention vs Baseline, N = 8	Land-based training, Post-intervention vs Baseline, N = 1
6MWT Mean (SD)	-22 (56.76)	-105 (84.98)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation was performed through centralised web-based system and a physiotherapist entered the participant identifier so that none of the study team had access to randomisation schedule during recruitment. No formal statistical comparisons were performed for baseline characteristics and any differences between arms (such as ethnicity of English/Welsh/Scottish/Northern Irish/ British – intervention n=2/8 (25%) versus control n=3/4 (75%)) were likely a result of chance due to small numbers in each arm.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Participants and personnel were aware of assigned interventions. One participant from the control arm left the study as they were accepted into another clinical trial. There is the possibility that this was because they were aware of the intervention and wanted to seek this kind of intervention elsewhere. As there were low numbers (1-2 participants) in the control arm with data for relevant outcomes, this may have impacted outcomes. Modified intention-to-treat analyses were performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcome data was missing for 2/4 (50%) participants in the control arm for the North Star Ambulatory Assessment and for 3/4 (75%) of participants in the control arm for the 6 minute walk test. No outcome data was missing for the intervention arm. Reasons for withdrawal from the study were burden of attending the trial procedure for the child (n=1), accepted into another trial (n=1) and lost to follow-up (no further information) (n=1). Unclear whether missingness in outcome depended on true value as reasoning for loss to follow-up is unknown.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the standardised protocol for assessments and objective nature of tasks performed.)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Detailed published protocol with analysis plan available online; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Hoang, 2016

Bibliographic Reference	Hoang, Phu; Schoene, Daniel; Gandevia, Simon; Smith, Stuart; Lord, Stephen R; Effects of a home-based step training programme on balance, stepping, cognition and functional performance in people with multiple sclerosis--a randomized controlled trial.; Multiple sclerosis (Houndmills, Basingstoke, England); 2016; vol. 22 (no. 1); 94-103

Study details

Country/ies where study was carried out	Australia
Study type	Randomised controlled trial (RCT)
Study dates	March 2013 - February 2014
Inclusion criteria	- Clinical diagnosis of multiple sclerosis according to the modified McDonald criteria, - Expanded disability status scale score of 2–6,

	- 18–65 years of age, - No evidence of cognitive impairment such as to provide informed consent and take instruction, - No multiple sclerosis exacerbation in the three months prior.
Exclusion criteria	- Other conditions that prevented stepping exercise such as severe spasticity, - Excessive fatigue or exercise intolerance (as determined by initial physiotherapist assessment at baseline).
Patient characteristics	N=50 adults with multiple sclerosis - Virtual reality-based step training: n=28 - Usual care: n=22 Age in years [Mean (SD)]: - Virtual reality-based step training: 53.4 (10.6) - Usual care: 51.4 (12.8) Sex (M/F): - Virtual reality-based step training: n=7/n=21 - Usual care: n=5/n=17 Time since diagnosis in years [Mean (SD)]: - Virtual reality-based step training: 11.6 (9.1) - Usual care: 13.4 (6.9)

	Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Virtual reality-based step training Protocol intervention group: Rehabilitation interventions to address mobility – Exergaming and AR/VR Delivery setting: Home Number/frequency of sessions: At least 2x per week Duration: 12 weeks Practitioner(s): Exercise therapist Two interactive exergames performed at home via a stepping mat wirelessly connected to a television. The first exergame was Stepmania, a rhythm video game requiring participants to match step direction and timing to stimuli on their television. Accompanying music was able to be selected by the participants from a predetermined list. The second exergame was choice stepping reaction time training requiring participants to step as quickly as possible to where the step direction is displayed on the screen via on one of the six step panels (forward, back, right and left, two of each). After each action the participant was to return to the middle step panel. Initial set up, training and risk assessment by exercise therapist and follow-up check-in phone call in the first 2 weeks. Assessments were performed in a gym setting. **Control** Name: Usual care Protocol description: Control (usual care) Delivery setting: Community setting Number/frequency of sessions: Not applicable Duration: 12 weeks

	Practitioner(s): None Continuation of usual physical activity. Assessments were performed in a gym setting.
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=50 - Virtual reality-based step training: n=28 - Usual care: 22
Other information	9HPT scores also reported but not extracted as included in the MSFC score.

AR: augmented reality; MSFC: multiple sclerosis functional composite score; N/n: number of participants; SD: standard deviation; VR: virtual reality; 9HPT: 9 hole peg test

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Virtual reality-based step training versus usual care: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Lower values are better

Outcome	Virtual reality-based step training, Post-intervention vs Baseline, N = 23	Usual care, Post-intervention vs Baseline, N = 21
TUG Mean (SD)	-0.8 (3.64)	-0.4 (3.08)
10MWT Mean (SD)	-2 (3.32)	-0.3 (3.3)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Virtual reality-based step training versus usual care: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Virtual reality-based step training, Post-intervention vs Baseline, N = 23	Usual care, Post-intervention vs Baseline, N = 21
6MWT Mean (SD)	2 (84.35)	13 (94.59)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Virtual reality-based step training versus usual care: Functioning

Functioning as measured by MSFC - Polarity - Lower values are better

Outcome	Virtual reality-based step training, Post-intervention vs Baseline, N = 23	Usual care, Post-intervention vs Baseline, N = 21
MSFC	-1.03 (1.33)	-0.77 (1.55)

Outcome	Virtual reality-based step training, Post-intervention vs Baseline, N = 23	Usual care, Post-intervention vs Baseline, N = 21
Mean (SD)		

MSFC: multiple sclerosis functional composite score; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Central randomisation by investigator not involved in recruitment or assessments and computer-generated random number schedule with block sizes of 6. It is unclear why there were more participants in the intervention arm and whether this impacted baseline differences in any way. No major baseline differences were observed.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of the allocations, however, no apparent deviations that arose from the trial context and modified intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcomes for participants lost to follow-up were not included in the analysis which occurred for 7/28 (18%; 4 due to personal circumstance, 1 due to exacerbation) in the intervention arm and 1/22 (5% due to health reasons) in the control arm. Health related reasons cited for loss to follow-up indicate that missingness of the outcome might be linked to true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome measurement methods were standard and appropriate and assessors were blinded to allocation status.)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-registered protocol on ANZCTR prior to study commencements with plans for outcomes and timepoints described; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

ANZCTR: Australian New Zealand Clinical Trials Registry

Kapadia, 2014

Bibliographic Reference	Kapadia, Naaz; Masani, Kei; Catharine Craven, B; Giangregorio, Lora M; Hitzig, Sander L; Richards, Kieva; Popovic, Milos R; A randomized trial of functional electrical stimulation for walking in incomplete spinal cord injury: Effects on walking competency.; The journal of spinal cord medicine; 2014; vol. 37 (no. 5); 511-24

Study details

Country/ies where study was carried out	Canada
Study type	Randomised controlled trial (RCT)
Study dates	March 2005 - December 2010
Inclusion criteria	- Had a traumatic incomplete spinal cord injury (C2 to T12, motor incomplete, AIS grade C or D),

	- At least 18 months post-injury, - Could not walk at baseline or required an assistive device, or walk with a speed ≤0.5 metres per second.
Exclusion criteria	- Contraindications for functional electrical stimulation (cardiac pacemakers, skin lesions, rashes at electrode sites, or muscle denervation), - Grade 4 pressure ulcers on the lower extremities, - Grade 2 or 3 pressure ulcers at functional electrical stimulation or harness sites, - Cardiovascular conditions like uncontrolled hypertension, orthostatic hypotension, or autonomic dysreflexia, - Medical clearance from the participant's family physician.
Patient characteristics	N=34 adults with traumatic incomplete spinal cord injury - Functional electrical stimulation plus bodyweight supported treadmill training: n=17 - Resistance and aerobic exercise programme: n=17 Age in years [Mean (SD)]: - Functional electrical stimulation plus bodyweight supported treadmill training: 56.59 (14.00) - Resistance and aerobic exercise programme: 54.06 (16.45) Sex (M/F): - Functional electrical stimulation plus bodyweight supported treadmill training: n=14/n=3 - Resistance and aerobic exercise programme: n=12/n=5 Time since injury in years [Mean (SD)]:

	- Functional electrical stimulation plus bodyweight supported treadmill training: 8.75 (9.74) - Resistance and aerobic exercise programme: 10.32 (11.13) Chronic neurological disorder category: Acquired spinal cord injury
Intervention(s)/control	**Intervention** Name: Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) Protocol intervention group: Mixed (Rehabilitation interventions to mobility – Gait training; Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics) Delivery setting: Outpatient spinal cord injury rehabilitation hospital Number/frequency of sessions: 3x 45-minute sessions per week Duration: 16 weeks Practitioner(s): Physiotherapist Intervention group received functional electrical stimulation while walking on a bodyweight support treadmill (Loko70, Woodway, USA) with a harness system. Functional electrical stimulation was delivered using Compex Motion stimulators with surface electrodes placed on the skin targeting key muscles (quadriceps, hamstrings, dorsiflexors, and plantarflexors) in a natural gait sequence. The system used balanced, biphasic, pulse-width modulated signals with adjustable amplitudes (8-125 mA) and pulse widths (0-300 μs). Initially, two physiotherapists controlled each leg's stimulation via push buttons, progressing to participant-controlled gait. Walking exercises were done with minimal bodyweight support, adjusting the speed for natural walking and ensuring smooth, coordinated movements. Gait speed adjustments were made by altering the swing phase duration in the functional electrical stimulation protocol, typically requiring no more than two iterations. Manual assistance was provided as needed to ensure physiological movements. Sessions included multiple 4-5 minute walking bouts with rest intervals. **Control** Name: Resistance and aerobic exercise programme Protocol description: Control (standard rehabilitation)

	Delivery setting: Outpatient spinal cord injury rehabilitation hospital Number/frequency of sessions: 3x 45-minute sessions per week Duration: 16 weeks Practitioner(s): Physiotherapist The control group participated in a tailored exercise programme including 20-25 minutes of resistance training (with hand weights, cables, and Uppertone system) and 20-25 minutes of aerobic training (arm cycling, leg cycling, and walking on a treadmill or in parallel bars). Resistance training involved 2-3 sets at 12-15 repetition maximum, progressively increased as tolerated. Aerobic exercise was monitored for moderate intensity (3-5 on the Borg Scale) to prevent excessive exertion. Blood pressure and heart rate were monitored during sessions. The control group also had the option to use the treadmill if they could walk unassisted.
Duration of follow-up	8 months follow-up (12 months from baseline)
Sources of funding	Not industry funded
Sample size	N=34 - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70): 17 - Resistance and aerobic exercise programme: 17
Other information	SCIM3 outcomes not measured at post-intervention or 2 months follow-up. Modified Ashworth Scale (measure of limb/joint/muscle function) measured but data reported narratively with insufficient information to conduct analysis.

mA: miliamps; N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision; SD: standard deviation; µs: microseconds

.

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 months from baseline)

- 2 months follow-up (6 months from baseline)
- 8 months follow-up (12 months from baseline)

Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) versus resistance and aerobic exercise programme: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), Post-intervention vs Baseline, N = 10	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 2 months follow-up vs Baseline, N = 10	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 8 months follow-up vs Baseline, N = 10	Resistance and aerobic exercise programme, Post-intervention vs Baseline, N = 6	Resistance and aerobic exercise programme, 2 months follow-up vs Baseline, N = 6	Resistance and aerobic exercise programme, 8 months follow-up vs Baseline, N = 6
TUG Mean (SD)	-10.6 (17.21)	-10.4 (17.04)	-11.4 (16.87)	-12.1 (24.51)	-18.4 (26.72)	-10.3 (25.11)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) versus resistance and aerobic exercise programme: Gait and balance

Gait as measured by 10MWT - Polarity - Lower values are better

Outcome	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), Post-intervention vs Baseline, N = 14	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 2 months follow-up vs Baseline, N = 14	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 8 months follow-up vs Baseline, N = 14	Resistance and aerobic exercise programme, Post-intervention vs Baseline, N = 7	Resistance and aerobic exercise programme, 2 months follow-up vs Baseline, N = 7	Resistance and aerobic exercise programme, 8 months follow-up vs Baseline, N = 7
10MWT Mean (SD)	-7.6 (34.11)	-9 (30.99)	-0.6 (45.01)	-20.4 (35.9)	-18.2 (33.25)	-14 (30.27)

N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) versus resistance and aerobic exercise programme: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), Post-intervention vs Baseline, N = 9	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 2 months follow-up vs Baseline, N = 9	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 8 months follow-up vs Baseline, N = 9	Resistance and aerobic exercise programme, Post-intervention vs Baseline, N = 7	Resistance and aerobic exercise programme, 2 months follow-up vs Baseline, N = 7	Resistance and aerobic exercise programme, 8 months follow-up vs Baseline, N = 7
6MWT Mean (SD)	29.2 (91.73)	31.4 (97.68)	44.6 (93.86)	51.5 (58.02)	52.9 (57.8)	47 (55.5)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 6MWT: 6 minute walk test

Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) versus resistance and aerobic exercise programme: Functioning

Functioning as measured by SCIM3 - Polarity - Higher values are better

Outcome	Functional electrical stimulation plus bodyweight supported treadmill training (Loko70), 8 months follow-up vs Baseline, N = 15	Resistance and aerobic exercise programme, 8 months follow-up vs Baseline, N = 11
SCIM3 Mean (SD)	6.4 (13.15)	0.9 (12.53)

N/n: number of participants; SD: standard deviation; SCIM3: spinal cord independence measure 3rd revision

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation was generated using randperm.m function in Matlab with allocations placed in concealed envelopes. No differences between baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants were aware of interventions allocated and no deviations from intended interventions. No information on whether intention-to-treat analyses were used. One participant was reported to drop out due to allocation (randomisation to control group), considered lost to follow-up and not analysed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(There were missing outcomes for participants lost to follow-up by post intervention (1/17, 6% for intervention, 5/17 29% for control arm) and at 6*

Section	Question	Answer
		months (1/17, 6% for control). Reasons cited for loss to follow-up were due to medical issues reported not to be related to the study (n=2, study arm not reported), leaving the country (n=1, study arm not reported), due to randomisation to the control group (n=1) and dropped out for unknown reasons (n=3). These participants were not included in the analysis nor were any sensitivity analyses performed. Proportions lost to follow-up differ between arms and It is unclear whether missingness depends on true value.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(SCIM3: (high): It is likely that assessment outcome could be influenced by knowledge of allocation as is a participant-reported measure by unblinded participants. Same time points and measurement tools used. TUG, 10MWT, 6MWT (some concerns): Although, validated and widely used tools all measures were taken without the functional electrical stimulation, assessing only the voluntary functions generated by the participants. The assessors were blinded to the group allocation of participants.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	High *(Although the protocol is available, there are changes in the primary objectives. SCIM3 outcomes were not measured post-intervention or at the 2-month follow-up. Modified Ashworth scale data was reported narratively, lacking sufficient information for analysis.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision; TUG: timed up and go test; 6MWT: 6 minute walk test; 10MWT: 10 metre walk test

Kleffelgaard, 2019

Bibliographic Reference	Kleffelgaard, Ingerid; Soberg, Helene Lundgaard; Tamber, Anne-Lise; Bruusgaard, Kari Anette; Pripp, Are Hugo; Sandhaug, Maria; Langhammer, Birgitta; The effects of vestibular rehabilitation on dizziness and balance problems in patients after traumatic brain injury: a randomized controlled trial.; Clinical rehabilitation; 2019; vol. 33 (no. 1); 74-84

Study details

Country/ies where study was carried out	Norway
Study type	Randomised controlled trial (RCT)
Study dates	January 2013 - October 2015
Inclusion criteria	- Participants with traumatic brain injury, - Aged 16–60 years, - Reported mild, moderate, or severe dizziness (Rivermead Post-Concussion Symptoms Questionnaire score ≥ 2), - Positive Romberg's test.
Exclusion criteria	- Severe psychological disease or substance abuse, - Insufficient command of Norwegian, - Cognitive dysfunction (unable to follow instructions or fill in forms), - Fractures or other comorbidities affecting mobility and independent gait, - Dizziness Handicap Inventory score < 15 points.
Patient characteristics	N=65 adults with traumatic brain injury - Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: n=33 - Multidisciplinary outpatient rehabilitation: n=32

	Age in years [Mean (SD)]: - Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: 37.6 (12.3) - Multidisciplinary outpatient rehabilitation: 41.2 (13.6) Sex (M/F): - Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: n=10/n=23 - Multidisciplinary outpatient rehabilitation: n=10/n=22 Time since injury in months [Mean (SD)]: - Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: 3.9 (2.2) - Multidisciplinary outpatient rehabilitation: 3.4 (1.9) Chronic neurological disorder category: Acquired brain injury Note: Characteristics reported for analysed numbers at first follow-up (n=33 for vestibular rehabilitation plus multidisciplinary outpatient rehabilitation and n=31 for multidisciplinary outpatient rehabilitation). n=1 did not receive allocated control as they withdrew after randomization and didn't give consent for baseline data use.
Intervention(s)/control	**Intervention** Name: Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Vestibular exercise, including optokinetic training Delivery setting: Outpatient rehabilitation clinic

	Number/frequency of sessions: 2x group sessions (2-5 participants) per week with 90-minutes for session 1 and 60-minutes for session 2 Duration: 8 weeks Practitioner(s): Physiotherapist The intervention included group sessions with guidance, individually modified vestibular rehabilitation exercises, a home exercise program, and an exercise diary. Groups of 2 to 5 participants attended two weekly sessions with different focuses: session 1 featured individually modified vestibular rehabilitation exercises in a circle training design, allowing participants to skip intolerable stations, while session 2 emphasised muscle conditioning and group interactions with balls and balloons. Exercises were tailored based on each participant's symptoms and functional challenges, including Brandt-Daroff exercises and maneuver treatments. Guidance sessions, led by physical therapists, included participant reflections, confidence building, education, and peer support, with a focus on positive experiences and self-efficacy. Parameters for vestibular rehabilitation exercises were adjusted based on subjective symptom levels, with feedback used to refine exercises and ensure a gradual introduction to avoid exacerbating symptoms. In addition, participants were offered usual outpatient multidisciplinary rehabilitation with aim to assist participation in daily activities and return to work. This involved clinical examinations by psychiatrists and assessments and follow-up by a multidisciplinary team if required. **Control** Name: Multidisciplinary outpatient rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient rehabilitation clinic Number/frequency of sessions: Not reported Duration: 8 weeks Practitioner(s): Physiotherapist The control only received usual multidisciplinary outpatient rehabilitation as described above, resulting in less therapy time compared to the intervention group. Participants with a positive positioning test (Dix-Hallpike and Roll test) were treated with repositioning maneuvers (Epley and Bar-B-Que Roll maneuvers) by the interventionist after baseline

	assessments, as not treating benign paroxysmal positional vertigo would conflict with research ethics due to strong evidence supporting these treatments.
Duration of follow-up	2 months follow-up (4 months from baseline [mean 4.4, standard deviation 1.0 months])
Sources of funding	Not industry funded
Sample size	N=65 - Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation: n=33 - Multidisciplinary outpatient rehabilitation: n=32

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline (mean 2.7, standard deviation 0.8 months))
- 2 months follow-up (4 months from baseline (mean 4.4, standard deviation 1.0 months))

Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation versus multidisciplinary outpatient rehabilitation: Gait and balance

Gait and balance as measured by Hi-MAT - Polarity - Higher values are better

Outcome	Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation, Post-intervention vs Baseline, N = 29	Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation, 2 months follow-up vs Baseline, N = 25	Multidisciplinary outpatient rehabilitation, Post-intervention vs Baseline, N = 23	Multidisciplinary outpatient rehabilitation, 2 months follow-up vs Baseline, N = 26
Hi-MAT Mean (SD)	6.7 (6.15)	6.4 (6.27)	2.1 (8.56)	5.2 (7.9)

Hi-MAT: high-level mobility assessment tool; N/n: number of participants; SD: standard deviation

Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation versus multidisciplinary outpatient rehabilitation: Gait and balance

Balance as measured by BESS - Polarity - Lower values are better

Outcome	Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation, Post-intervention vs Baseline, N = 31	Vestibular rehabilitation plus multidisciplinary outpatient rehabilitation, 2 months follow-up vs Baseline, N = 26	Multidisciplinary outpatient rehabilitation, Post-intervention vs Baseline, N = 26	Multidisciplinary outpatient rehabilitation, 2 months follow-up vs Baseline, N = 28
BESS Mean (SD)	-10.6 (7.9)	-12.2 (7.86)	2.1 (6.63)	-0.1 (6.6)

BESS: balance error scoring system; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(A computer-generated list of random numbers in blocks of 4 was prepared by statisticians not involved in the trial. An uninvolved research assistant stored the list and prepared sequentially numbered, opaque, sealed envelopes. The allocation sequence was concealed from the interventionist. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although participants and personnel were aware of interventions allocated, there were no deviations from intended interventions. 1/32 (3.1%) participant in control arm did not receive the rehabilitation after randomisation due to refusal to participate and were not included in the analysis. Intention-to-treat analyses were used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(4/33 (12.1%) and 7/32 (21.9%) of participants in the intervention and control groups for gait and balance outcome measured by Hi-MAT at post-intervention; 10/33 (30.3%) and 6/32 (18.8%) of participants in the intervention and control groups for gait and balance outcome measured by Hi-MAT at 2 months follow-up; 2/33 (6.1%) and 6/32 (18.8%) of participants in the intervention and control groups for balance measured by BESS at post-intervention; 7/33 (21.2%) and 4/32 (12.4%) of participants in the intervention and control groups for balance measured by BESS at 2 months follow-up, respectively were lost to follow-up. All results were biased by missing data; missingness unlikely to depend on true value based on reasons: orthopaedic surgery (1 in intervention), vacation (3 in intervention), did not wish to participate (3 in intervention, 3 in control), or no reason provided (1 in each arm).)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-specified analysis plan was published; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BESS: balance error scoring system; Hi-MAT: high-level mobility assessment tool

Lam, 2015

Bibliographic Reference	Lam, Tania; Pauhl, Katherine; Ferguson, Amanda; Malik, Raza N; Krassioukov, Andrei; Eng, Janice J; Training with robot-applied resistance in people with motor-incomplete spinal cord injury: Pilot study.; Journal of rehabilitation research and development; 2015; vol. 52 (no. 1); 113-29

Study details

Country/ies where study was carried out	Canada
Study type	Randomised controlled trial (RCT)
Study dates	Not reported

Inclusion criteria	- Motor-incomplete spinal cord injury (SCI; American Spinal Injury Association Impairment Scale impairment scale C or D) for 1 year or longer, - Able to walk on treadmill with bodyweight support without manual assistance, - Aged 19 to 65 years. Note: Published protocol additionally included motor-incomplete SCI due to non-progressive lesion, controlled spasticity (stable medication) throughout the study.
Exclusion criteria	- Lesion level lower than thoracic 11 or lower motoneuron injury, - Cannot step even with assistance of a treadmill and bodyweight support, - Weight of over 300 pounds or height greater than 6 feet 1 inch as that is the size capacity of Lokomat, - Cardiac, musculoskeletal, or other condition which prevents exercise, - Participation in rehabilitation therapy or other research study containing an exercise component or mobility outcomes. Note: Published protocol had additional exclusion criteria which were femur length <35 centimetres or >47 centimeters and bodyweight over 150 kilograms, skin conditions or open wounds or sores where contact with leg cuffs of Lokomat or bodyweight harness is located, existing cognitive impairment (based on cognitive capacity screening examination score less than 24/30).
Patient characteristics	N=15 adults with motor-incomplete spinal cord injury - Robot-resisted treadmill training (Lokomat): n=8 - Robot-assisted treadmill training (Lokomat): n=7 Age in years [Mean (SD)]: - Robot-resisted treadmill training (Lokomat): 40.3 (14.1) - Robot-assisted treadmill training (Lokomat): 50 (14.3)

	Sex (M/F): - Robot-resisted treadmill training (Lokomat): n=6/n=2 - Robot-assisted treadmill training (Lokomat): n=3/n=4 Time since injury in months [Mean (SD)]: - Robot-resisted treadmill training (Lokomat): 5.6 (6.5) - Robot-assisted treadmill training (Lokomat): 5.3 (4.4) Chronic neurological disorder category: Acquired spinal cord injury
Intervention(s)/control	**Intervention** Name: Robot-resisted treadmill training (Lokomat) Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Not reported Number/frequency of sessions: 3x 45-minutes per week Duration: 3 months Practitioner(s): Not reported Lokomat-based training using custom software control to use a velocity-dependent resistance against the hip and knee. Resistance level was gauged by isometric muscle testing with the Lokomat as well as with walking on the treadmill with the Lokomat at current training speed. Force level was reassessed every 4-6 training sessions. Bodyweight support was based on minimum tolerance levels and speed initially was 1.0 kilometres per hour and increased in increments by 0.1 kilometres per hour which was increased if the participant could maintain the treadmill speed for at least 5-minutes.

	Participants that had weak or paralyzed ankle dorsiflexion were aided by the Lokomat's passive food lifters. Rest breaks were granted when needed. **Control** Name: Robot-assisted treadmill training (Lokomat) Protocol description: Same intervention (different intensity) Delivery setting: Not reported Number/frequency of sessions: 3x per week Duration: 3 months Practitioner(s): Not reported 45-minutes of conventional Lokomat-based training whereby the hip and knee joint motors of the Lokomat move the participants' legs to form a normative gait. Bodyweight support and speed of the treadmill was the same as for the intervention group.
Duration of follow-up	6 months follow-up (9 months from baseline)
Sources of funding	Not industry funded
Sample size	N=15 - Robot-resisted treadmill training (Lokomat): n=8 - Robot-assisted treadmill training (Lokomat): n=7

N/n: number of participants; SCI: spinal cord injury; SD: standard deviation

Outcomes

Study timepoints

- Baseline

- Post-intervention (3 months from baseline)
- 1 month follow-up (4 months from baseline)
- 6 months follow-up (9 months from baseline)

Robot-resisted treadmill training versus robot-assisted bodyweight supported treadmill training: Gait and balance

Gait and balance as measured by SCI-FAP - Polarity - Lower values are better

Outcome	Robot-resisted treadmill training (Lokomat), Post-intervention vs Baseline, N = 8	Robot-resisted treadmill training (Lokomat), 1 month follow-up vs Baseline, N = 8	Robot-resisted treadmill training (Lokomat), 6 months follow-up vs Baseline, N = 8	Robot-assisted treadmill training (Lokomat), Post-intervention vs Baseline, N = 7	Robot-assisted treadmill training (Lokomat), 1 month follow-up vs Baseline, N = 7	Robot-assisted treadmill training (Lokomat), 6 months follow-up vs Baseline, N = 7
SCI-FAP Mean (SD)	-205 (382.17)	-217 (381.84)	-220 (382.33)	-17 (513.85)	-34 (512.62)	-45 (505.03)

N/n: number of participants; SCI-FAP: spinal cord injury functional ambulation profile; SD: standard deviation

Robot-resisted treadmill training versus robot-assisted bodyweight supported treadmill training: Gait and balance

Gait as measured by 10MWT - Polarity - Higher values are better

Outcome	Robot-resisted treadmill training (Lokomat), Post-intervention vs Baseline, N = 7	Robot-resisted treadmill training (Lokomat), 1 month follow-up vs Baseline, N = 7	Robot-resisted treadmill training (Lokomat), 6 months follow-up vs Baseline, N = 7	Robot-assisted treadmill training (Lokomat), Post-intervention vs Baseline, N = 5	Robot-assisted treadmill training (Lokomat), 1 month follow-up vs Baseline, N = 5	Robot-assisted treadmill training (Lokomat), 6 months follow-up vs Baseline, N = 5
10MWT Mean (SD)	0.11 (0.21)	0.1 (0.2)	0.08 (0.2)	0.11 (0.26)	0.14 (0.27)	0.11 (0.26)

N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Robot-resisted treadmill training versus robot-assisted bodyweight supported treadmill training: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-resisted treadmill training (Lokomat), Post-intervention vs Baseline, N = 8	Robot-resisted treadmill training (Lokomat), 1 month follow-up vs Baseline, N = 8	Robot-resisted treadmill training (Lokomat), 6 months follow-up vs Baseline, N = 8	Robot-assisted treadmill training (Lokomat), Post-intervention vs Baseline, N = 5	Robot-assisted treadmill training (Lokomat), 1 month follow-up vs Baseline, N = 5	Robot-assisted treadmill training (Lokomat), 6 months follow-up vs Baseline, N = 5
6MWT Mean (SD)	22 (78.69)	29 (68.8)	55 (79.21)	19 (99.46)	65 (101.55)	59 (99.86)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Stratified randomisation was described but no information on allocation concealment. Authors report no statistically significant differences between arms at baseline. Although visually it appeared there were differences between groups in mean age and composition of sex, any differences were likely due to chance due to small sample size.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants were blinded, unclear if personnel delivering the intervention were blinded. There was no deviation from allocated intervention due to trial context and an appropriate intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Outcome data not available for all participants (2/7 (29%) in control at all time points and 1/8 (13%) in the intervention only at 6 month time point with loss to follow-up in the control group potentially related to missing outcome (pneumonia) whereas other reasons are unlikely to relate to missingness in the outcome (family difficulties for control arm; moved out of province for intervention arm). The authors conducted missing completely at random multiple imputation for intention-to-treat analysis but whether this reduces bias in missing outcome is unknown as the authors did not provide a rationale towards their choice of multiple implementation method as well as justification for the assumption that missingness in the outcome does not depend on its true value other than through measured variables included in the imputation model.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcomes appropriately assessed and outcome assessors were blinded to allocation at each time point.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Pre-registered protocol is available via clinicaltrials.gov, however, contains*

Section	Question	Answer
		minimal information about planned outcomes and no information about statistical analysis plans.)
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Leung, 2014

Bibliographic Reference	Leung, Joan; Harvey, Lisa A; Moseley, Anne M; Whiteside, Bhavini; Simpson, Melissa; Stroud, Katarina; Standing with electrical stimulation and splinting is no better than standing alone for management of ankle plantarflexion contractures in people with traumatic brain injury: a randomised trial.; Journal of physiotherapy; 2014; vol. 60 (no. 4); 201-8

Study details

Country/ies where study was carried out	Australia
Study type	Randomised controlled trial (RCT)
Study dates	January 2009 - December 2014
Inclusion criteria	- Admitted with a traumatic brain injury to one of three brain injury rehabilitation units in Sydney, - First documented traumatic brain injury, - Score of 4 or lower on the walking item of Functional Independence Measure (an inability to walk 17 metres without physical assistance or 50 metres with supervision),

	- Presence of an ankle contracture (defined as passive dorsiflexion ankle range of motion less than 5 degrees at a torque of 12 newton metres, - Ability to participate in the assessment and intervention programme, - No unstable medical conditions or recent ankle fractures, - No other neurological conditions such as spinal cord injury or cerebrovascular disease, - Anticipated length of stay in hospital of at least 6 weeks, - No botulinum toxin injection to ankle joint within previous 3 months.
Exclusion criteria	None reported
Patient characteristics	N=36 adults with traumatic brain injury - Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: n=18 - Tilt table standing plus multidisciplinary rehabilitation: n=18 Age in years [Mean (SD)]: - Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: 38 (14) - Tilt table standing plus multidisciplinary rehabilitation: 38 (15) Sex (n): - Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: n=14/3 - Tilt table standing plus multidisciplinary rehabilitation: n=15/3 Time since injury in months [Mean (SD)]:

	- Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: 140 (96 to 226) - Tilt table standing plus multidisciplinary rehabilitation: 83 (66 to 161) Chronic neurological disorder category: Acquired brain injury Note: Baseline characteristics were only reported for n=17 for tilt table standing, electrical stimulation and ankle splinting and n=18 for tilt table standing only as 1 participant was excluded post randomisation due to incorrect diagnosis.
Intervention(s)/control	**Intervention** Name: Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics Delivery setting: Inpatient – rehabilitation unit Number/frequency of sessions: 5x 30-minute sessions per week of tilt table standing with electrical stimulation and ankle splinting for 5 days per week (12 hours) Duration: 6 weeks Practitioner(s): Nursing staff, physiotherapists, or physiotherapy assistants Participants underwent tilt table standing with wedge while electrical stimulation was applied to the ankle dorsiflexor muscles by physiotherapists. Splints applied by nursing staff, physiotherapists, or physiotherapy assistants. Both groups received usual multidisciplinary rehabilitation as appropriate (no further details reported).. **Control** Name: Tilt table standing plus multidisciplinary rehabilitation Protocol description: Control (standard rehabilitation care alone)

	Delivery setting: Inpatient – rehabilitation unit Number/frequency of sessions: 3 x 30-minute sessions per week, totalling 18 seesions. Duration: 6 weeks Practitioner(s): Physiotherapists Participants underwent tilt table standing without wedge and received usual multidisciplinary rehabilitation as appropriate (no further details reported).
Duration of follow-up	1 month follow-up (10 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=36 - Tilt table standing, electrical stimulation and ankle splinting plus multidisciplinary rehabilitation: n=18 - Tilt table standing plus multidisciplinary rehabilitation: n=18

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6 weeks from baseline)
- 1 month follow-up (10 weeks from baseline)

Functional electrical stimulation plus ankle splinting plus tilt table standing versus tilt table standing: Limb/joint/muscle functioning

Spasticity as measured by TS - Polarity - Lower values are better

Outcome	Functional electrical stimulation plus ankle splinting plus tilt table standing, Post-intervention vs Baseline, N = 17	Functional electrical stimulation plus ankle splinting plus tilt table standing, 1 month follow-up vs Baseline, N = 17	Tilt table standing, Post-intervention vs Baseline, N = 18	Tilt table standing, 1 month follow-up vs Baseline, N = 15
TS Mean (SD)	0 (0.71)	1 (0.71)	2 (0.71)	1 (0.71)

N/n: number of participants; SD: standard deviation; TS: Tardieu scale

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer generated external randomisation and concealed envelopes were used. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although participants were not blinded, it is unlikely that deviations arose because of the experimental context and analysis was on the basis of modified intention- to-treat.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Missing data occurred for 1/18 (6%) in intervention due to exclusion based on wrong diagnosis and 3/18 (17%) in control arm whereby at week 10 follow-up, 2 were discharged to regional area and 1 participant withdrew. Missingness unlikely depended on true value.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome measures were appropriate and unlikely to have differed between groups, and outcome assessors were blinded to group allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Lozano-Berrio, 2022

Bibliographic Reference	Lozano-Berrio, V; Alcobendas-Maestro, M; Polonio-Lopez, B; Gil-Agudo, A; de la Pena-Gonzalez, A; de Los Reyes-Guzman, A; The Impact of Robotic Therapy on the Self-Perception of Upper Limb Function in Cervical Spinal Cord Injury: A Pilot Randomized Controlled Trial.; International journal of environmental research and public health; 2022; vol. 19 (no. 10)

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)
Study dates	April 2016 - April 2019

Inclusion criteria	- Cervical spinal cord injury (C4-C8) classified A-D on the ASIA Impairment Scale, - Traumatic or non-progressive aetiology, - Injury evolution less than 6 months (subacute), - Age between 16 and 75 years, - Ability to achieve a seated posture, - Signed informed consent.
Exclusion criteria	- Unstable orthopaedic injuries or unstable osteosynthesis in the upper limb, - Skin lesions or pressure ulcers at exoskeleton placement, - Joint stiffness or severe spasticity, - Severe broncho-pneumopathy or heart disease requiring exercise monitoring, - Visual problems or cognitive impairment, - Failure to sign informed consent.
Patient characteristics	N=28 adults with cervical spinal cord injury - Robotic training plus conventional therapy: n=14 - Conventional therapy: n=14 Age in years [Mean (SD)]: - Robotic training plus conventional therapy: 39.92 (16.52) - Conventional therapy: 46.81 (16.30)

	Sex (M/F): - Robotic training plus conventional therapy: n=8/n=5 - Conventional therapy: n=10/n=3 Time since injury in months [Mean (SD)]: - Robotic training plus conventional therapy: 3.86 (1.66) - Conventional therapy: 4.29 (1.37) Chronic neurological disorder category: Acquired spinal cord injury Note: Baseline characteristics were only reported for participants analysed (n=13 in each arm).
Intervention(s)/control	**Intervention** Name: Robotic training plus conventional therapy Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training Delivery setting: Inpatient paraplegic unit Number/frequency of sessions: 5x 60-minute sessions per week Duration: 8 weeks (a maximum of 10 weeks was permitted) Practitioner(s): Clinical staff (no further details reported) Participants received 30-minutes of daily conventional therapy focused on upper limb function and activities of daily living treatment. Additionally, the intervention group received 30-minutes of upper limb robotic therapy using the Armeo®Spring device, which was split into two parts: 15-minutes of normalised games and 15-minutes of activities of daily living training for drinking. In the game, participants used the Armeo Spring device to simulate the actions of reaching, lifting, drinking, and returning a glass to the table.

	Control Name: Conventional therapy Protocol description: Control (standard rehabilitation care alone) Delivery setting: Inpatient paraplegic unit Number/frequency of sessions: 5x 60-minute sessions per week Duration: 8 weeks (a maximum of 10 weeks was permitted) Practitioner(s): Clinical staff (no further details reported) Participants received 30-minutes of daily conventional therapy for upper limb function and activities of daily living treatment. The control group received an additional 30-minutes of conventional therapy. No further details reported on content of conventional therapy.
Duration of follow-up	Post-intervention (10 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=28 - Robotic training plus conventional therapy: n=14 - Conventional therapy: n=14

ASIA: American spinal injury association; c: cervical; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (10 weeks from baseline.)

Robotic training plus conventional therapy versus conventional therapy: Limb/joint/muscle function

Upper limb functioning as measured by CUE - Polarity - Higher values are better

Robotics and repetitive task training versus control in adults with acquired spinal cord injury

Outcome	Robotic training plus conventional therapy, Post-intervention vs Baseline, N = 13	Conventional therapy, Post-intervention vs Baseline, N = 13
CUE Mean (SD)	28.46 (36.51)	19 (27.65)

CUE: capabilities of upper extremity questionnaire; N/n: number of participants; SD: standard deviation

Robotic training plus conventional therapy versus conventional therapy: Functioning

Functioning as measured by SCIM3 - Polarity - Higher values are better

Robotics and repetitive task training versus control in adults with acquired spinal cord injury

Outcome	Robotic training plus conventional therapy, Post-intervention vs Baseline, N = 13	Conventional therapy, Post-intervention vs Baseline, N = 13
SCIM3 Mean (SD)	16 (16.21)	17 (16.31)

N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Random number generation and concealed allocation following blocked randomisation. Each block of four participants had two allocated to the control group and two to the intervention group. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(No information on blinding of participants, carer or personnel, however, due to nature of intervention most likely not possible. One participant discontinued to receive an additional intervention (Hand Tutor) and was excluded from analysis. Based on deduction (as it is not made clear in the study) the participant appeared to be originally assigned to the intervention group.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(1/14 (7.1%) and 1/14 (7.1%) of participants in the intervention and control groups, respectively dropped out of the study before the final assessment time-point. Their outcome data not included in the analysis. Loss to follow-up was balanced between groups and reasons for drop out unrelated to true value (hospital discharge, received additional intervention) so missingness unlikely depended on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(CUE, SCIM3 (high). Whilst the examiners were unaware of the experimental group assignment, the outcome for CUE is subjective in evaluating difficulty in performing determined upper limb tasks according to the participants' perception and SCIM3 could be influenced by knowledge of allocation as is a participant-reported measure by unblinded participants. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Published protocol. All relevant scales, time points and analysis results reported in the study.)*

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

CUE: capabilities of upper extremity questionnaire; N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision

Lozano-Quilis, 2014

Bibliographic Reference	Lozano-Quilis, Jose-Antonio; Gil-Gomez, Hermenegildo; Gil-Gomez, Jose-Antonio; Albiol-Perez, Sergio; Palacios-Navarro, Guillermo; Fardoun, Habib M; Mashat, Abdulfattah S; Virtual rehabilitation for multiple sclerosis using a kinect-based system: randomized controlled trial.; JMIR serious games; 2014; vol. 2 (no. 2); e12

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)
Study dates	Not reported.
Inclusion criteria	- Relapsing-remitting and secondary-progressive multiple sclerosis, - Men and women, - Aged 18 to 65 years, - Minimum score of 6 on every item within the domain of the Functional Independence Measure,

	- No need for assistive devices movement or at most a cane, - No cognitive impairments.
Exclusion criteria	- Presence of flare-up symptoms, - Unable to physically complete all rehabilitation sessions.
Patient characteristics	N=11 adults with relapsing-remitting and secondary-progressive multiple sclerosis - Virtual reality-based motor rehabilitation plus traditional physiotherapy: n=6 - Traditional physiotherapy: n=5 Age in years [Mean (SD)]: - Virtual reality-based motor rehabilitation plus traditional physiotherapy: 48.33 (10.82) - Traditional physiotherapy: 40.60 (9.24) Sex (M/F): - Virtual reality-based motor rehabilitation plus traditional physiotherapy: n=3/n=3 - Traditional physiotherapy: n=4/n=1 Time since diagnosis in years [Mean (SD)]: - Virtual reality-based motor rehabilitation plus traditional physiotherapy: 14.00 (12.69) - Traditional physiotherapy: 4.70 (3.11)

	Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Virtual reality-based motor rehabilitation plus traditional physiotherapy Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – exergaming and AR/VR Delivery setting: Neurorehabilitaiton service in a multiple sclerosis association Number/frequency of sessions: One session weekly totaling in ten sessions Duration: 10 weeks Practitioner(s): Therapist (not specified) Virtual rehabilitation was undertaken using the software and hardware of RemoviEM for motor rehabilitation exercise. The therapist chose the exercises for the participant and the system displays participant progress. The three motor rehabilitation exercises were TouchBall, TakeBall and StepBall with time limits for each activity and involved visual and audio cues. TouchBall focused on balance and weight transfer with lateral movements of the trunk with the participant sitting or standing while trying to touch virtual objects with hands before they disappear, using only the upper body. TakeBall focused on complete movements of upper limbs with coordination whereby virtual objects were to be moved from an initial to target position with both hands (from a sitting or standing position). StepBall focused on balance and weight transfer with lateral movements and monopodal load whereby virtual objects on the ground at either side of the participant were stepped on before they disappeared whilst virtual obstacles could appear between feet and the object. The start of the session involved instructions towards virtual interactions and goals as well as a countdown towards the exercise and at the end of the session there was a summary of results which the participant and therapist could view. Virtual rehabilitation ran for 15-minutes at the end of a 1-hour session. The first 45-minutes were dedicated to traditional therapy (as described in control group). **Control** Name: Traditional physiotherapy Protocol description: Control (standard rehabilitation care alone)

	Delivery setting: Neurorehabilitation service in a multiple sclerosis association Number/frequency of sessions: 1x session per week totaling 10 sessions Duration: 10 weeks Practitioner(s): Physiotherapist Participants received standard balance and gait rehabilitation exercises with sessions lasting 1-hour.
Duration of follow-up	Post-intervention (Time from baseline not reported)
Sources of funding	Not industry funded
Sample size	N=11 - Virtual reality-based motor rehabilitation plus traditional physiotherapy: n=6 - Traditional physiotherapy: n=5

AR: augmented reality; N/n: number of participants; SD: standard deviation; VR: virtual reality

Outcomes

Study timepoints

- Baseline
- Post-intervention (Time from baseline not reported)

Virtual reality-based motor rehabilitation plus traditional physiotherapy versus traditional physiotherapy: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by TBG - Polarity - Higher values are better

Gait as measured by 10MWT - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Virtual reality-based motor rehabilitation plus traditional physiotherapy, Post-intervention vs Baseline, N = 6	Traditional physiotherapy, Post-intervention vs Baseline, N = 5
TUG Mean (SD)	-2.37 (2.36)	-1.66 (3.46)
TBG Mean (SD)	0.84 (1.77)	1 (1.67)
10MWT Mean (SD)	-2.69 (4.3)	-2.14 (4.01)
BBS Mean (SD)	2.33 (4.28)	0.2 (4.33)

AR: augmented reality; BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait; TUG: timed up and go test; VR: virtual reality; 10MWT: 10 metre walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Randomisation was computer-generated using a basic random number generator. No information on allocation concealment provided. Unable to*

Section	Question	Answer
		determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and those delivering the intervention/comparator were likely aware of the allocations, however, there were no reasons to suggest deviations from intended interventions due to the trial context. A modified intention-to-treat analysis was likely used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcome data was not available for 1 participant who dropped out of the trial from the control arm (1/7, 17%) with no reason provided and therefore it is unclear whether missingness on outcome depended on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(The authors report that the trial is single blinded but do not provide any further details. Assessment of outcome could be influenced by knowledge of allocation, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on pre-specified analysis plan with authors stating that the trial was not pre-registered as there were no safety concerns.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Manzanares, 2021

Bibliographic Reference	Manzanares, Aaron; Camblor, Angel; Romero-Arenas, Salvador; Segado, Francisco; Gil-Arias, Alexander; Effect of a semi-immersive virtual reality navigation therapy on quality of life in persons with spinal cord injury.; Disability and rehabilitation. Assistive technology; 2021; 1-6

Study details

Country/ies where study was carried out	Spain
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Spinal cord injury with medullary lesion below T1, - Were beyond the early subacute phase, - Could begin exercising.
Exclusion criteria	Not reported
Patient characteristics	N=11 adults with spinal cord injury - Virtual reality navigation therapy plus standard rehabilitation programme: n=6 - Standard rehabilitation programme: n=5 Age in years [Mean (SD)]: - Virtual reality navigation therapy plus standard rehabilitation programme: 42.33 (10.72) - Standard rehabilitation programme: 42.40 (16.68)

	Sex (M/F): - Virtual reality navigation therapy plus standard rehabilitation programme: n=3/n=3 - Standard rehabilitation programme: n=4/n=1 Time since injury: Not reported Chronic neurological disorder category: Acquired spinal cord injury
Intervention(s)/control	**Intervention** Name: Virtual reality navigation therapy plus standard rehabilitation programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR Delivery setting: Rehabilitation hospital Number/frequency of sessions: 3x 40-minutes per week for intervention and 5x 2-hours per week for standard rehabilitation Duration: 6 weeks Practitioner(s): Primary researcher with PhD in sport sciences and expert in sailing Participants underwent semi-immersive virtual reality navigation therapy using an Interactive Rehabilitation Exercise system for 30- to 40-minutes per session. Participants sat in a real adapted boat and manipulated controls that were close to their hands as would be in a real boat. The VSail-Access simulation was projected on a screen ahead of them where they saw the front of the boat, the sail, sea and any land ahead such that a sailing environment was simulated. Weather conditions were controlled by the software. An initial familiarisation session was held with basic sailing exercises. In each therapy sessions there were three different routes with learning processes and training components

	towards navigation. Feedback was standardised and a teaching protocol was followed. Wind intensity could vary to increase intensity of the session (8 to 18 knots) which varied the heal and the intensity increased weekly. Alongside the intervention, participants underwent rehabilitation as per hospital protocol (details in control group). **Control** Name: Standard rehabilitation programme Protocol description: Control (standard rehabilitation care alone) Delivery setting: Rehabilitation hospital Number/frequency of sessions: 5x 2-hours per week Duration: 6 weeks Practitioner(s): Not reported Standard rehabilitation based on hospital protocol which ran for 2-hours per day and included physiotherapeutic exercise, strengthening and mobility work.
Duration of follow-up	Post-intervention (7 weeks from baseline)
Sources of funding	Not reported
Sample size	N=11 - Virtual reality navigation therapy plus standard rehabilitation programme: n=6 - Standard rehabilitation programme: n=5

AR: augmented reality; N/n: number of participants; PhD: doctor of philosophy; SD: standard deviation; T: thoracic; VR: virtual reality

Outcomes

Study timepoints

- Baseline

- Post-intervention (7 weeks from baseline)

Virtual reality navigation therapy plus standard rehabilitation programme versus standard rehabilitation programme: Gait and balance

Balance as measured by MFRT - Polarity - Higher values are better

Outcome	Virtual reality navigation therapy plus standard rehabilitation programme, Post-intervention vs Baseline, N = 6	Standard rehabilitation programme, Post-intervention vs Baseline, N = 5
MFRT Mean (SD)	4.05 (10.62)	1.5 (11.88)

AR: augmented reality; MFRT: modified functional reach test; N/n: number of participants; SD: standard deviation; VR: virtual reality

Virtual reality navigation therapy plus standard rehabilitation programme versus standard rehabilitation programme: Functioning

Functioning as measured by SCIM3 - Polarity - Higher values are better

Outcome	Virtual reality navigation therapy plus standard rehabilitation programme, Post-intervention vs Baseline, N = 6	Standard rehabilitation programme, Post-intervention vs Baseline, N = 5
SCIM3 Mean (SD)	2.33 (6.79)	-0.6 (3.33)

AR: augmented reality; N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision; SD: standard deviation; VR: virtual reality

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Purposive sampling with randomisation performed via website generator with no further information provided on allocation concealment. Any group differences (such as differences in gender ratios) at baseline were likely due to change due to low numbers.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of the allocations, however, there were no apparent deviations from intended interventions due to the trial context and likely intention-to-treat analysis used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(The study provides no information about follow-up numbers nor outcome data completeness.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(Outcome assessors were not reported to be blinded to allocation. Spinal Cord Independence Measure 3rd revision assessment (high): it is likely that assessment outcome could be influenced by knowledge of allocation as is a participant-reported measure by unblinded participants. Modified functional reach test (some concerns): Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Maranesi, 2022

Bibliographic Reference	Maranesi, Elvira; Casoni, Elisa; Baldoni, Renato; Barboni, Ilaria; Rinaldi, Nadia; Tramontana, Barbara; Amabili, Giulio; Benadduci, Marco; Barbarossa, Federico; Luzi, Riccardo; Di Donna, Valentina; Scendoni, Pietro; Pelliccioni, Giuseppe; Lattanzio, Fabrizia; Riccardi, Giovanni Renato; Bevilacqua, Roberta; The Effect of Non-Immersive Virtual Reality Exergames versus Traditional Physiotherapy in Parkinson's Disease Older Patients: Preliminary Results from a Randomized-Controlled Trial.; International journal of environmental research and public health; 2022; vol. 19 (no. 22)

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Age above 65 years, - Could give informed consent, - Hoen and Yahr scale between 1 and 3, - Functional ambulation category of 2 or higher, - Ranking scale score 3 or below, - Consistent medication for minimum of 1 month,

	- Did not have depression as defined by geriatric depression scale 5-items, - Mini-mental state examination of 24 or above.
Exclusion criteria	Not described in study, protocol described the following: - Enrolled in other studies, - Clinical dementia rating score of 3 or above, - Prior syncopal episodes, epilepsy and vertigo not controlled by medication, - Major autonomic system challenges, - Severe behavioural syndromes which were not treated with medication, - Other neurological diseases, - Severe systemic diseases with life expectancy less than 12 months, - Participants could not follow-up.
Patient characteristics	N=32 adults with Parkinson's disease - Non-immersive virtual reality exergame and traditional rehabilitation programme: n=16 - Traditional rehabilitation programme Age in years [Mean (SD)]: - Non-immersive virtual reality exergame and traditional rehabilitation programme: 72.7 (6.3) - Traditional rehabilitation programme: 75.5 (5.4) Sex (M/F):

	- Non-immersive virtual reality exergame and traditional rehabilitation programme: n=6/n=10 - Traditional rehabilitation programme: n=9/n=5 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=16 for non-immersive virtual reality exergame and traditional rehabilitation programme and n=14 for traditional rehabilitation programme).
Intervention(s)/control	**Intervention** Name: Non-immersive virtual reality exergame and traditional rehabilitation programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together, exergaming and AR/VR Delivery setting: Outpatient rehabilitation unit Number/frequency of sessions: 2x 50-minute sessions per week, totalling 10 sessions Duration: 5 weeks Practitioner(s): Physiotherapist Each session consisted of 30-minutes of traditional rehabilitation therapy (as described in the control arm) and 20-minutes of virtual reality exergaming using the Tymo system. Tymo was non-immersive and tailored to the individual based on ability. The participant stood on a platform in front of a screen and they controlled actions on the screen via their body movements. Physiotherapists decided whether games would be performed using one-dimension (antero-posterior or latero-lateral) or two-dimension (combining antero-posterior and latero-lateral) movements. Games involved movement to avoid obstacles, controlling the center of gravity in the game by body movement to collect a falling object, moving a ball on a plane with obstacles in order to reach a single point with the participant needing to move in all directions to control the ball on the plane. Some games involved a cognitive element.

	Control Name: Traditional rehabilitation programme Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient rehabilitation unit Number/frequency of sessions: 2x 50-minute sessions per week, totalling 10 sessions Duration: 5 weeks Practitioner(s): Physiotherapist Traditional rehabilitation session running for 50-minutes. This included breathing and relaxation, task-oriented exercises, walking with cues, stretching, static and dynamic balance training, flexibility exercises, unilateral and contralateral coordination exercises carried out both in bed as well as standing and using all limbs.
Duration of follow-up	Post-intervention (5 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=32 - Non-immersive virtual reality exergame and traditional rehabilitation programme: n=16 - Traditional rehabilitation programme: n=16

AR: augmented reality; N/n: number of participants; SD: standard deviation; VR: virtual reality

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)

Non-immersive virtual reality exergame and traditional rehabilitation programme versus traditional rehabilitation programme: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Outcome	Non-immersive virtual reality exergame and traditional rehabilitation programme, Post-intervention vs Baseline, N = 16	Traditional rehabilitation programme, Post-intervention vs Baseline, N = 14
TBG Mean (SD)	1.3 (1.6)	1.1 (1.06)

AR: augmented reality; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait; VR: virtual reality

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Single sequence randomisation performed by computer which generated a list of random numbers. The participant was assigned a number based on their order of inclusion in the study. No details on allocation concealment. It is mentioned that a different researcher performed randomisation to that who performed data analysis. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were aware of allocated interventions. There is no information on whether there were any deviations from the intended interventions. A modified intention-to-treat analysis was likely used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Missing outcome data for 2/16 (13%) of participants in the control arm with*

Section	Question	Answer
		reasons of loss to follow-up not reported and therefore unclear whether missingness in the outcome depended on true value.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-specified analysis plan through clinicaltrials.gov protocol; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Nilsagard, 2013

Bibliographic Reference	Nilsagard, Ylva E; Forsberg, Anette S; von Koch, Lena; Balance exercise for persons with multiple sclerosis using Wii games: a randomised, controlled multi-centre study.; Multiple sclerosis (Houndmills, Basingstoke, England); 2013; vol. 19 (no. 2); 209-16

Study details

Country/ies where study was carried out	Sweden
Study type	Randomised controlled trial (RCT)

Study dates	September 2010 - July 2011
Inclusion criteria	- Reported, subjectively perceived impaired balance function in standing or walking activities, - Ability to walk 100 metres without resting,
Exclusion criteria	- Cognitive or linguistic problems with understanding instructions or filling in self-administered outcome measures, - Ongoing exacerbation of multiple sclerosis, - Other disease interfering with either intervention or testing procedures, - Weight lower than 140 kilograms (due to manufacturer restrictions).
Patient characteristics	N=44 adults with multiple sclerosis - Exergame-based balance exercises (Nintendo Wii): n=42 - Waitlist control: n=42 Age in years [Mean (SD)]: - Exergame-based balance exercises (Nintendo Wii): 50.0 (11.5) - Waitlist control: 49.4 (11.1) Sex (M/F): - Exergame-based balance exercises (Nintendo Wii): n=10/n=32 - Waitlist control: n=10/n=32 Time since diagnosis in years [Mean (SD)]:

	- Exergame-based balance exercises (Nintendo Wii): 12.5 (8.0) - Waitlist control: 12.2 (9.2) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Exergame-based balance exercises (Nintendo Wii) Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Individual sessions (setting not reported) Number/frequency of sessions: 2x 30-minute sessions per week, totalling 12 sessions Duration: 6-7 weeks Practitioner(s): Physiotherapist. Supervised sessions of balance exercise using Nintendo Wii Fit Plus® with Wii Balance Board®. The exercises in the programme were controlled using centre of balance on the board. Participants started sessions with easier exercises and were encouraged by physiotherapists to progress to more difficult exercises where possible or after 'completing' a level. Participants were not allowed to receive physiotherapy targeting imbalance prior to or during the study, but no other restrictions in activity were made. **Control** Name: Waitlist control. Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable

	Practitioner(s): Not applicable No further details reported.
Duration of follow-up	Post-intervention (6-7 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=44 - Exergame-based balance exercises (Nintendo Wii): n=42 - Waitlist control: n=42

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6-7 weeks from baseline)

Exergame-based balance exercises (Nintendo Wii) versus waitlist control: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by DGI - Polarity - Higher values are better

Gait and balance as measured by FSST - Polarity - Lower values are better

Gait as measured by T25FWT - Polarity - Higher values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Outcome	Exergame-based balance exercises (Nintendo Wii), Post-intervention vs Baseline, N = 41	Waitlist control, Post-intervention vs Baseline, N = 39
TUG Mean (SD)	-0.8 (2.4)	0.1 (2.1)
DGI Mean (SD)	1.78 (2.3)	1 (2)
FSST Mean (SD)	-1.6 (2.1)	-2 (6.6)
T25FWT Mean (SD)	-0.3 (1.1)	0 (1.4)
MSWS-12 Mean (SD)	-5.9 (11.5)	-3.95 (18.1)

DGI: dynamic gait index scoring form; FSST: four-square step test; ft/s: feet per second; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; T25FWT: timed 25 foot walk test

Exergame-based balance exercises (Nintendo Wii) versus waitlist control: Exercise capacity

Gait and balance as measured by 10XSST - Polarity - Lower values are better

Outcome	Exergame-based balance exercises (Nintendo Wii), Post-intervention vs Baseline, N = 41	Waitlist control, Post-intervention vs Baseline, N = 39
10XSST Mean (SD)	-3.2 (7.9)	-2.2 (6.7)

N/n: number of participants; SD: standard deviation; 10XSST: 10-repetition sit-to-stand test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Adequate randomisation and concealment methods reported (computer generated/sealed envelopes) and the groups appear similar at baseline (although significance testing is not reported).)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(The authors report that a number of participants in the control group (no exercise) expressed disappointment regarding being assigned to this group, and that this group "... reported twice the frequency of unsupervised exercise during the study period compared with the balance exercise group." page 214)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(No information regarding the extent of missing data or methods to control for this.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Measurement of outcomes was appropriate and unlikely to have differed by group, and outcome assessors were blinded to group allocation.)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Novotna, 2019

Bibliographic Reference	Novotna, K.; Janatova, M.; Hana, K.; Svestkova, O.; Preiningerova Lizrova, J.; Kubala Havrdova, E.; Biofeedback Based Home Balance Training can Improve Balance but Not Gait in People with Multiple Sclerosis; Multiple Sclerosis International; 2019; vol. 2019; 2854130

Study details

Country/ies where study was carried out	Czech Republic
Study type	Randomised controlled trial (RCT)
Study dates	January 2016 - May 2017
Inclusion criteria	- Multiple sclerosis defined according to McDonald criteria, - Reported subjective perceived imbalance or history of falls (in the last year), - Clinically stable, without relapse or deterioration in the previous three months,

	- Aged 18–60 years, - Ability to walk with or without a walking aid for at least 5 metres (Expanded Disability Status Scale 1 to 7), - Ability to maintain a standing position for at least 10-minutes, - Able to perform exercise (assessed by physiotherapist).
Exclusion criteria	- Inpatient rehabilitation programme during previous 3 months, - Orthopaedic problems or other conditions affecting balance and gait performance, - Blurred vision, - Severe cognitive impairment or psychiatric disorders, - Pregnancy, - Weight over 150 kg (to be able to use the exercise platform), - Currently receiving physiotherapy targeting balance problems, - Changes in lifestyle prior to or during the study.
Patient characteristics	N=39 adults with multiple sclerosis - Tailored home-based balance exercise: n=23 - Waitlist control: n=16 Age in years [Mean (SD)]: - Tailored balance exercise programme: 39.39 (9.68) - Waitlist control: 42.56 (10.63)

	Sex (M/F): - Tailored balance exercise programme: n=6/n=17 - Waitlist control: n=4/n=12 Time since diagnosis in years [Mean (SD)]: - Tailored balance exercise programme: 14.95 (8.59) - Waitlist control: 14.5 (9.88) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Tailored balance exercise programme Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises. Delivery setting: Community (participant's home). Number/frequency of sessions: Participants instructed to complete at least 15-minutes training every day (total estimated to be 7 hours). Duration: 4 weeks Practitioner(s): Initially supervised by a physiotherapist however the majority of the programme is participant led. Interactive home-based balance exercise training (Homebalance) with audio and visual feedback. The programme consists of two therapeutic games, one focusing on positioning and directional control, and a second focusing on stability (in combination with cognitive training (remembering sequences) During the first session, a physiotherapist instructed participants how to perform the exercises whilst maintaining the correct upright position. The programme was tailored to the participants balance impairment and needs.

	Control Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s): Not applicable No further details reported.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=39 - Tailored balance exercise programme: n=23 - Waitlist control: n=16

kg: kilograms; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Tailored balance exercise programme versus waitlist control: Gait and balance

Gait and balance as measured by Mini-BESTest - Polarity - Higher values are better

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Tailored balance exercise programme, Post-intervention vs Baseline, N = 23	Waitlist control, Post-intervention vs Baseline, N = 16
Mini-BESTest Mean (SD)	1.13 (4.23)	0.81 (3.42)
TUG Mean (SD)	-0.62 (7.72)	-0.45 (3.89)
MSWS-12 Mean (SD)	-1.61 (11.79)	3.44 (10.58)
BBS Mean (SD)	1.87 (6.45)	0.69 (4.1)

BBS: Berg balance scale; MiniBESTest: mini balance evaluation systems test; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SD: standard deviation; TUG: Timed up and go

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No details on randomisation or concealment methods are reported, and although the groups appear similar at baseline, no details or values from*

Section	Question	Answer
		significance testing are reported (it is only reported narratively that there were no significant differences in balance and gait parameters).)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(No information regarding possible deviations (although it is unlikely that any arose due to the experimental context), and no information regarding analysis approach.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(No information regarding extent of missing data or methods used to control for this.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(All measures validated and commonly used tools. MSWS-12 (high): Likely that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by unblinded participants and control is not an active intervention. BBS, TUG, mini BESTest (some concerns): Outcome assessors were not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Palamara, 2017

Bibliographic Reference	Palamara, Grazia; Gotti, Francesco; Maestri, Roberto; Bera, Rossana; Gargantini, Roberto; Bossio, Fabiola; Zivi, Ilaria; Volpe, Daniele; Ferrazzoli, Davide; Frazzitta, Giuseppe; Land Plus Aquatic Therapy Versus Land-Based Rehabilitation Alone for the Treatment of Balance Dysfunction in Parkinson Disease: A Randomized Controlled Study With 6-Month Follow-Up.; Archives of physical medicine and rehabilitation; 2017; vol. 98 (no. 6); 1077-1085

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	September 2014 - December 2014
Inclusion criteria	- Parkinson’s disease diangosis, - Hoehn and Yahr stage 2.5 to 3, - Consistent medication for eight weeks prior to enrolment and during hospitalisation, - Mini-Mental State Examination score of 24 or above.
Exclusion criteria	- Cardiac and pulmonary diseases, - Urinary incontinence, - Deep brain stimulation treatment.
Patient characteristics	N=34 adults with Parkinson’s disease - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: n=17 - Multidisciplinary intensive rehabilitation treatment: n=17

	Age in years [Mean (SD)]: - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: 70.9 (5.7) - Multidisciplinary intensive rehabilitation treatment: 70.8 (5.3) Sex (M/F): - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: n=9/n=8 - Multidisciplinary intensive rehabilitation treatment: n=11/n=6 Time since diagnosis in months [Mean (SD)]: Not reported, number of days in hospital at baseline [Mean (SD)]: - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: 35.9 (7.3) - Multidisciplinary intensive rehabilitation treatment: 34.5 (3.3) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Aquatic therapy plus multidisciplinary intensive rehabilitation treatment Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy Delivery setting: Inpatient, neurorehabilitation ward of general hospital Number/frequency of sessions: 3x 60-minutes (maximum) per week of aquatic therapy on alternate days + 3-4x 60-minute daily sessions of physical therapy for 5 days and 60-minutes of physical exercise on day 6 Duration: 4 weeks

	Practitioner(s): Physiotherapist specialised in aquatic therapy and multidisciplinary team (physical therapist, occupational therapist, speech therapist, neuropsychologist) Aquatic therapy programme in addition to multidisciplinary intensive rehabilitation treatment as described in the control group below. The aquatic therapy programme involved aerobic exercises and physical activities to assist with balance, motor skills, coordination and joint mobility which ran for up to 1-hour. Sessions consisted of 10-minutes of warm up exercises, 30- to 45-minutes of central session training (trunk mobility exercises, static and dynamic exercises, both involving floating devices, and balance training) and 5-minutes of cooldown. The "shaping" principle was used to increase the challenge of the exercise programme every week. On the days where the aquatic therapy training occurred, the first session of multidisciplinary intensive rehabilitation treatment was not administered such that time and dose were equal in both groups. **Control** Name: Multidisciplinary intensive rehabilitation treatment Protocol descrption: Control (standard rehabilitation care alone) Delivery setting: Inpatient, neurorehabilitation ward general hospital Number/frequency of sessions: 4x 60-minute daily sessions of physical therapy for 5 days and 60-minutes of physical exercise on day 6 Duration: 4 weeks Practitioner(s): Multidisciplinary team (physical therapist, occupational therapist, speech therapist, neuropsychologist) Multidisciplinary intensive rehabilitation treatment was tailored towards inpatients with Parkinson’s disease whereby sessions were 1-hour in length and land based. Individual initial session with physical therapist involved cardiovascular warmup, relaxation, muscle-stretching exercises and exercises for abdominal muscles and posture. The next sessions involved aerobic exercise (70 to 80% intensity of heart rate reserve plus resting rate) aimed to assist balance and gait. This involved using a stabilometric platform with visual cues, treadmill plus (with visual and auditory cues), a form of cross-trainer and cycloergometer. The third session was aimed towards occupational therapy and the fourth was speech therapy. On the sixth day, participants underwent training only with devices (not specified) for 1-hour. The programme was tailored to the individual and sometimes involved robotic-assisted walking training where there was complexity in gait disorders such as freezing and could also involve virtual reality training and meeting with neuropsychologist.
Duration of follow-up	6 months follow-up (7 months from baseline)

Sources of funding	Not reported
Sample size	N=34 - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment: n=17 - Multidisciplinary intensive rehabilitation treatment: n=17
Other information	As part of the multi-disciplinary intensive rehabilitation treatment received by both groups (inpatients with Parkinson's disease), the programme was tailored to the individual and sometimes involved robotic-assisted walking training where there was complexity in gait disorders such as freezing and could also involve virtual reality training and meeting with neuropsychologist.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)
- 6 months follow-up (7 months from baseline)

Aquatic therapy plus multidisciplinary intensive rehabilitation treatment versus multidisciplinary intensive rehabilitation treatment: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Aquatic therapy plus multidisciplinary intensive rehabilitation treatment, Post-intervention vs Baseline, N = 17	Aquatic therapy plus multidisciplinary intensive rehabilitation treatment, 6 months follow-up vs Baseline, N = 17	Multidisciplinary intensive rehabilitation treatment, Post-intervention vs Baseline, N = 17	Multidisciplinary intensive rehabilitation treatment, 6 months follow-up vs Baseline, N = 17
TUG Mean (SD)	-3.4 (3.05)	-1.4 (3.01)	-2.4 (2.51)	0.8 (3.06)
BBS Mean (SD)	7.8 (4.79)	5.4 (5.11)	7.3 (2.92)	1.4 (3.11)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Aquatic therapy plus multidisciplinary intensive rehabilitation treatment versus multidisciplinary intensive rehabilitation treatment: Limb/joint/muscle function

Motor functioning as measured per UPDRS III - Polarity - Lower values are better

Outcome	Aquatic therapy plus multidisciplinary intensive rehabilitation treatment, Post-intervention vs Baseline, N = 17	Aquatic therapy plus multidisciplinary intensive rehabilitation treatment, 6 months follow-up vs Baseline, N = 17	Multidisciplinary intensive rehabilitation treatment, Post-intervention vs Baseline, N = 17	Multidisciplinary intensive rehabilitation treatment, 6 months follow-up vs Baseline, N = 17
UPDRS III Mean (SD)	-6 (3.6)	-0.3 (4)	-7 (5.02)	-1.4 (4.83)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation with computer generated list of random numbers and allocation was concealed until assignment with investigators and assessors blind to allocation. No statistically significant differences between characteristics of both groups at baseline.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and practitioners were aware of the interventions and no deviations arising from the experimental context were apparent. Intention-to-treat analysis was likely used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Paul, 2019

Bibliographic Reference	Paul, Lorna; Renfrew, Linda; Freeman, Jennifer; Murray, Heather; Weller, Belinda; Mattison, Paul; McConnachie, Alex; Heggie, Robert; Wu, Olivia; Coulter, Elaine H; Web-based physiotherapy for people affected by multiple sclerosis: a single blind, randomized controlled feasibility study.; Clinical rehabilitation; 2019; vol. 33 (no. 3); 473-484

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	June 2015 - May 2016
Inclusion criteria	- Confirmed diagnosis of multiple sclerosis, - Expanded Disability Disease Steps of 4.0-6.5, - Access to a personal computer/tablet with an email address and internet connection.
Exclusion criteria	- Currently taking part in regular exercise (≥ two times/week) and/or regular physiotherapy programme, - Poor cognitive function (Mini-Mental State Examination Score <24), - Any significant change in medication or a relapse within the previous 3 months, - Other significant co-morbidities for which exercise would be contra-indicated, - Currently participating in another clinical trial.
Patient characteristics	N=90 adults with multiple sclerosis - Web-based individualised physiotherapy programme: n=45 - Physiotherapy exercise information sheet: n=45

	Age in years [Mean (SD)]: - Web-based individualised physiotherapy programme: 55.6 (10.2) - Physiotherapy exercise information sheet: 56.5 (9.1) Sex (M/F): - Web-based individualised physiotherapy programme: n=13/n=32 - Physiotherapy exercise information sheet: n=8/n=37 Time since diagnosis in years [Mean (SD) not reported] [Median (IQR)]: - Web-based individualised physiotherapy programme: 10 (6 to 18) - Physiotherapy exercise information sheet: 15 (10 to 23) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Web-based individualised physiotherapy programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes Delivery setting: Multiple sclerosis outpatient centres Number/frequency of sessions: Tailored according to exercise diaries every 2 weeks Duration: 6 months Practitioner(s): Physiotherapist

	Participants received a personalised exercise programme via www.webbasedphysio.com. These programmes included cardiovascular, strengthening, and balance exercises, along with warm-up, cool-down, and stretching exercises at varying difficulty levels, tailored to each participant's needs. The website provided exercises through videos, text, and audio descriptions, along with disease-specific advice and education. During the intervention, a physiotherapist reviewed electronic exercise diaries every two weeks and remotely adjusted the programmes based on participant feedback, which could involve modifying exercises, difficulty levels, or repetitions/sets. Participants were notified of any changes by email. **Control** Name: Physiotherapy exercise information sheet Protocol description: Control (standard rehabilitation care alone) Delivery setting: Multiple Sclerosis outpatient centres Number/frequency of sessions: Not applicable Duration: Not applicable Practitioner(s): Not applicable Participants were provided with a printed exercise sheet from www.physiotherapyexercises.com. The programmes included exercises similar to those in the intervention group. Participants filled out a paper-based exercise diary, which they mailed to the research team every 3 months.
Duration of follow-up	3 months follow-up (9 months from baseline)
Sources of funding	Not industry funded
Sample size	N=90 - Web-based individualised physiotherapy programme: n=45 - Physiotherapy exercise information sheet: n=45
Other information	Outcomes also reported at 3 months but not extracted as intervention not completed.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6 months from baseline)
- 3 months follow-up (9 months from baseline)

Web-based individualised physiotherapy programme versus physiotherapy exercise information sheet: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Web-based individualised physiotherapy programme, Post-intervention vs Baseline, N = 33	Web-based individualised physiotherapy programme, 3 months follow-up vs Baseline, N = 34	Physiotherapy exercise information sheet, Post-intervention vs Baseline, N = 37	Physiotherapy exercise information sheet, 3 months follow-up vs Baseline, N = 36
TUG Mean (SD)	-0.33 (3.39)	-1.43 (5.11)	-0.15 (4.2)	-1.2 (6.03)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Web-based individualised physiotherapy programme versus physiotherapy exercise information sheet: Gait and balance

Gait as measured by T25FWT - Polarity - Higher values are better

Outcome	Web-based individualised physiotherapy programme, Post-intervention vs Baseline, N = 28	Web-based individualised physiotherapy programme, 3 months follow-up vs Baseline, N = 27	Physiotherapy exercise information sheet, Post-intervention vs Baseline, N = 28	Physiotherapy exercise information sheet, 3 months follow-up vs Baseline, N = 32
T25FWT Mean (SD)	-0.06 (0.62)	-0.03 (0.53)	0.12 (1.43)	0.13 (0.8)

ft/s: feet per second; N/n: number of participants; SD: standard deviation; T25FWT: timed 25 foot walk test

Web-based individualised physiotherapy programme versus physiotherapy exercise information sheet: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Web-based individualised physiotherapy programme, Post-intervention vs Baseline, N = 37	Web-based individualised physiotherapy programme, 3 months follow-up vs Baseline, N = 36	Physiotherapy exercise information sheet, Post-intervention vs Baseline, N = 39	Physiotherapy exercise information sheet, 3 months follow-up vs Baseline, N = 36
BBS Mean (SD)	0.81 (6.31)	0.41 (6.86)	1.86 (6.74)	3.75 (6.69)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation

Web-based individualised physiotherapy programme versus physiotherapy exercise information sheet: Exercise capacity

Exercise capacity as measured by 2MWT - Polarity - Higher values are better

Outcome	Web-based individualised physiotherapy programme, Post-intervention vs Baseline, N = 37	Web-based individualised physiotherapy programme, 3 months follow-up vs Baseline, N = 35	Physiotherapy exercise information sheet, Post-intervention vs Baseline, N = 39	Physiotherapy exercise information sheet, 3 months follow-up vs Baseline, N = 36
2MWT Mean (SD)	0.77 (15.12)	-2.61 (16.19)	3.32 (19.48)	5.05 (20.43)

N/n: number of participants; SD: standard deviation; 2MWT: 2 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Remote, telephone automated randomisation system within the Glasgow Clinical Trials Unit. No details on allocation concealment provided. Characteristics balanced at baseline.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of interventions allocated And 1/45 (2.22%) of participants in the control group received the intervention intended for the intervention group. Intention-to-treat analyses were used and this participant was analysed in the comparator group.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Loss to follow-up occurred for 11/45 (24.4%) and 9/45 (20%) of participants in respective intervention and control groups for gait and balance outcome measured by TUG at the final assessment time-point; 18/45 (40%) and 13/45 (28.9%) of participants in respective intervention and control groups for gait and balance outcome measured by T25FWT at the final assessment time-point; 9/45 (20%) and 9/45 (20%) of participants in respective intervention and control groups for balance measured by BBS at the final assessment time-*

Section	Question	Answer
		point; 10/45 (22.2%) and 9/45 (20%) of participants in respective intervention and control groups for exercise capacity as measured by 2MWT at the final assessment time-point. All results were biased by missing data. There is no information on whether the missing data depends on the true value.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation..)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; TUG: timed up and go test; T25FWT: timed 25 foot walk test; 2MWT: 2 minute walk test

Pavlikova, 2020

Bibliographic Reference	Pavlikova, M; Cattaneo, D; Jonsdottir, J; Gervasoni, E; Stetkarova, I; Angelova, G; Markova, M; Prochazkova, M; Prokopiusova, T; Hruskova, N; Reznickova, J; Zimova, D; Spanhelova, S; Rasova, K; The impact of balance specific physiotherapy, intensity of therapy and disability on static and dynamic balance in people with multiple sclerosis: A multi-center prospective study.; Multiple sclerosis and related disorders; 2020; vol. 40; 101974

Study details

Country/ies where study was carried out	Czech Republic and Italy
Study type	Randomised controlled trial (RCT)
Study dates	March 2011 - October 2014
Inclusion criteria	- Multiple sclerosis diagnosed using McDonald criteria, - Stable clinical status in the preceding 3 months, - Ability to walk for 6 metres (with or without an assistive device), - Ability to maintain a standing position with open eyes for at least 30 seconds, - Ability to maintain single leg standing position for 10 seconds, - Sufficient cognitive ability (based on clinical judgement) to understand and execute instructions given by the therapist.
Exclusion criteria	Not reported

Patient characteristics	N=178 adults with multiple sclerosis
	- Balance specific physiotherapy
	  - Sensory-motor integration training: n=79
	  - Motor programme activating therapy: n=35
	- Non-balance specific physiotherapy:
	  - Conventional dynamic strengthening exercises: n=40
	  - Vojta reflex locomotion: n=24
	
	Age in years [Mean (SD) not reported] [Median (IQR)]:

	- Italian cohort (inpatient): 45.5 (14.5) - Italian cohort (outpatient): 48.9 (16.9) - Czech cohort (outpatient): 45.5 (19.0) Sex (M/F): - Italian cohort (inpatient): n=12/n=30 - Italian cohort (outpatient): n=21/n=36 - Czech cohort (outpatient): n=18/n=39 Time since diagnosis in years [Mean (SD) not reported] [Median (IQR[1])]: - Italian cohort (inpatient): 14.9 (10.0) - Italian cohort (outpatient): 13.9 (12.0) - Czech cohort (outpatient): 12.0 (8.5) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics not reported by intervention group. [1] IQR reported as 1 number
Intervention(s)/control	**Intervention** Name: Balance specific physiotherapy (Sensory-motor integration training or motor programme activating therapy) Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Inpatient and outpatient

	Number/frequency of sessions: 20 sessions. Details on length of each session not reported Duration: Programme delivered across 20 consecutive days for inpatients, and 2 months for outpatients Practitioner(s): Not reported The experimental interventions included at least 25-minutes of balance specific treatment aimed at improving the participant's control of position and movement of the centre of mass and body segments during static, dynamic and transitional tasks. In Italy both inpatient and outpatient cohorts received Sensory-motor Integration Training focusing on motor/skill acquisition; and balance exercises are conducted under different sensory contexts oriented to the task execution. In the Czech Republic (outpatient only), participants received Motor Programme Activating Therapy. In this programme, exercises were conducted using a variety of somatosensory stimuli (mainly proprioceptive, but also tactile, visual, auditory) in different functionally centred initial postural positions (such as sitting, standing) to foster responses (such as standing up or walking). **Control** Name: Non-balance specific physiotherapy (Conventional dynamic strengthening exercises or Vojta reflex locomotion) Protocol description: Control (standard rehabilitation care alone) Delivery setting: Inpatient and outpatient Number/frequency of sessions: 20 sessions. Details on length of each session are not reported Duration: Programme delivered across 20 consecutive days for inpatients, and two months for outpatients Practitioner(s): Not reported The goal of these programmes was to reduce functional limitation but specific treatment of balance was restricted to a maximum of 10-minutes per session. In Italy, participants (inpatient and outpatient) received sessions comprised of conventional exercises, such as stretching, core stability and light strengthening exercises. In the Czech Republic (outpatient only) participants received Vojta reflex locomotion treatment. This programme focused on the activation of global locomotion patterns by stimulating specific zones, with participants placed in a precisely

	determined initial position. The goal was to activate the involuntary responses of muscle function necessary for spontaneous movements.
Duration of follow-up	Post-intervention (Time from baseline not reported)
Sources of funding	Not industry funded
Sample size	N=178 - Balance specific physiotherapy (Sensory-motor integration training): n=79 - Balance specific physiotherapy (Motor programme activating therapy): n=35 - Non-balance specific physiotherapy (Conventional dynamic strengthening exercises): n=40 - Non-balance specific physiotherapy (Vojta reflex locomotion): n=24

IQR: interquartile range; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (Time from baseline not reported)

Balance specific physiotherapy (sensory-motor integration training or motor programme activating therapy) versus non-balance specific physiotherapy (conventional dynamic strengthening exercises or Vojta reflex locomotion): Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Balance specific physiotherapy (Sensory-motor integration training), Post-intervention, N = 30	Balance specific physiotherapy (Motor programme activating therapy), Post-intervention, N = 20	Non-balance specific physiotherapy (Conventional dynamic strengthening exercises), Post-intervention, N = 18	Non-balance specific physiotherapy (Vojta reflex locomotion), Post-intervention, N = 23
TUG Median (IQR, reported as 1 value)	-0.1 (4.8)	-1 (3.4)	-0.2 (3)	-0.7 (2.6)

IQR: interquartile range; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Balance specific physiotherapy (sensory-motor integration training or motor programme activating therapy) versus non-balance specific physiotherapy (conventional dynamic strengthening exercises or Vojta reflex locomotion): Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Balance specific physiotherapy (Sensory-motor integration training), Post-intervention vs Baseline, N = 67	Balance specific physiotherapy (Motor programme activating therapy), Post-intervention vs Baseline, N = 26	Non-balance specific physiotherapy (Conventional dynamic strengthening exercises), Post-intervention vs Baseline, N = 32	Non-balance specific physiotherapy (Vojta reflex locomotion), Post-intervention vs Baseline, N = 23
BBS Mean (SD)	3.92 (5.23)	1.6 (3.8)	1.1 (4.35)	1.8 (6.3)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Although an adequate randomisation and concealment method was used (externally held random number table), it is not clear whether there were any imbalances between intervention groups at baseline as the significance testing reported appears to relate to the differences between the Italian and Czech centres.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although it is unlikely that participants and personnel were blinded to allocation status, and deviations from the intended interventions are not discussed specifically it is unlikely that these arose or that this would have happened due to the experimental context; authors state that data were analysed using an intention-to treat-approach.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(There were high levels of missing data in pre-treatment timed-up-and-go measurements (n=31). As the majority of this data came from the Italian inpatient cohort they were excluded from the final analysis.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-planned analysis reported and all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Pazzaglia, 2020

Bibliographic Reference	Pazzaglia, C; Imbimbo, I; Tranchita, E; Minganti, C; Ricciardi, D; Lo Monaco, R; Parisi, A; Padua, L; Comparison of virtual reality rehabilitation and conventional rehabilitation in Parkinson's disease: a randomised controlled trial.; Physiotherapy; 2020; vol. 106; 36-42

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	June 2016 to not reported
Inclusion criteria	- Diagnosed with Parkinson’s disease based on the Gelb criteria, - Able to undergo the rehabilitation programme with low chance of falling, - Could undergo motor rehabilitation without assistance, - No cognitive impairment as indicated by Mini-Mental State Examination score over 25, - Consistent medication for Parkinson’s disease during the rehabilitation programme.
Exclusion criteria	- Substantial hearing loss and/or visual impairment,

	- Major comorbidities which would prevent rehabilitation such as postural hypotension, heart disease, stroke, severe shoulder–hip disease.
Patient characteristics	N=51 adults with Parkinson's disease - Virtual reality-based rehabilitation programme: n=25 - Conventional rehabilitation programme: n=26 Age in years [Mean (SD)]: - Virtual reality-based rehabilitation programme: 72 (7) - Conventional rehabilitation programme: 70 (10) Sex (M/F): - Virtual reality-based rehabilitation programme: n=18/n=7 - Conventional rehabilitation programme: n=17/n=9 Time since diagnosis in months [Mean (SD)]: - Virtual reality-based rehabilitation programme: 89 (92) - Conventional rehabilitation programme: 57 (53) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Virtual reality-based rehabilitation programme

	Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR Delivery setting: Outpatient Number/frequency of sessions: 3x 40-minute sessions per week Duration: 6 weeks Practitioner(s): Not reported Virtual reality sessions ran for 40-minutes. This involved equipment for motion analysis and NIRVANA (BTS Spa). The participant stood in front of a screen and interacted through movement. These involved seven exercises with the participant in the middle of the room performing a task. Each task was four minutes long followed by a 1-minute rest period. Exercises involved touching and moving a trumpet across a screen, touching a rose with sequencing and distancing varying as decided by physical therapist, leading a dog to four corners of the wall screen (free movement by the participant), touching eggs randomly projected onto the screen, touching unannounced moles that appeared from a hole in the ground, motor task balancing between two lateral bars without touching the bars (indicated by a sound if touched), quickly clearing leaves appearing on the wall screen. **Control** Name: Conventional rehabilitation programme Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient Number/frequency of sessions: 3x 40-minute sessions per week Duration: 6 weeks Practitioner(s): Not reported Standard rehabilitation programme based on KNGF guidelines for physical therapy in Parkinson's disease. Sessions ran for 40-minutes and comprised warm-up with passive movements and muscular strengthening of lower limbs, active phase involving motor coordination with upper and lower limbs, balance training, start and stop exercises and walking training which could be performed both standing and seated and seated cool-down which involved manipulation, mobilisation and respiratory exercises.

Duration of follow-up	Post-intervention (6 weeks from baseline)
Sources of funding	Partial industry funding (BTS Spa, Garbagnate Milanese, Milan, Italy)
Sample size	N=51 - Virtual reality-based rehabilitation programme: n=25 - Conventional rehabilitation programme: n=26
Other information	The study reported that BTS Bioengineering contributed partial funding for the first author and supplied the virtual reality equipment, but had no involvement in study design, collection, analysis and interpretation of data, writing the report and in the decision to submit the article for publication.

AR: augmented reality; KNGF: Royal Dutch Society for Physical Therapy; N/n: number of participants; SD: standard deviation; VR: virtual reality

Outcomes

Study timepoints

- Baseline
- Post-intervention (6 weeks from baseline)

Virtual reality-based rehabilitation programme versus conventional rehabilitation programme: Gait and balance

Gait and balance as measured by DGI - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Virtual reality-based rehabilitation programme, Post-intervention vs Baseline, N = 25	Conventional rehabilitation programme, Post-intervention vs Baseline, N = 26
DGI Mean (SD)	1.6 (2.3)	-0.2 (2.72)
BBS Mean (SD)	3.6 (5.57)	0.8 (5.2)

AR: augmented reality; BBS: Berg balance scale; DGI: dynamic gait index scoring form; N/n: number of participants; SD: standard deviation; VR: virtual reality

Virtual reality-based rehabilitation programme versus conventional rehabilitation programme: Limb/joint/muscle function

Upper limb function as measured by DASH - Polarity - Lower values are better

Outcome	Virtual reality-based rehabilitation programme, Post-intervention vs Baseline, N = 25	Conventional rehabilitation programme, Post-intervention vs Baseline, N = 26
DASH Mean (SD)	-7.9 (13.93)	-5.2 (9.04)

AR: augmented reality; DASH: disabilities of the arm, shoulder and hand; N/n: number of participants; SD: standard deviation; VR: virtual reality

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Block randomisation was performed by a researcher not involved in enrolment. No statistical differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and practitioners were aware of the interventions. No information about deviations arising from the experimental context, however, modified intention-to-treat analysis was likely used)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(The study provides no information about follow-up numbers nor outcome data completeness. The supplementary document led to an error page and there was no information in text as to what the contents of this might have been (for example, flow chart).)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(Disabilities of the arm, shoulder and hand (high risk): Outcome assessors were not blinded to allocation. Likely that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by unblinded participants. Same time points and measurement tools used.* *Berg balance scale and dynamic gait index (some concerns): Outcome assessors were not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Berg balance scale - risk of bias overall rating of some concerns, dynamic gait index - risk of bias overall rating of some concerns, disabilities of the arm, shoulder and hand scale - risk of bias overall rating of high.

Pelosin, 2017

Bibliographic Reference	Pelosin, Elisa; Avanzino, Laura; Barella, Roberta; Bet, Cristina; Magioncalda, Elisabetta; Trompetto, Carlo; Ruggeri, Piero; Casaleggio, Mauro; Abbruzzese, Giovanni; Treadmill training frequency influences walking improvement in subjects with Parkinson's disease: a randomized pilot study.; European journal of physical and rehabilitation medicine; 2017; vol. 53 (no. 2); 201-208

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosed with idiopathic Parkinson’s disease based on the United Kingdom Parkinson's Disease Society Brain Bank criteria, - Hoehn and Yahr stage 1 to 2.5, - Consistency in medication for minimum 3 months, - Can walk without aid for 6-minutes.
Exclusion criteria	- Previous neurological conditions other than Parkinson’s disease,

	- Having had deep brain stimulation, - Any freezing of gait, - Mini-Mental State Examination score over 24, - Cardiovascular conditions, - Orthopedic conditions that limit exercise training.
Patient characteristics	N=30 adults with idiopathic Parkinson's disease - High-frequency treadmill training: n=10 - Intermediate-frequency treadmill training: n=10 - Low-frequency treadmill training: n=10 Age in years [Mean (SD)]: - Low-frequency treadmill training: 73.1 (6.8) - Intermediate-frequency treadmill training: 73.7 (8.3) - High-frequency treadmill training: 69.9 (4.5) Sex: Not reported Time since diagnosis in years [Mean (SD)]: - Low-frequency treadmill training: 9.8 (3.3) - Intermediate-frequency treadmill training: 9.9 (4.5) - High-frequency treadmill training: 9.8 (2.6)

	Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: High-frequency treadmill training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Outpatients clinic Number/frequency of sessions: 5x 45-minute sessions per week Duration: 10 sessions, number of weeks not reported Practitioner(s): Not reported Identical protocol for each frequency group apart from frequency: 45-minute sessions with initial treadmill speed to 90% of overground comfortable walking speed with increase of 5%every two sessions to reach the target 115% for the final two training sessions. Name: Intermediate-frequency treadmill training Protocol intervention group: Rehabilitation interventions to address mobility– Gait training Delivery setting: Outpatients clinic Number/frequency of sessions: 3x 45-minute sessions per week Duration: 10 sessions, number of weeks not reported Practitioner(s): Not reported As described above, with alternate frequency.

	Control Name: Low-frequency treadmill training Protocol description: Same intervention (different frequency) Delivery setting: Outpatients clinic Number/frequency of sessions: 2x 45-minute sessions per week Duration: 10 sessions, number of weeks not reported Practitioner(s): Not reported As described above, with alternate frequency.
Duration of follow-up	4 months follow-up (Time from basline not reported)
Sources of funding	Not industry funded
Sample size	N=30 - Low-frequency treadmill training: n=10 - Intermediate-frequency treadmill training: n=10 - High-frequency treadmill training: n=10

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (Time from baseline not reported)
- 2 months follow-up (Time from baseline not reported)

- 4 months follow-up (Time from baseline not reported)

Low-frequency treadmill training versus intermediate-frequency treadmill training versus high-frequency treadmill training: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Low-frequency treadmill training, Post-intervention vs Baseline, N = 10	Low-frequency treadmill training, 2 months follow-up vs Baseline, N = 10	Low-frequency treadmill training, 4 months follow-up vs Baseline, N = 10	Intermediate-frequency treadmill training, Post-intervention vs Baseline, N = 10	Intermediate-frequency treadmill training, 2 months follow-up vs Baseline, N = 10	Intermediate-frequency treadmill training, 4 months follow-up vs Baseline, N = 10	High-frequency treadmill training, Post-intervention vs Baseline, N = 10	High-frequency treadmill training, 2 months follow-up vs Baseline, N = 10	High-frequency treadmill training, 4 months follow-up vs Baseline, N = 10
TUG Mean (SD)	-3.9 (0.93)	-3.5 (1.03)	-1.8 (0.96)	-4.9 (1.85)	-4.2 (1.85)	-3.2 (1.81)	-1.3 (1.41)	0.1 (1.38)	0.9 (1.34)
10MWT Mean (SD)	-2.7 (0.6)	-1.8 (0.74)	-1.4 (1.45)	-2.2 (0.35)	-1.8 (0.46)	-1 (0.62)	0.1 (0.75)	0.8 (0.84)	2.8 (1.43)
BBS Mean (SD)	2.2 (1.83)	1.3 (1.79)	-0.1 (1.65)	4.8 (1.42)	4.7 (1.39)	2.2 (1.43)	0.7 (2.18)	0 (2.13)	-4.3 (2.2)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Participants were randomised with computerised random number generator with block size 3, however, it is unclear whether the recruiter performed the randomisation. There were no significant differences in baseline variables reported, however, baseline differences are unclear for gender as the study did not report baseline gender characteristics despite planning to compare this in the stated statistical analyses.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel likely aware of allocation, however, all received allocated intervention and intention-to-treat analysis was appropriate.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Measurement of outcome was appropriate and outcome assessors were blinded to allocation at each time point.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Picelli, 2013

Bibliographic Reference	Picelli, Alessandro; Melotti, Camilla; Origano, Francesca; Neri, Roberta; Waldner, Andreas; Smania, Nicola; Robot-assisted gait training versus equal intensity treadmill training in patients with mild to moderate Parkinson's disease: a randomized controlled trial.; Parkinsonism & related disorders; 2013; vol. 19 (no. 6); 605-10

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Confirmed diagnosis of idiopathic Parkinson’s disease based on the UK Brain Bank Criteria, - Hoehn and Yahr stage 3 with staging during the “ON” phase, - Mini-Mental State Examination score over 24.
Exclusion criteria	- Severe dyskinesias or “on-off” fluctuations, - Alterations to medication for Parkinson’s disease within the study period, - Problems relating to somatic sensation affecting lower limbs, - Vestibular disorders or paroxysmal vertigo,

	- Other neurological or orthopedic conditions where the lower limbs are affected such as musculoskeletal diseases, severe osteoarthritis, peripheral neuropathy or joint replacement, - Any cardiovascular issues such as recent myocardial infarction, heart failure, uncontrolled hypertension or orthostatic hypotension. Note: Exclusion criteria during the study was listed as those unable to keep up with the robot gait or treadmill training pace.
Patient characteristics	N=60 adults with idiopathic Parkinson's disease - Robot-assisted gait training: n=20 - Treadmill training: n=20 - Conventional gait training: n=20 Age in years [Mean (SD)]: - Robot-assisted gait training: 68.50 (10.10) - Treadmill training: 68.80 (7.72) - Conventional gait training: 67.55 (7.08) Sex (M/F): - Robot-assisted gait training: n=9/n=11 - Treadmill training: n=6/n=14 - Conventional gait training: n=8/n=12 Time since diagnosis in years [Mean (SD)]:

	- Robot-assisted gait training: 6.52 (5.30) - Treadmill training: 6.99 (6.17) - Conventional gait training: 6.79 (6.30) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Neurorehabilitation unit Number/frequency of sessions: 3x 45-minute sessions on alternating days per week, totalling 12 sessions Duration: 4 weeks Practitioner(s): Not reported Sessions occurred during “ON” medication phase. Participants underwent training with the Gait Trainer GT1 machine which is a static suspension system containing 2 motor-controlled footplates on two bars creating robotic assisted propulsion. Participants were placed in a harness with centre of mass movements controlled by attached ropes. Each session was 45-minutes and contained 3 parts with 5-minute break in-between. Participants were initially trained at 20% of bodyweight supported and speed of treadmill was 1 kilometre per hour for 10-minutes. This gradually decreased to 0% of bodyweight supported and increased to 2 kilometres per hour for 10-minutes. **Control** Name: Treadmill training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Neurorehabilitation unit Number/frequency of sessions: 3x 45-minute sessions on alternating days per week totalling 12 sessions

	Duration: 4 weeks Practitioner(s): Not reported Sessions occurred during “ON” medication phase. Treadmill training without bodyweight support for 45-minutes per session with 3 parts and rest for 5-minutes in-between. Participants started at 1 kilometre per hour for 10-minutes, increased to 1.5 kilometres per hour for 10-minutes and then 2.0 kilometres per hour for 10-minutes **Control** Name: Conventional gait training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Neurorehabilitation unit Number/frequency of sessions: 3x 30-minute sessions on alternating days per week totalling 12 sessions Duration: 4 weeks Practitioner(s): Therapist (not specified) Sessions occurred during “ON” medication phase. Conventional gait training for 30-minutes based on the proprioceptive neuromuscular facilitation concept which focuses on pelvic control and movement for regulating gait. Sessions involved 10-minutes each of rhythmic initiation, slow reversal and agonistic reversal pelvic exercises. Duration and intensity was the same for all participants.
Duration of follow-up	3 months follow-up (4 months from baseline)
Sources of funding	Not industry funded
Sample size	N=60 - Robot-assisted gait training: n=20 - Treadmill training: n=20 - Conventional gait training: n=20

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)
- 3 months follow-up (4 months from baseline)

Robot-assisted gait training versus treadmill training versus conventional gait training: Gait and balance

Gait as measured by 10MWT - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Robot-assisted gait training, Post-intervention vs Baseline, N = 20	Robot-assisted gait training, 3 months follow-up vs Baseline, N = 20	Treadmill training, Post-intervention vs Baseline, N = 20	Treadmill training, 3 months follow-up vs Baseline, N = 20	Conventional gait training, Post-intervention vs Baseline, N = 20	Conventional gait training, 3 months follow-up vs Baseline, N = 20
10MWT Mean (SD)	0.28 (0.057)	0.27 (0.066)	0.17 (0.12)	0.17 (0.12)	0.03 (0.14)	0.02 (0.14)
BBS Mean (SD)	5.15 (2.6)	4.3 (2.66)	3.6 (3.13)	3.7 (3.51)	1 (3.63)	1.1 (3.48)

BBS: Berg balance scale; m/s: metres per second; N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Robot-assisted gait training versus treadmill training versus conventional gait training: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training, Post-intervention vs Baseline, N = 20	Robot-assisted gait training, 3 months follow-up vs Baseline, N = 20	Treadmill training, Post-intervention vs Baseline, N = 20	Treadmill training, 3 months follow-up vs Baseline, N = 20	Conventional gait training, Post-intervention vs Baseline, N = 20	Conventional gait training, 3 months follow-up vs Baseline, N = 20
6MWT Mean (SD)	84.75 (41.25)	73.5 (41.11)	80.05 (54.36)	75.55 (54.44)	2.85 (37.9)	-2 (29.87)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Robot-assisted gait training versus treadmill training versus conventional gait training: Functioning

Functioning as measured by UPDRS - Polarity - Lower values are better

Outcome	Robot-assisted gait training, Post-intervention vs Baseline, N = 20	Robot-assisted gait training, 3 months follow-up vs Baseline, N = 20	Treadmill training, Post-intervention vs Baseline, N = 20	Treadmill training, 3 months follow-up vs Baseline, N = 20	Conventional gait training, Post-intervention vs Baseline, N = 20	Conventional gait training, 3 months follow-up vs Baseline, N = 20
UPDRS Mean (SD)	-5.75 (4.7)	-6.15 (4.83)	-3.85 (6.27)	-4.05 (6.71)	0.1 (5.89)	0 (5.94)

N/n: number of participants; SD: standard deviation; UPDRS: unified Parkinson's disease rating scale

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Block randomisation performed with randomisation list produced. One investigator checked correct participant allocation according to the randomisation list. Authors report unmasking at the end of the study to check that there were no errors with allocation and specifically mentions another investigator blinded to allocation which suggests concealment at the allocation stage. No significant differences between allocated groups on baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants were not blinded to allocation and personnel likely not blinded. Appropriate intention-to-treat analysis applied with unlikely deviations from allocations due to trial context.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome measurement appropriate and assessors were blinded to allocation at each time point.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Piira, 2019a

Bibliographic Reference	Piira, Anu; Lannem, Anne M; Sorensen, Marit; Glott, Thomas; Knutsen, Raymond; Jorgensen, Lone; Gjesdal, Knut; Hjeltnes, Nils; Knutsen, Synnove F; Robot-assisted locomotor training did not improve walking function in patients with chronic incomplete spinal cord injury: A randomized clinical trial.; Journal of rehabilitation medicine; 2019; vol. 51 (no. 5); 385-389

Study details

Country/ies where study was carried out	Norway
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- 18-70 years of age, - Motor incomplete spinal cord injury according to American Spinal Injury Association, Impairment Scale C or D at least 2 years after the injury, - Living within 70 kilometres of the training site (in Oslo), - Mostly requiring a wheelchair with or without some walking ability, - Body mass index 30 kilograms per metres squared or lower, - No cognitive issues.
Exclusion criteria	- Conditions that could interfere with locomotor training, - Physical barriers to using a robotic device.
Patient characteristics	N=24 adults with motor incomplete spinal cord injury - Robot-assisted locomotor training (Lokomat): n=12 - Usual care: n=12

	Age in years [Mean (SD)]: - Robot-assisted locomotor training (Lokomat): 55 (8) - Usual care: 46 (15) Sex (M/F): - Robot-assisted locomotor training (Lokomat): n=4/n=3 - Usual care: n=5/n=7 Time since injury in years [Mean (SD)]: - Robot-assisted locomotor training (Lokomat): 21 (23) - Usual care: 15 (18) Chronic neurological disorder category: Acquired spinal cord injury Note: Baseline characteristics were only reported for n=7 for robot-assisted locomotor training (Lokomat) and n=12 for usual care.
Intervention(s)/control	**Intervention** Name: Robot-assisted locomotor training (Lokomat) Protocol intervention group: Rehabilitation interventions to address mobility - Gait training Delivery setting: Outpatient clinic Number/frequency of sessions: 3x per week, totalling 60 sessions

	Duration: 6 months Practitioner(s): Therapist (no further detail) Sessions involved 20- to 30-minutes of preparation such as stretching, fitting harness, treadmill training with bodyweight support (lower than 40% of initial bodyweight) for 20- to 60-minutes and if time, a few minutes of overground walking with or without exercises on the treadmill. Participants had their feet and hips placed in motorised braces (computer controlled, lining with the treadmill speed to move legs similar to normal gait patterns) and while walking on the treadmill were provided with ongoing feedback about their involvement in movements. Over time, bodyweight support was reduced as well as adjusted guidance force and walking speed increased. **Control** Name: Usual care Protocol description: Control (usual care) Delivery setting: Outpatient clinic Number/frequency of sessions: 1 to 5x per week, duration not reported Duration: 6 months Practitioner(s): Physical therapist Low intensity usual care from local physical therapist. Participants wrote in a diary their daily activities and training which was handed in once a month. Received regular follow-up phone calls to assist with compliance.
Duration of follow-up	Post-intervention (14-16 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=24 - Robot-assisted locomotor training (Lokomat): n=12 - Usual care: n=12

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (14-16 weeks from baseline)

Robot-assisted locomotor training versus usual care: Gait and balance

Gait as measured by 10MWT - Polarity - Higher values are better

Outcome	Robot-assisted locomotor training (Lokomat), Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 9
10MWT Mean (range)	0 (-0.1-0.1)	0.1 (-0.1-0.6)

m/s: metres per second; N/n: number of participants; 10MWT: 10 metre walk test

Robot-assisted locomotor training versus usual care: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Balance as measured by MFRT - Polarity - Higher values are better

Outcome	Robot-assisted locomotor training (Lokomat), Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 12
BBS Mean (range)	4.3 (0-10)	3.2 (-1-9)
MFRT Mean (range)	-11 (-19-0)	-2.4 (-14-8)

BBS: Berg balance scale; MFRT: modified functional reach test; N/n: number of participants

Robot-assisted locomotor training versus usual care: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted locomotor training (Lokomat), Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 9
6MWT Mean (range)	6.6 (-14-34)	23.1 (-45-43)

6MWT: 6 minute walk test; N/n: number of participants

Robot-assisted locomotor training versus usual care: Limb/joint/muscle function

Lower limb function as measured by LEMS - Polarity - Higher values are better

Outcome	Robot-assisted locomotor training (Lokomat), Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 12
LEMS Mean (range)	5.4 (-1-19)	0.2 (-11-7)

LEMS: lower extremity motor score; N/n: number of participants

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation by concealed sealed envelopes with no further information provided. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were not blinded to allocated intervention, however, there was no reason to suggest that deviations occurred due to trial context and appropriate modified intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Proportion of missing data differs between groups. Outcome data were not available for 5/12 (42%) of those in the intervention due to early dropout (n=4) or partial completion of study (n=1) while outcome data was available for all in the control arm. This led to an imbalance between the arms (intervention n=7 and control n=12). Reasons for early dropout are not reported and may be related to outcome.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Measurement of outcome was appropriate and assessors were blinded to allocation through all time points.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Published pre-specified protocol available on clinicaltrials.gov with analysis plan; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Piira, 2019b

Bibliographic Reference	Piira, Anu; Lannem, Anne M; Sorensen, Marit; Glott, Thomas; Knutsen, Raymond; Jorgensen, Lone; Gjesdal, Knut; Hjeltnes, Nils; Knutsen, Synnove F; Manually assisted body-weight supported locomotor training does not re-establish walking in non-walking subjects with chronic incomplete spinal cord injury: A randomized clinical trial.; Journal of rehabilitation medicine; 2019; vol. 51 (no. 2); 113-119

Study details

Country/ies where study was carried out	Norway
Study type	Randomised controlled trial (RCT)

Study dates	Not reported
Inclusion criteria	- 18-70 years of age, - Motor incomplete spinal cord injury according to American Spinal Injury Association, Impairment Scale C or D at least 2 years after the injury, - Living outside driving distance of Oslo, - Mostly requiring a wheelchair with or without some walking ability, - Body mass index 30 kilograms per metres squared or lower, - No cognitive issues, - Motivated to undergo locomotor training.
Exclusion criteria	- Spasticity and contractures that could interfere with locomotor training, - Lower limb osteoporosis, - Pregnancy, - Involved in other intense training programmes, - Medical conditions that would prevent training, - Prior knee or hip replacement, - Physical barriers to using a robotic device. Note: Participants were asked not to change spasm lowering medication during study period (this was listed as exclusion criteria in the protocol but not the published paper) and protocol also listed adequate contraceptive use required for those at fertile age.
Patient characteristics	N=20 adults with motor incomplete spinal cord injury - Bodyweight supported locomotor training: n=10

	- Usual care: n=10 Age in years [Mean (SD)]: - Bodyweight supported locomotor training: 46 (14) - Usual care: 54 (13) Sex (M/F): - Bodyweight supported locomotor training: n=6/n=4 - Usual care: n=9/n=1 Time since injury in years [Mean (SD) not reported] [Median (IQR)]: - Bodyweight supported locomotor training: 5 (2 to 33) - Usual care: 3 (2 to 22) Chronic neurological disorder category: Acquired spinal cord injury
Intervention(s)/control	**Intervention** Name: Bodyweight supported locomotor training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Inpatient rehabilitation centre Number/frequency of sessions: 2x 90-minute daily sessions of bodyweight supported locomotor training with manual assistance 5-days per week within 3 periods, each of 4-weeks, totalling 60 sessions.

	Duration: 12 weeks Practitioner(s): 3-5 persons (no detail) Participants used a treadmill with bodyweight support system for a total of 90-minutes per day. Length of training sessions were determined on individual endurance, correct lower limb movement and walking rhythm. Bodyweight support was aimed at being reduced to lower than 40% with or without greater walking speed of 2 to 4 kilometres per hour. Lower-limb braces and orthoses were not to be worn during training and handrail support was kept to minimum. Visual feedback by mirror was provided with 3-5 personnel involved to aid pelvic and leg movement. Before and after each session, soft-tissue mobilisation and stretching was undertaken. Participants were provided with home exercises between sessions in order to assist with transferable skills to non-experimental environment. **Control** Name: Usual care Protocol description: Control (usual care) Delivery setting: Inpatient rehabilitation centre Number/frequency of sessions: Varied Duration: Unclear Practitioner(s): Physical therapist Usual care from local physical therapist which ranged in frequency and intensity (for some this only involved passive movement of joints while for over 50% there was some overground gait training and independent gym training). Participants wrote in a diary their daily activities and training which was handed in once a month. Received regular follow-up phone calls to assist with compliance.
Duration of follow-up	Post-intervention (14-16 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=20 - Bodyweight supported locomotor training: n=10

	- Usual care: n=10

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (14-16 weeks from baseline)

Bodyweight supported locomotor training versus usual care: Gait and balance

Gait as measured by 10MWT - Polarity - Higher values are better

Outcome	Bodyweight supported locomotor training, Post-intervention vs Baseline, nN = 7	Usual care, Post-intervention vs Baseline, N = 7
10MWT Mean (SD)	0.2 (0.3)	0.1 (0.2)

m/s: metres per second; N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Bodyweight supported locomotor training versus usual care: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Balance as measured by MFRT - Polarity - Higher values are better

Outcome	Bodyweight supported locomotor training, Post-intervention vs Baseline, N = 9	Usual care, Post-intervention vs Baseline, N = 9
BBS Mean (SD)	0 (2.6)	1.2 (3.9)
MFRT Mean (SD)	0.8 (15.4)	-5.8 (6.9)

BBS: Berg balance scale; MFRT: modified functional reach test; N/n: number of participants; SD: standard deviation

Bodyweight supported locomotor training versus usual care: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Bodyweight supported locomotor training, Post-intervention vs Baseline, N = 7	Usual care, Post-intervention vs Baseline, N = 6
6MWT Mean (SD)	25.4 (40.9)	29.6 (38.2)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Bodyweight supported locomotor training versus usual care: Limb/joint/muscle function

Lower limb function as measured by LEMS - Polarity - Higher values are better

Outcome	Bodyweight supported locomotor training, Post-intervention vs Baseline, N = 9	Usual care, Post-intervention vs Baseline, N = 9
LEMS Mean (SD)	2.1 (2.8)	-0.6 (5.1)

LEMS: lower extremity motor score; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Blocked randomisation by sealed envelope with a staff member external to the study selecting envelopes for allocation and informing the project coordinator on the allocation. There were differences between groups on a number of baseline variables such as for gender, age, traumatic injury, wheelchair dependency and injury level. While no formal statistical tests were undertaken to determine differences between groups at baseline and both arms contained small numbers (n=10 per arm), authors performed a secondary analysis to adjust for baseline variables that were imbalanced between groups.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were not blinded to allocated intervention, however, there was no reason to suggest that deviations occurred due to trial context and appropriate modified intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data was not available for all participants. 1/9 (10%) of participants in each arm dropped out due to personal reasons with no indication that the missingness in outcome was related to true value.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Measurement of outcome was appropriate and assessors were blinded to allocation through all time points.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Published pre-specified protocol available on clinicaltrials.gov, however, it is unclear as to whether some analyses were pre-planned (such as adjusting for baseline variables) due to lack of detail; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Pollet, 2023

Bibliographic Reference	Pollet, Joel; Buraschi, Riccardo; Ranica, Giorgia; Pancera, Simone; Anastasi, Denise; Fazio, Rossella; Monteleone, Serena; Lena, Eleonora; Floridi, Valeria; Zucchini, Franco; Falso, Maurizio Vincenzo; The Effect of Personalized Shoe Insoles on Parkinson's Disease Subjects: A Triple-Blind Randomized Controlled Trial.; Journal of clinical medicine; 2023; vol. 12 (no. 23)

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)

Study dates	March 2021 - March 2023
Inclusion criteria	- Diagnosed with idiopathic Parkinson's disease, - Aged over 18 years, - Able to walk independently or with a walking aid for at least 10 metres.
Exclusion criteria	- Clinical instability, - Other neurological diseases, pathologies, or significant alterations that may impinge gait cycle, - Unable to sustain assessment procedures.
Patient characteristics	N=42 adults with idiopathic Parkinson’s disease - Custom-made shoe insole plus standard rehabilitation: n=21 - Sham flat insole plus standard rehabilitation: n=21 Age in years [Mean (SD)]: - Custom-made shoe insole plus standard rehabilitation: 72.0 (7.05) - Sham flat insole plus standard rehabilitation: 72.0 (5.02) Sex (n): - Custom-made shoe insole plus standard rehabilitation: n=15/6 - Sham flat insole plus standard rehabilitation: n=14/7 Time since diagnosis: Not reported

	Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Custom-made shoe insole plus standard rehabilitation Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics Delivery setting: Community – participants wore insoles at home/in their daily lives Number/frequency of sessions: Participants instructed to wear insoles for at least 6 hours per day and rehabilitation 2x 90-minutes per week for 20 sessions Duration: 10 weeks Practitioner(s): Not reported Both groups received rehabilitation consisting of 20 sessions, twice per week for 90-minutes (60-minutes of physiotherapy and 30-minutes of occupational therapy). At the end of this period, participants were assigned home-based exercises. **Control** Name: Sham flat insole plus standard rehabilitation Protocol description: Placebo (sham) Delivery setting: Community – participants wore insoles at home/in their daily lives Number/frequency of sessions: Participants instructed to wear insoles for at least 6 hours per day and rehabilitation 2x 90-minutes per week for 20 sessions Duration: 10 weeks

	Practitioner(s): Not reported Both groups received rehabilitation consisting of 20 sessions, twice per week for 90-minutes (60-minutes of physiotherapy and 30-minutes of occupational therapy). At the end of this period, participants were assigned home-based exercises.
Duration of follow-up	4 weeks follow-up (14 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=42 - Custom-made shoe insole plus standard rehabilitation: n=21 - Sham flat insole plus standard rehabilitation: n=21
Other information	Baseline measures for TUG and 10MWT also completed without PRO-STEP or sham insole but not extracted as less comparable with follow-up timepoints.

N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

.

Outcomes

Study timepoints

- Baseline
- Post-intervention (10 weeks from baseline)
- 4 weeks follow-up (14 weeks from baseline)

Custom-made shoe insole plus standard rehabilitation versus sham flat insole plus standard rehabilitation: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Custom-made shoe insole plus standard rehabilitation, Post-intervention vs Baseline, N = 21	Custom-made shoe insole plus standard rehabilitation, 4 weeks follow-up vs Baseline, N = 21	Sham flat insole plus standard rehabilitation, Post-intervention vs Baseline, N = 21	Sham flat insole plus standard rehabilitation, 4 weeks follow-up vs Baseline, N = 21
TUG Mean (SD)	-2.57 (3.3)	-3.5 (3.38)	-3.06 (4.87)	-1.83 (4.51)
10MWT Mean (SD)	0.09 (0.2)	0.07 (0.21)	0.05 (0.24)	-0.07 (0.24)
BBS Mean (SD)	2.28 (6.58)	4.03 (6.8)	4.12 (4.9)	1.76 (5.11)

BBS: Berg balance scale; m/s: metres per second; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Web-based randomisation by an independent researcher, opaque envelopes used to conceal sequence, and groups appear comparable at baseline with no statistically significant differences in baseline characteristics.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants were blinded to group allocation through use of a sham insole and intention-to-treat analysis performed)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Analysis accounted for missing outcome data through the maximum likelihood estimation via the expectation-maximisation algorithm. This was an appropriate method to account for the missing outcome data from 2/21 (9.5%) participants in the intervention arm due to hospitalisation after falls.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome measures were appropriate, methods were unlikely to vary between groups.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Trial protocol registered on clinicaltrials.gov which coincides with when the trial start date. Detail provided about time-points and measurement according to each outcome (including baseline measurements without orthosis) but no detail provided about analysis intentions.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Pompa, 2017

Bibliographic Reference	Pompa, Alessandra; Morone, Giovanni; Iosa, Marco; Pace, Luca; Catani, Sheila; Casillo, Paolo; Clemenzi, Alessandro; Troisi, Elio; Tonini, Angelo; Paolucci, Stefano; Grasso, Maria Grazia; Does robot-assisted gait training improve ambulation in highly

disabled multiple sclerosis people? A pilot randomized control trial.; Multiple sclerosis (Houndmills, Basingstoke, England); 2017; vol. 23 (no. 5); 696-703

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	March 2011 - January 2014
Inclusion criteria	- Diagnosis of multiple sclerosis based on McDonald criteria, - Aged 25-64 years, - Expanded Disability Status Scale score of 6 to 7.5, - Mini-Mental State Examination score of 24 or above.
Exclusion criteria	- Other orthopaedic or neurological diseases which could disrupt movement, - Severe psychiatric condition, - Any relapses one month before enrolment, - Changes in symptomatic or preventative treatments relating to multiple sclerosis, - Botulin toxin injections in the 3 months before enrolment, - Lower limb spasticity >3 at enrolment according to the modified Ashworth scale.
Patient characteristics	N=50 adults with multiple sclerosis - Robot-assisted gait training plus standard rehabilitation programme: n=25 - Conventional gait training plus standard rehabilitation programme: n=25

	Age in years [Mean (SD)]: - Robot-assisted gait training plus standard rehabilitation programme: 47.00 (11.17) - Conventional gait training plus standard rehabilitation programme: 49.86 (8.21) Sex (M/F): - Robot-assisted gait training plus standard rehabilitation programme: n=11/n=10 - Conventional gait training plus standard rehabilitation: n=10/n=12 Time since diagnosis in years [Mean (SD)]: - Robot-assisted gait training plus standard rehabilitation programme: 17.05 (9.12) - Conventional gait training plus standard rehabilitation programme: 14.09 (5.71) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=21 for robot-assisted gait training plus standard rehabilitation programme and n=22 for conventional gait training plus standard rehabilitation programme).
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training plus standard rehabilitation programme Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Inpatients at institute for research and healthcare Number/frequency of sessions: 12 sessions, 3x per week in the morning

	Duration: 4 weeks Practitioner(s): Two physiotherapists for gait training, multidisciplinary team for standard rehabilitation Robot-assisted gait training sessions were 40-minutes in length and used an electromechanical Gait Trainer GTII whereby participants were supported by a harness in an upright position and feet placed on motorised foot-plates that mimicked gait movement. Participants were advised to aid the gait like movement of the trainer. The sessions involved 20-minutes of walking and the remaining time was used to set up the device or prepare participants for walking. Initial sessions had 40 to 50% of bodyweight support and decreased as soon as possible in remaining sessions due to the severity of disability. Speed was usually between 1.3 to 1.8 kilometres per hour based on the comfort of the participant. Standard rehabilitation was minimum 2 hours per day of physical therapy (active and passive motion exercises, strengthening exercises, hand function, transfer and balance training) in addition to occupational, cognitive, respiratory or phoniatric therapy where needed. This was under supervision of a multidisciplinary team involving psychiatrist, neurologist and cardiologists, neuropsychologist, nurses, physiotherapists, occupational and speech therapists, social services car manager, dietician and support staff. **Control** Name: Conventional gait training plus standard rehabilitation programme Protocol description: Control (standard rehabilitation care alone) Delivery setting: Inpatients at institute for research and healthcare Number/frequency of sessions: 12 sessions, 3x per week in the morning Duration: 4 weeks Practitioner(s): Two physiotherapists for gait training, multidisciplinary team for standard rehabilitation Conventional gait training sessions were also 40-minutes in length and exercises were provided to prepare participants for walking (such as static exercises on parallel bars, trunk and pelvis exercises as well as for balance and coordination) and for walking on the ground which increased in difficulty incrementally. Participants also received standard rehabilitation as described above.
Duration of follow-up	Post-intervention (4 weeks from baseline)

Sources of funding	Not industry funded
Sample size	N=50 - Robot-assisted gait training plus standard rehabilitation programme: n=25 - Conventional gait training plus standard rehabilitation programme: n=25
Other information	100mm VAS for spasticity (measure of limb/joint/muscle function) also reported but not extracted as does not appear to be validated in multiple sclerosis. Modified Barthel Index (measure of activities of daily living) and Expanded Disability Status Scale (measure of disability) reported but not extracted as not global measures of functioning.

mm: milimetres; N/n: number of participants; SD: standard deviation; VAS: visual analogue scale

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Robot-assisted gait training plus standard rehabilitation programme versus conventional gait training plus standard rehabilitation programme: Gait and balance

Gait and balance as measured RMI - Polarity - Higher values are better

Gait and balance as measured by FAC - Polarity - Higher values are better

Outcome	Robot-assisted gait training plus standard rehabilitation programme, Post-intervention vs Baseline, N = 21	Conventional gait training plus standard rehabilitation programme, Post-intervention vs Baseline, N = 22
RMI Mean (SD)	2 (1.74)	1.27 (2.07)
FAC Mean (SD)	0.66 (1)	0 (0.78)

FAC: functional ambulatory category; N/n: number of participants; RMI: Rivermead mobility index; SD: standard deviation

Robot-assisted gait training plus standard rehabilitation programme versus conventional gait training plus standard rehabilitation programme: Exercise capacity

Exercise capacity as measured by 2MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training plus standard rehabilitation programme, Post-intervention vs Baseline, N = 21	Conventional gait training plus standard rehabilitation programme, Post-intervention vs Baseline, N = 22
2MWT Mean (SD)	8.88 (13.75)	2.81 (16.71)

N/n: number of participants; SD: standard deviation; 2MWT: 2 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation performed via computer-generated list covered by straps to conceal allocation; no statistically significant differences amongst groups at baseline.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and likely practitioners were aware of allocation, however, there was no indication of deviations from protocol and analysis was modified intention-to-treat.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcome data was not available for 4/25 (16%) of participants in the intervention due to medical reasons (n=2) or withdrawal of consent at first session (n=1) and 3/25 (12%) of participants in the comparator arm due to medical reasons (n=2) or multiple sclerosis relapse (n=1). Authors do not conduct analyses to address missingness in outcome and describe in methods that these participants lost to follow-up were not included in the analysis due to the "plausible" assumption of data missing at random. However, no rationale is provided and the reference provided by the authors state that trials need to provide a rationale for missing data assumptions. As most reasons for loss to follow-up are related to health, there is potential for missingness in outcome depended on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessors were blinded to allocation and outcome measurements were appropriate.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Prosperini, 2013

Bibliographic Reference	Prosperini, Luca; Fortuna, Deborah; Gianni, Costanza; Leonardi, Laura; Marchetti, Maria Rita; Pozzilli, Carlo; Home-based balance training using the Wii balance board: a randomized, crossover pilot study in multiple sclerosis.; Neurorehabilitation and neural repair; 2013; vol. 27 (no. 6); 516-25

Study details

Country/ies where study was carried out	Italy
Study type	Cross-over randomised controlled trial
Study dates	February 2011 - June 2011
Inclusion criteria	- Multiple sclerosis diagnosed according to McDonald criteria, - Aged 18 to 50 years, - Relapsing–remitting or secondary progressive multiple sclerosis, - Expanded Disability Status Scale score equal to or less than 5.5, - Ability to walk without resting for at least 100 metres, - Presence of an objective balance disturbance (for example, impaired straight line walking, gait ataxia, or positive Romberg test).

Exclusion criteria	- Use of assistive device or foot ankle orthosis, - Relapse in previous six months, - Initiation of disease modifying or symptomatic treatments, or any medication change in previous three months, - Seizures, - Severe blurred vision, - Concomitant otological or vestibular diseases (non-multiple sclerosis related), - Psychiatric disorders or severe cognitive impairment, - Cardiovascular and respiratory disorders.
Patient characteristics	N=36 adults with with relapsing-remitting or secondardy progressive multiple sclerosis - Exergame-based balance training (Nintendo Wii): n=18 - No intervention: n=18 Age in years [Mean (SD)]: - Exergame-based balance training (Nintendo Wii): 35.3 (8.6) - No intervention: 37.1 (8.8) Sex (M/F): - Exergame-based balance training (Nintendo Wii): n=5/n=13 - No intervention: n=6/n=12 Time since diagnosis in years [Mean (SD)]:

	- Exergame-based balance training (Nintendo Wii): 12.2 (6.0) - No intervention: 9.3 (5.3) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Exergame-based balance training (Nintendo Wii) Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Home based Number/frequency of sessions: 5x 30-minute sessions per week (weekdays only) Duration: 12 weeks/48 sessions (participants were not allowed to skip more than one session per week) Practitioner(s): The first session was completed under supervision of a physiotherapist however the intervention is participant led. Participants used the Nintendo Wii Balance Board® and played games from a pre-specified list. The balance board detected the users centre of balance and weight shifts and reflected this in the movement of the onscreen avatar, thereby providing visual feedback to participants. Each game started at the lowest level of difficulty and when users reach a certain score the programme automatically starts a new level. If this progress was not achieved, participants played each game for a maximum of ten minutes. **Control** Name: No intervention Protocol description: Control (no intervention) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s): Not applicable

	No intervention received during the first 12 weeks by participants in the comparator arm (second cross-over period where they received the intervention is not considered in this review).
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=36 - Exergame-based balance training (Nintendo Wii): n=18 - No intervention: n=18
Other information	Crossover randomised controlled trial design - only outcomes from first time period included and analysed. Outcomes at 24 weeks follow-up have not been. Centre of pressure displacements (measure of balance) also reported but not extracted as measurement data, not a validated scale.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Exergame-based balance training (Nintendo Wii) versus no intervention: Gait and balance

Gait and balance as measured by FSST - Polarity - Lower values are better

Gait as measured by T25FWT - Polarity - Lower values are better

Outcome	Exergame-based balance training (Nintendo Wii), Post-intervention vs Baseline, N = 17	No intervention, Post-intervention vs Baseline, N = 17
FSST Mean (SD)	-2.7 (8.42)	0.2 (6.79)
T25FWT Mean (SD)	-0.7 (1.95)	-0.8 (3.3)

FSST: four-square step test; N/n: number of participants; SD: standard deviation; T25FWT: timed 25 foot walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer generated and external randomisation, no apparent imbalances between groups at baseline (significance testing was reported).)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although it is not possible to blind participants to group allocation and the issue of deviations from the intended interventions is not specifically discussed it is unlikely that deviations occurred (or that these would have arisen due to the experimental context); and an intention-to-treat approach to analysis appears to have been taken.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(No information regarding the extent of missing data or methods to control for this are reported.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Although outcome assessors were not blinded to intervention status it is unlikely that measurement of each outcome differed between groups, and the majority of outcomes reported used objective measures or validated participant self-report measures.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Pullia, 2023

Bibliographic Reference	Pullia, Massimo; Ciatto, Laura; Andronaco, Giuseppe; Donato, Concetta; Aliotta, Rosario Ermes; Quartarone, Angelo; De Cola, Maria Cristina; Bonanno, Mirjam; Calabro, Rocco Salvatore; Cellini, Roberta; Treadmill Training Plus Semi-Immersive Virtual Reality in Parkinson's Disease: Results from a Pilot Study.; Brain sciences; 2023; vol. 13 (no. 9)

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)

Study dates	October 2021 - December 2022
Inclusion criteria	- Diagnosed with Parkinson's disease based on the Movement Disorder Society Clinical Diagnostic Criteria for Parkinson's Disease, - Aged 50 to 70 years, - Having moderate to advanced disease (defined as scoring between 2 and 4 (inclusive) on Hoehn and Yahr scale, - Could walk without aid with Functional Ambulation Categories score greater than 2.
Exclusion criteria	- Having cognitive, visual, or auditory issues that affect comprehension and/or ability to undertake study exercises, - Any comorbidities that inhibit upright posture and walking such as hypotension, - Lack of informed consent, - Relating to the use of the C-Mill treadmill limitations, exclusions were weight over 135 kilograms, greater than 200 centimetres in height and any open lesions or bandages located where the harness would be placed on the body.
Patient characteristics	N=20 adults with Parkinson's disease - Virtual reality-based treadmill training (C-Mill): n=10 - Conventional gait training: n=10 Age in years [Mean (SD)]: - Virtual reality-based treadmill training (C-Mill): 64.5 (10.84) - Conventional gait training: 65.5 (10.36) Sex (M/F): - Virtual reality-based treadmill training (C-Mill): n=9/n=1

	- Conventional gait training: n=4/n=6 Time since diagnosis in years [Mean (SD)]: - Virtual reality-based treadmill training (C-Mill): 8.3 (4.09) - Conventional gait training: 13 (8.4) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Virtual reality-based treadmill training (C-Mill) Protocol intervention group: Rehabilitation interventions to address mobility – Exergaming and AR/VR Delivery setting: Innovation Neurorehabilitation Laboratory Number/frequency of sessions: 20 sessions, 4x per week Duration: 5 weeks Practitioner(s): Physiotherapists Participants trained with a C-Mill treadmill which had semi-immersive virtual reality. The C-Mill treadmill contained bodyweight sensors, a harness with safety rope, handrail and a projector with associated audio-visual stimuli (vertical VR screen located at front of the treadmill). The sessions involved gait with projection of virtual obstacles, traffic cones or country paths and accompanying audio-visual stimuli, differential walking speeds via virtual exercises projected on a screen ahead and treadmill walking with changes in lateral direction when virtual projections appeared on the screen. Each session was 45-minutes in duration. **Control** Name: Conventional gait training Protocol description: Control (standard rehabilitation)

	Delivery setting: Rehabilitation gym Number/frequency of sessions: 20 sessions, 4x per week Duration: 5 weeks Practitioner(s): Physiotherapists Conventional motor rehabilitation programme with provision of weight-shifting exercises, monoprodalic and bipodal balance exercises, and gait training by the use of obstacles, tandem, and slalom walking with a variety of audio-visual cues. Each session was 45-minutes in duration. Manual guidance by physiotherapists lowered the risk of falls.
Duration of follow-up	Post-intervention (5 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=20 - Virtual reality-based treadmill training (C-Mill): n=10 - Conventional gait training: n=10
Other information	Timed Up and Go (measure of gait and balance) also reported but not extracted as only presented per side, and not total scores.

AR: augmented reality; N/n: number of participants; SD: standard deviation; VR: virtual reality

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)

Virtual reality-based treadmill training (C-Mill) versus conventional gait training: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Gait as measured by 10MWT - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Virtual reality-based treadmill training (C-Mill), Post-intervention, N = 10	Conventional gait training, Post-intervention, N = 10
TBG Median (IQR)	27 (23.5 to 28)	20.5 (8.75 to 25.25)
10MWT Median (IQR)	5.27 (4.06 to 5.85)	6.19 (2.6 to 8.8)
BBS Median (IQR)	52.5 (50.25 to 55.25)	40 (13.25 to 47.25)

BBS: Berg balance scale; IQR: interquartile range; N/n: number of participants; TBG: Tinetti balance and gait; 10MWT: 10 metre walk test

Virtual reality-based treadmill training (C-Mill) versus conventional gait training: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Virtual reality-based treadmill training (C-Mill), Post-intervention, N = 10	Conventional gait training, Post-intervention, N = 10
6MWT Median (IQR)	360 (345 to 381)	155 (0 to 294)

IQR: interquartile range; N/n: number of participants; 6MWT: 6 minute walk test

Virtual reality-based treadmill training (C-Mill) versus conventional gait training: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Virtual reality-based treadmill training (C-Mill), Post-intervention, N = 10	Conventional gait training, Post-intervention, N = 10
UPDRS III Median (IQR)	25.5 (14.75 to 44.25)	29 (22.75 to 42)

IQR: interquartile range; N/n: number of participants; UPDRS III: unified Parkinson's disease rating scale part 3

Virtual reality-based treadmill training (C-Mill) versus conventional gait training: Functioning

Functioning as measured by FIM - Polarity - Higher values are better

Outcome	Virtual reality-based treadmill training (C-Mill), Post-intervention, N = 10	Conventional gait training, Post-intervention, N = 10
FIM Median (IQR)	120.5 (117.5 to 123.7)	104.5 (82 to 113)

FIM: functional independence measure; IQR: interquartile range; N/n: number of participants

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Block randomisation (block size 4) via a web-based randomisation app. No information as to who had access or control of the application. There were no statistically significant differences between groups at baseline.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants were not blinded to allocation and personnel likely not blinded. Appropriate intention-to-treat analysis applied with no apparent deviations from allocations due to trial context.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were available for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome measurement appropriate and assessors were blinded to allocation at each time point.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Raciti, 2022

Bibliographic Reference	Raciti, Loredana; Pignolo, Loris; Perini, Valentina; Pullia, Massimo; Porcari, Bruno; Latella, Desiree; Isgro, Marco; Naro, Antonino; Calabro, Rocco Salvatore; Improving Upper Extremity Bradykinesia in Parkinson's Disease: A Randomized Clinical Trial on the Use of Gravity-Supporting Exoskeletons.; Journal of clinical medicine; 2022; vol. 11 (no. 9)

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	July 2019 - March 2020
Inclusion criteria	- History of idiopathic Parkinson’s disease diagnosed according to the UK Brain Bank criteria, - A Hoehn and Yahr stage between 2 and 3 determined in the “ON” phase, - Age between 50 and 80 years old.
Exclusion criteria	- Moderate to severe cognitive deficits (that is, a Mini-Mental State Examination < 20), - Severe dyskinesia or severe on–off motor fluctuations, - Stereotaxic brain surgery for Parkinson’s disease, - Changes in dopamine therapy dose within 3 months before baseline, - Unstable cardiac or respiratory illness interfering with training, - Any medical condition compromising training, including severe osteoarthritis or peripheral neuropathies.
Patient characteristics	N=30 adults with idiopathic Parkinson’s disease - Upper limb robotic therapy: n=15 - Conventional physical therapy: n=15

	Age in years [Mean (SD)]: - Upper limb robotic therapy: 65.7 (7) - Conventional physical therapy: 62.7 (10.1) Sex: Not reported Time since diagnosis in years [Mean (SD)]: - Upper limb robotic therapy: 5.3 (3.4) - Conventional physical therapy: 6.2 (4.6) Chronic neurological disorder category: Progressive neurological diseases Note: Characteristics only presented for participants analysed rather than randomised (n=15 for upper limb robotic therapy and n=9 for conventional physical therapy).
Intervention(s)/control	**Intervention** Name: Upper limb robotic therapy Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training Delivery setting: Outpatient Movement Disorders Clinic Number/frequency of sessions: 6x 45-minute sessions per week Duration: 8 weeks

	Practitioner(s): Physiotherapist The Armeo®Spring (Hocoma Inc., Zurich, Switzerland) is a mechanical device with an adaptable suspension system for the upper limb, supporting from the shoulder to the wrist and ending with a grasping system for the hand. Its sensitivity can be adjusted based on the participant's condition, providing information on movement parameters like resistance, strength, range of motion, and coordination. The system calibrates the working space and difficulty level according to the participant's active mobility and enhances movements with visual feedback (2D virtual reality) in a three-dimensional space. A physiotherapist in robot-assisted therapy supervised the training, adjusted the device for the participant, selected the workspace and exercises, and modified exercise difficulties in subsequent sessions. **Control** Name: Conventional physical therapy Protocol description: Control (standard care rehabilitation alone) Delivery setting: Outpatient Movement Disorders Clinic Number/frequency of sessions: 6x 45-minute sessions per week Duration: 8 weeks Practitioner(s): Physiotherapist Participants received the same total treatment time as the intervention group. They underwent conventional rehabilitation, including passive and active-assisted mobilisation of the upper limbs, traditional neuromuscular facilitation training, proprioception exercises, stiffness reduction for joints and muscles, and active exercises involving reaching and picking objects. No further details reported on content of conventional therapy.
Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=30 - Upper limb robotic therapy: n=15 - Conventional physical therapy: n=15

N/n: number of participants; SD: standard deviation; 2D: 2-dimensional

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)

Upper limb robotic therapy versus conventional physical therapy: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Upper limb function as measured by FMA-UE - Polarity - Higher values are better

Outcome	Upper limb robotic therapy, Post-intervention, N = 15	Conventional physical therapy, Post-intervention, N = 9
UPDRS III Median (IQR)	21 (16 to 26)	32 (23.25 to 40)
FMA-UE Median (IQR)	53 (51 to 55)	56 (52.5 to 59.5)

FMA-UE: Fugl-Meyer assessment for upper extremity; IQR: interquartile range; N/n: number of participants; UPDRS III: unified Parkinson's disease rating scale part 3

Upper limb robotic therapy versus conventional physical therapy: Limb/joint/muscle function

Upper limb function as measured by MI-UE - Polarity - Higher values are better

Outcome	Upper limb robotic therapy, Post-intervention, N = 12	Conventional physical therapy, Post-intervention, N = 9
MI-UE Median (IQR)	89 (83 to 94)	82 (79.25 to 88.5)

IQR: interquartile range; MI-UE: motricity index - upper extremity; N/n: number of participants

Upper limb robotic therapy versus conventional physical therapy: Limb/joint/muscle function

Hand function as measured by 9HPT - time - Polarity - Lower values are better

Outcome	Upper limb robotic therapy, Post-intervention vs Baseline, N = 12	Conventional physical therapy, Post-intervention vs Baseline, N = 9
9HPT - time Mean (SD)	-8.1 (11.31)	-3.7 (4.51)

N/n: number of participants; SD: standard deviation; 9HPT: 9 hole peg test

Upper limb robotic therapy versus conventional physical therapy: Functioning

Functioning as measured by FIM - Polarity - Higher values are better

Outcome	Upper limb robotic therapy, Post-intervention, N = 12	Conventional physical therapy, Post-intervention, N = 9
FIM	110 (105 to 115)	101 (100 to 106)

Outcome	Upper limb robotic therapy, Post-intervention, N = 12	Conventional physical therapy, Post-intervention, N = 9
Median (IQR)		

FIM: functional independence measure; IQR: interquartile range; N/n: number of participants

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Computer-generated randomly permuted blocks scheme. Participants were also stratified by disability and impairment levels to balance baseline physical capacity between groups. No information on allocation concealment. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised. Further, only age, disease duration, and levodopa equivalent daily dose were reported.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants were not aware of interventions allocated. Although personnel were aware of interventions allocated, there were no deviations from intended interventions. Intention-to-treat analysis was not performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(9HPT, MI-UE and FIM (high risk): 3/15 (20%) and 6/15 (40%) of participants in the intervention and control groups, respectively were lost to follow-up, all results were possibly biased by missing data; loss to follow-up not balanced between groups; reason for missingness reported for control group (all COVID-19 emergencies) but not for 3 lost in the intervention group. FMA-UE and UPDRS III (some concerns): (0/15 (0%) and 6/15 (40%) of participants in the intervention and control groups, respectively were lost to follow-up, all results were possibly biased by missing data; loss to follow-up not balanced*

Section	Question	Answer
		between groups; missingness unlikely to depend on true value as all drop-outs were due to Covid-19 emergencies.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Published protocol. All relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	FMA-UE and UPDRS III - risk of bias overall rating of some concerns; 9HPT, MI-UE and FIM - risk of bias overall rating of high risk.

Covid-19: coronavirus disease; FIM: functional independence measure; FMA-UE: Fugl-Meyer assessment for upper extremity; MI-UE: motricity index - upper extremity; UPDRS III: unified Parkinson's disease rating scale part 3; 9HPT: 9 hole peg test

Renfrew, 2019

Bibliographic Reference	Renfrew, Linda Miller; Paul, Lorna; McFadyen, Angus; Rafferty, Danny; Moseley, Owen; Lord, Anna C; Bowers, Roy; Mattison, Paul; The clinical- and cost-effectiveness of functional electrical stimulation and ankle-foot orthoses for foot drop in Multiple Sclerosis: a multicentre randomized trial.; Clinical rehabilitation; 2019; vol. 33 (no. 7); 1150-1162

Study details

Country/ies where study was carried out	UK

Study type	Randomised controlled trial (RCT)
Study dates	Recruitment not reported (entire study period April 2014 - March 2018)
Inclusion criteria	- People with a clinical diagnosis of multiple sclerosis and persistent foot-drop (defined as lasting at least 3 months) observed during a 5-minute walk test, - People showing no relapse or change in disability in previous 3 months, - People with 5° of passive dorsiflexion, - People able to tolerate functional electrical stimulation.
Exclusion criteria	- People with a history of functional electrical stimulation or ankle-foot orthosis to treat their foot drop, - People with moderate to severe cognitive impairment (defined as a Montreal Cognitive Assessment score of below 26), - People with foot drop due to other conditions, - People with comorbidities (including severe lower limb or trunk ataxia) significantly affecting their gait, marked proximal weakness, plantar flexor spasticity, or stance phase instability, - People with contraindications for functional electrical stimulation.
Patient characteristics	N=85 adults with multiple sclerosis and persistent foot-drop - Functional electrical stimulation: n=42 - Ankle-foot orthosis: n=43 Age in years [Mean (SD)]: - Functional electrical stimulation: 50.4 (10.4) - Ankle-foot orthosis: 51.4 (11.2)

	Sex (M/F): - Functional electrical stimulation: n=8/n=33 - Ankle-foot orthosis: n=20/n=18 Time since diagnosis in years [Mean (SD)]: - Functional electrical stimulation 7.6 (8.6) - Ankle-foot orthosis 10.2 (10.3) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants who started intervention rather than those randomised (n=41 for functional electrical stimulation and n=38 for ankle-foot orthosis).
Intervention(s)/control	**Intervention** Name: Functional electrical stimulation Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics Delivery setting: Not applicable Number/frequency of sessions: Not applicable Duration: 12 months Practitioner(s): Physiotherapist experienced with functional electrical stimulation Odstock Dropped Foot Stimulator Pace was fitted, applying a wired heel switch and a 40 Hz stimulation frequency. Electrode position, pulse width, waveform and ramping parameters were adjusted for each participant for optimal muscle contraction, with the current amplitude averaging 40 mA (range 7-72 mA). Participants were instructed in gradually increase usage over initial 6 weeks.

	Control Name: Ankle-foot orthosis Protocol description: Control (standard care rehabilitation alone) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Duration: 12 months Practitioner(s): Orthotist Custom made, solid ankle-foot orthosis, made with 5 mm homopolymer polypropylene and following guideline for ankle-foot orthoses after stroke. Trim lines were anterior to malleoli and ankle section was reinforced if needed. The tibia was angled forward by roughly 10° from vertical and heel wedged were used to finetune each orthosis. Participants were instructed in gradually increase usage over initial 6 weeks.
Duration of follow-up	Post-intervention (12 months from baseline)
Sources of funding	Not industry funded
Sample size	N=85 - Functional electrical stimulation: n=42 - Ankle-foot orthosis: n=43
Other information	Outcomes also reported at 3 months and 6 months but not extracted as intervention not completed. 5-minute self-selected walking test (measure of exercise capacity) also reported but not extracted as does not appear to be validated.

Hz: hertz; mA: milliamperes; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 months from baseline)

Functional electrical stimulation versus ankle-foot orthoses: Gait and balance

Gait as measured by T25FWT (without device) - Polarity - Higher values are better

Gait as measured by T25FWT (with device) - Polarity - Higher values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Outcome	Functional electrical stimulation, Post-intervention vs Baseline, N = 31	Ankle-foot orthosis, Post-intervention vs Baseline, N = 22
T25FWT (without device) Mean (SD)	0.01 (0.23)	0.1 (0.23)
T25FWT (with device) Mean (SD)	0.03 (0.26)	0.15 (0.21)
MSWS-12 (device usage not reported) Mean (SD)	-0.5 (8.67)	-4.9 (7.9)

ft/s: feet per second; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SD: standard deviation; T25FWT: timed 25 foot walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Shuffled envelopes randomisation sequence; allocation concealed using appropriate envelopes. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(No information on blinding of participants, carers and people delivering intervention but nature of intervention and control hard to blind against; no deviations from intended intervention due to trial context as occupational therapists would have had to fit incorrect orthoses. Naive per-protocol analysis performed; 1/42 (2.4%) in intervention arm and 5/43 (12%) in intervention arm did not receive intervention after randomisation due not being able to commit to study (intervention arm) or not being happy with allocation or ankle-foot orthoses (control arm) and were not included in the analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Missing outcome data at 12 months from baseline were 11/42 (26.2%) for intervention arm and 21/43 (49%) for control arm; sensitivity analysis or correction for bias analysis not presented; missingness of outcome likely to depend on true value as rates of loss to follow up different across groups and some reasons for missing outcome data depend on true value (All reasons: did not receive intervention (n=1 intervention, n=5 control), relapse (intervention n=2, control n=0), unhappy with or not using intervention (intervention n=2, control n=10), unable to commit (intervention n=2, control n=0), disease progression (intervention n=1, control n=3), discontinued (intervention n=0, control n=1), lost contact (intervention n=2, control n=2), unwell (intervention n=0, control n=1) increased neuropathic pain (intervention n=1, control n=0), missed assessment (intervention n=1, control n=0). Note: Numbers do not add up but correct as reported.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(MSWS-12 (some concerns) - Appropriate outcome measurement method,*

Section	Question	Answer
		unlikely to differ between groups; outcome assessors probably aware of group allocation as self-reported measures by probably unblinded participants; outcome measurement could be influenced by knowledge of group allocation as subjective measurements but unlikely as measured using standardised, validated measurement tool, and control group received an active intervention which reduces risk of bias. T25FWT (low)- Appropriate outcome measurement method, unlikely to differ between groups; outcome assessors probably aware of group allocation as self-reported measures by probably unblinded participants; outcome measurement unlikely to be influenced by knowledge of group allocation as objective measurement using standardised, validated measurement tool.)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; T25FWT: timed 25 foot walk test

Robinson, 2015

Bibliographic Reference	Robinson, Jonathan; Dixon, John; Macsween, Alasdair; van Schaik, Paul; Martin, Denis; The effects of exergaming on balance, gait, technology acceptance and flow experience in people with multiple sclerosis: a randomized controlled trial.; BMC sports science, medicine & rehabilitation; 2015; vol. 7; 8

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	October 2011 - April 2012
Inclusion criteria	- Aged 18 to 65 years, - Clinical diagnosis of multiple sclerosis, - Self-reported ability to walk 100 metres with or without resting with the use of one stick or crutch (equivalent to an Expanded Disability Status Scale score of 6), - Able to read and comprehend written and spoken English.
Exclusion criteria	- Acute exacerbation and/or relapse of multiple sclerosis symptoms within the previous 3 months, - Diagnoses of any other condition affecting the central nervous system, - Any musculoskeletal injury, - Currently receiving physical therapy.
Patient characteristics	N=56 adults with multiple sclerosis - Exergame-based balance training (Nintendo Wii): n=20 - Traditional balance training: n=18 - No intervention: n=18 Age in years [Mean (SD)]: - Exergame-based balance training (Nintendo Wii): 52.6 (6.1) - Traditional balance training: 53.9 (6.5)

	- No intervention: 51.9 (4.7) Sex (M/F): - Exergame-based balance training (Nintendo Wii): n=6/n=14 - Traditional balance training: n=7/n=12 - No intervention: n=5/n=12 Time since diagnosis in years [Mean (SD)]: - Exergame-based balance training (Nintendo Wii): Not reported - Traditional balance training: Not reported - No intervention: Not reported Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were reported for different allocation of participants (n=20 for exergame-based balance training (Nintendo Wii), n-19 for traditional balance training, and n=17 for no intervention)
Intervention(s)/control	**Intervention** Name: Exergame-based balance training (Nintendo Wii) Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Outpatient (individual sessions) Number/frequency of sessions: 2x 40-60-minute sessions per week Duration: 4 weeks

	Practitioner(s): Physiotherapist Sessions were comprised of Nintendo Wii Fit® system games. These focus on balance, aerobic activity, and muscle strength. All games were undertaken in the standing position. Name: Traditional balance training Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting Outpatient (individual sessions) Number/frequency of sessions 2x 40-60-minute sessions per week Duration: 4 weeks Practitioner(s): Physiotherapist The traditional balance training was designed to be comparable to the exergame-based balance programme. All exercises were undertaken in standing position. **Control** Name: No intervention Protocol description: Control (no intervention) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s): Not applicable Participants received no intervention.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=56

	- Exergame-based balance training (Nintendo Wii): n=20 - Traditional balance training: n=18 - No intervention: n=18

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Exergame-based balance training (Nintendo Wii) versus traditional balance training versus no intervention: Gait and balance

Gait as measured by MSWS-12 - Polarity - Lower values are better

Outcome	Exergame-based balance training (Nintendo Wii), Post-intervention vs Baseline, N = 20	Traditional balance training, Post-intervention vs Baseline, N = 16	No intervention, Post-intervention vs Baseline, N = 15
MSWS-12 Mean (SD)	-5.5 (11.82)	-6.1 (11.46)	3.8 (15.32)

MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SD: standard deviation

Exergame-based balance training (Nintendo Wii) versus traditional balance training versus no intervention: Functioning

Functioning as measured by WHODAS2.0 - Polarity - Lower values are better

Outcome	Exergame-based balance training (Nintendo Wii), Post-intervention vs Baseline, N = 20	Traditional balance training, Post-intervention vs Baseline, N = 16	No intervention, Post-intervention vs Baseline, N = 15
WHODAS2.0 Mean (SD)	-11.3 (3.32)	-10.7 (5.25)	0.2 (5.62)

N/n: number of participants; SD: standard deviation; WHODAS2.0: World Health Organisation disability assessment schedule

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Although adequate randomisation methods were used (computer generated), there is no information regarding allocation concealment. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(It would not have been possible to blind participants and practitioners to group allocation and there is no information regarding the potential for deviations. Inconsistency with baseline characteristic reporting (1 participant appears to have switched groups between traditional balance training and no intervention) but no further information given. Two participants in the traditional balance training arm and 3 in the no intervention arm withdrew from the study upon allocation and excluded from analysis. Reasons for withdrawal were not reported but could be due to allocation.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(The authors conducted a complete-case analysis on the remaining participants with baseline outcome measures. For participants lost to follow-up, only baseline data was included in the analysis. Complete-case analysis does*

Section	Question	Answer
		not substitute a sensitivity analysis when outcome data are missing not at random, and 4/18 (22%) control arm participant data is missing. Possible that this could be related to true value, but reasons given in paper make it unlikely (hospitalisation not related to the study, multiple sclerosis relapse; number of participants per reason is unclear.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	High *(MSWS-12, WHODAS2.0 (high): Likely that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by unblinded participants and control is not an active intervention.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

MSWS-12: multiple sclerosis walking scale; N/n: number of participants; WHODAS2.0: World Health Organisation disability assessment schedule

Schaible, 2021

Bibliographic Reference	Schaible, Fabian; Maier, Franziska; Buchwitz, Timo Marcel; Schwartz, Frank; Hoock, Marius; Schonau, Eckhard; Libuda, Miriam; Hordt, Anke; van Eimeren, Thilo; Timmermann, Lars; Eggers, Carsten; Effects of Lee Silverman Voice Treatment BIG and conventional physiotherapy on non-motor and motor symptoms in Parkinson's disease: a randomized controlled study comparing three exercise models.; Therapeutic advances in neurological disorders; 2021; vol. 14; 1756286420986744

Study details

Country/ies where study was carried out	Germany
Study type	Randomised controlled trial (RCT)
Study dates	July 2015 - May 2017
Inclusion criteria	- Hoehn and Yahr stages 1 to 3, - Age: 35 to 80 years, - No walking aids, - Stable medication for 4 weeks prior to and during the study.
Exclusion criteria	- Dementia (Parkinson's Neuropsychometric Dementia Assessment score < 14), - Depression (Beck Depression Inventory score > 28), - Use of antidepressive or antipsychotic medication, - Participation in LSVT BIG therapy in the past year, - Disabling bradykinesia to ensure participants can engage in the intensive physiotherapy, - History of cardiovascular, neurological, or musculoskeletal disorders affecting Parkinson's disease testing.
Patient characteristics	N=29 adults with Parkinson's disease - Personalised intensive physiotherapy programme: n=16 - Conventional physiotherapy programme: n=13 Age in years [Mean (SD)]: - Personalised intensive physiotherapy programme: 66.20 (8.65)

	- Conventional physiotherapy programme: 65.50 (8.21) Sex (M/F): - Personalised intensive physiotherapy programme: n=6/n=9 - Conventional physiotherapy programme: n=10/n=2 Time since diagnosis in years [Mean (SD)]: - Personalised intensive physiotherapy programme: 5.27 (3.41) - Conventional physiotherapy programme: 5.42 (4.21) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Personalised intensive physiotherapy programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Individualised (tailored) exercise programmes Delivery setting: University Hospital of Cologne Number/frequency of sessions: 4x 60-minute sessions per week totalling 16 sessions Duration: 4 weeks Practitioner(s): Physiotherapist Participants received individual one-on-one sessions and were encouraged to practice at home for 4- to 6-hours per week. All participants were instructed to avoid additional activities during the 8-week intervention period. Sessions aimed for 60% to 80% maximal effort, as rated by the Borg scale. Training followed the European Guideline for Parkinson's

	Physiotherapy, focusing on individual deficits, gait, falls, freezing of gait, and dexterity. Each participant had a personalised programme, including exercises such as complex motor sequences, stretching, dual tasks, core stability, and mental imagery. Worksheets explaining these exercises were provided for home practice. Intensity increased progressively through higher repetitions, weights, task difficulty, and pace, as reflected by the Borg scale and heart rate changes. **Control** Name: Conventional physiotherapy programme Protocol description: Control (standard care rehabilitation alone) Delivery setting: Office-based practice of their choice Number/frequency of sessions: 4x 60-minute sessions per week totalling 16 sessions Duration: 8 weeks Practitioner(s): Physiotherapist No specific exercises, repetitions, or resistance levels were prescribed, reflecting the standard physiotherapy treatment for Parkinson's disease in such settings.
Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=29 - Personalised intensive physiotherapy programme: n=16 - Conventional physiotherapy programme: n=13
Other information	Study included a third arm (n=15 participants) who were assigned LSVT-BIG intervention. Data not extracted as intervention not in protocol. Outcomes also reported at 4 weeks but not extracted as intervention not completed. Outcomes reported in the article as mean (95% CI). Converted to mean (SD) using agreed calculations for this report.

	All participants were tested while on their regular medication in the "ON" medication state.

CI: confidence interval; LSVT-BIG: Lee Silverman voice treatment for limb motor systems; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)

Personalised intensive physiotherapy programme versus conventional physiotherapy programme: Exercise capacity

Exercise capacity as measured by 5XSST - Polarity - Lower values are better

Outcome	Personalised intensive physiotherapy programme, Post-intervention vs Baseline, N = 15	Conventional physiotherapy programme, Post-intervention vs Baseline, N = 12
5XSST Mean (SD)	-2.19 (1.15)	-0.55 (1.09)

N/n: number of participants; SD: standard deviation; 5XSST: 5 times sit to stand test

Personalised intensive physiotherapy programme versus conventional physiotherapy programme: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Personalised intensive physiotherapy programme, Post-intervention vs Baseline, N = 15	Conventional physiotherapy programme, Post-intervention vs Baseline, N = 12
UPDRS III Mean (SD)	-5.7 (3.63)	-2.11 (3.51)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Randomisation was performed using an online randomisation software (www.sealedenvelope.com) that generated a randomised allocation sequence in a 1:1:1 ratio. No information on allocation concealment. No statistical differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were aware of interventions allocated, however due to nature of intervention blinding most likely not possible. There were no deviations from intended interventions. Intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(3/16 (18.75%) and 1/13 (7.7%) of participants in the intervention and control groups, respectively had dropped out by the final assessment time-point at 8 weeks. The reasons for attrition were physical problems (n=2 intervention), personal reasons (n=1 intervention) and withdrawal of consent (n=1 control). The authors report using last observation carried forward methods in their analysis, however, this is not considered to be an appropriate method to control for missing data given that physical problems could depend on true value. The analysis also did not include those who did not complete all 16 sessions and did not have at*

Section	Question	Answer
		least one follow-up visit (n=1/16 intervention who withdrew due to physical problems, n=1/13 control withdrew consent). No sensitivity analyses conducted.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Schlenstedt, 2015

Bibliographic Reference	Schlenstedt, Christian; Paschen, Steffen; Kruse, Annika; Raethjen, Jan; Weisser, Burkhard; Deuschl, Gunther; Resistance versus Balance Training to Improve Postural Control in Parkinson's Disease: A Randomized Rater Blinded Controlled Study.; PloS one; 2015; vol. 10 (no. 10); e0140584

Study details

Country/ies where study was carried out	Germany

Study type	Randomised controlled trial (RCT)
Study dates	September 2011 - February 2014
Inclusion criteria	- Diagnosed with idiopathic Parkinson's disease (using UK Brain Bank criteria by a neurologist specialising in movement disorders), - Postural instability (defined as a score of 25 or lower on the Fullerton Advanced Balance scale), - Able to follow exercise instructions.
Exclusion criteria	- Deep brain stimulation, - Other diseases that could influence stance and gait performance, - Participation in a specific resistance training or balance training programme (other than any usual physical therapy), during previous 6 months, - Participation in any other medical, behavioural or exercise treatment (other than any usual therapeutic treatment) during study period, - Unstable medication, - Cardiopulmonary/metabolic diseases that could interfere with the safe conduct of the study protocol.
Patient characteristics	N=40 adults with idiopathic Parkinson’s disease - Resistance training balance exercises: n=20 - Conventional balance training: n=20 Age in years [Mean (SD)]: - Resistance training balance exercises: 75.7 (5.5) - Conventional balance training: 75.7 (7.2)

	Sex (M/F): - Resistance training balance exercises: n=12/n=5 - Conventional balance training: n=9/n=6 Time since diagnosis in years [Mean (SD)]: - Resistance training balance exercises: 10.1 (6.0) - Conventional balance training: 9.3 (7.9) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed at post-intervention (n=17 for resistance training balance exercises and n=15 for conventional balance training).
Intervention(s)/control	**Intervention** Name: Resistance training balance exercises Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises (such as sitting/ standing and reaching) Delivery setting: Group based (4–5 participants), location not reported. Number/frequency of sessions: 2x 60-minute session per week Duration: 7 weeks Practitioner(s): Sport scientist Each session consisted of 10-minutes warm-up and 50-minutes of training. Training was focused on improving muscle strength in the lower limbs. Participants completed 3 sets of 15-20 repetitions for each exercise or until failure.

	Resistance was increased if participants were able to complete the repetitions without failure. Resistance was provided using small weights or bodyweight. Participants rested for 2-minutes between exercise sets. **Control** Name: Conventional balance exercises Protocol description: Control (standard rehabilitation care alone) Delivery setting: Group based (4-5 participants), location not reported Number/frequency of sessions 2x 60-minute session per week Duration: 7 weeks Practitioner(s): Sport scientist Each session consisted of 10-minutes warm-up and 50-minutes of training. Training was comprised of stance and gait tasks which require feedforward (allowing participants to lean) and feedback (for example, shoulder pulls from the trainer) postural control. Progression was achieved by reducing or manipulating the sensory information needed to maintain balance and by adding movement to make the activity more dynamic. Each exercise lasted for 45-seconds and was repeated 3 times, followed by a rest period of 2-minutes.
Duration of follow-up	4 weeks follow-up (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=40 - Resistance training balance exercises: n=20 - Conventional balance training: n=20

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)
- 4 weeks follow-up (12 weeks from baseline)

Resistance training balance exercises versus conventional balance training: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by FAB - Polarity - Higher values are better

Outcome	Resistance training balance exercises, Post-intervention vs Baseline, N = 17	Resistance training balance exercises, 4 weeks follow-up vs Baseline, N = 14	Conventional balance training, Post-intervention vs Baseline, N = 15	Conventional balance training, 4 weeks follow-up vs Baseline, N = 11
TUG Mean (SD)	-1.7 (2.12)	-1.2 (2.14)	-0.2 (2.04)	-0.8 (2.02)
FAB Mean (SD)	2.3 (3.65)	0.3 (3.51)	0.4 (3.56)	-0.5 (3.25)

FAB: Fullerton advanced balance; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Resistance training balance exercises versus conventional balance training: Limb/joint/muscle functioning

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Resistance training balance exercises, Post-intervention vs Baseline, N = 17	Resistance training balance exercises, 4 weeks follow-up vs Baseline, N = 14	Conventional balance training, Post-intervention vs Baseline, N = 15	Conventional balance training, 4 weeks follow-up vs Baseline, N = 11
UPDRS III Mean (SD)	-0.4 (6.26)	-0.1 (6.84)	-0.9 (4.43)	-0.7 (3.72)

N/n: number of participants; SD: standard deviation; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Although no information is provided regarding allocation concealment, the authors report their randomisation methods (computer generated). Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(It would not have been possible to blind participants and practitioners to group allocation, however, it is unlikely that that any deviations arose as a result of the experimental context. Authors state that they conducted a naïve per-protocol analysis, however, within their definition of this they also state that they excluded participants from the analysis for other reasons. 3/20 (15%) participants in intervention and 5/20 (25%) in control were excluded as they did not complete the training protocol by intervention completion. However, 2 of these participants in the intervention arm were excluded based on eligibility criteria (diagnosed with atypical Parkinson's; changed medication) and 1 in the control arm were excluded as they started another high intensity rehabilitation training program. Together, this would have substantially impacted results.)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Missing outcome data for 3/20 (15%) participants in intervention and 5/20 (25%) in control at post-intervention (8 weeks) due to change of medication (n=1 intervention), diagnosis of atypical Parkinson's (n=1 intervention), health issues not related to training (n=1 intervention, n=3 control), transport issues (n=1 control), started another high intensity rehabilitation training programme (n=1) and for 3/20 (15%) and 4/20 (20%) in intervention and control, respectively at 12 weeks follow-up due to health problems not related to training (n=1 each arm), not willing to participate (n=1 in each arm), transport issues (n=1 intervention), not available at this time point (n=2 control). No methods to control for missingness and outcome data missing due to health concerns could depend on true value with large and differing proportions of missing data between groups on this basis.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Trial registered on clinicaltrials.gov which was reported to be delayed in registration until enrolment of first participant due to administrative error. Trial only lists primary outcome. Study protocol available as supplementary material to the publication. The study originally intended to use BBS and replaced this with FAB after ethical approval. Reported reason for change in the study publication was due to reduced ceiling effect and assessment of reactive postural control. Otherwise, the specific outcome measures were not listed in the protocol nor was there a detailed analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg Balance Scale; FAB: Fullerton advanced balance; N/n: number of participants

Solaro, 2020

Bibliographic Reference	Solaro, Claudio; Cattaneo, Davide; Basteris, Angelo; Carpinella, Ilaria; De Luca, Alice; Mueller, Margit; Bertoni, Rita; Ferrarin, Maurizio; Sanguineti, Vittorio; Haptic vs sensorimotor training in the treatment of upper limb dysfunction in multiple sclerosis: A multi-center, randomised controlled trial.; Journal of the neurological sciences; 2020; vol. 412; 116743

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	January 2013 - December 2015
Inclusion criteria	- Both sexes, - Age >18 years, - Definite multiple sclerosis, - No relapses or Expanded Disability Status Scale worsening >1 point in last 3 months with Expanded Disability Status Scale <7.5, - Ashworth score <2 in upper limb, - 9HPT between 30 and 180 seconds,

	- Right hand dominance, - Mini-Mental State Examination above 24.
Exclusion criteria	- Previous treatment with robot-assisted exercise, - Presence of severe nystagmus, - Visual acuity <4/10 (evaluated using Eye Chart 16 lines), - Major orthopaedic disorders.
Patient characteristics	N=41 adults with multiple sclerosis - Robot-based haptic training: n=20 - Sensorimotor training: n=21 Age in years [Mean (SD)]: - Robot-based haptic training: 53 (10) - Sensorimotor training: 46 (10) Sex (M/F): - Robot-based haptic training: n=8/n=12 - Sensorimotor training: n=9/n=12 Time since diagnosis in years [Mean (SD)]: - Robot-based haptic training: 15 (10)

	- Sensorimotor training: 13 (8) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Robot-based haptic training Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training Delivery setting: Neurology unit Number/frequency of sessions: 2x 40-minute sessions per week Duration: 4 weeks Practitioner(s): Neurologist The Haptic group's task was similar to the Sensorimotor group's but involved moving a virtual point mass connected to their hand by a linear spring. Subjects moved the point mass to the target area as quickly as possible. The difficulty was determined by the stiffness of the virtual spring: higher stiffness made the task more difficult than simple reaching, while an additional spring between the hand and the starting point created resistance to challenge muscle weakness. The robot rendered the forces from both springs. Difficulty could be adjusted by varying the spring stiffness. The stiffness values were constant throughout each session, with an adaptation procedure at the beginning. A performance score (0-10), based on movement duration and path length, was displayed after each movement. **Control** Name: Sensorimotor training Protocol description: Placebo (placebo) Delivery setting: Neurology unit Number/frequency of sessions: 2x 40-minute sessions per week

	Duration: 4 weeks Practitioner(s): Neurologist Participants sat on a chair and grasped the manipulandum handle with their most affected hand. Participants performed fast and accurate reaching movements toward targets (displayed as green circles on a black background, ∅ 2 centimetres) arranged in an equilateral triangle (side length: 22.5 centimetres), covering six directions (0°, 60°, 120°, 180°, 240°, 300°). The current hand position was displayed as a red circle (∅ 1 centimetre)), while the manipulandum only recorded hand movements without generating forces. The task was successfully completed when the virtual mass remained on the target for at least 150 milliseconds. If a subject couldn't reach the target within 7 seconds, the robot completed the movement. A performance score (0-10) based on movement duration and path length was displayed at the end of each movement.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=41 - Robot-based haptic training: n=20 - Sensorimotor training: n=21
Other information	9HPT and ARAT scores reported in the article as mean (SE). Converted to mean (SD) using agreed calculations for this report. Outcomes also measured at 2 months follow-up but presented graphically and could not be reliably extracted.

ARAT: action research arm test; N/n: number of participants; SE: standard error; SD: standard deviation; 9HPT: 9 hole peg test

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Robot-based haptic training versus sensorimotor training: Limb/joint/muscle function

Upper limb function as measured by ARAT - Polarity - Higher values are better

Hand function as measured by 9HPT - Polarity - Lower values are better

Outcome	Robot-based haptic training, Post-intervention vs Baseline, N = 19	Sensorimotor training, Post-intervention vs Baseline, N = 17
ARAT Mean (SD)	3 (3.12)	2 (3.11)
9HPT Mean (SD)	-13 (27.03)	-5 (18.65)

ARAT: action research arm test; N/n: number of participants; SD: standard deviation; 9HPT: 9 hole peg test

Robot-based haptic training versus sensorimotor training: Limb/joint/muscle function

Hand function as measured by 9HPT - Polarity - Higher values are better

Hand function as measured by 9HPT - Polarity - Higher values are better

Hand function as measured by 9HPT - Polarity - Lower values are better

Outcome	Robot-based haptic training, Post-intervention, N = 19	Sensorimotor training, Post-intervention, N = 17
9HPT Improvers (decrease in scores after treatment)	n = 15; % = 79	n = 10; % = 59

Outcome	Robot-based haptic training, Post-intervention, N = 19	Sensorimotor training, Post-intervention, N = 17
No of events		
9HPT Responders (decrease of at least 20% in 9HPT score) No of events	n = 6; % = 32	n = 3; % = 18
9HPT Worsening (increase in scores after treatment) No of events	n = 4; % = 21	n = 7; % = 41

N/n: number of participants; SD: standard deviation; 9HPT: 9 hole peg test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Computer-generated randomly permuted blocks scheme. No information on allocation concealment. No differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and personnel were not aware of interventions allocated, there were no deviations from intended interventions. A per-protocol analysis was used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(1/20 (5%) and 4/21 (19%) of participants in the intervention and control groups, respectively were lost to follow-up at the post-intervention time-point;* loss to follow-up n*ot* balanced s*uch that all results were probably biased by*

Section	Question	Answer
		missing data; There is no information on whether missingness depends on true value nor were any methods employed to investigate missing data.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

ARAT: action research arm test; 9HPT: 9 hole peg test

Song, 2018

Bibliographic Reference	Song, Jooeun; Paul, Serene S; Caetano, Maria Joana D; Smith, Stuart; Dibble, Leland E; Love, Rachelle; Schoene, Daniel; Menant, Jasmine C; Sherrington, Cathie; Lord, Stephen R; Canning, Colleen G; Allen, Natalie E; Home-based step training using videogame technology in people with Parkinson's disease: a single-blinded randomised controlled trial.; Clinical rehabilitation; 2018; vol. 32 (no. 3); 299-311

Study details

Country/ies where study was carried out	Australia

Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosis of idiopathic Parkinson's disease by a neurologist, - Living in the community, - Age 40 years or above, - Could walk without assistance for ≥30 metres, - Consistent Parkinson's disease medication for minimum 2-weeks.
Exclusion criteria	- High cognitive impairment with Mini-Mental State Examination Score lower than 24, - Medical conditions preventing physical assessment or stepping training.
Patient characteristics	N=60 adults with idiopathic Parkinson's disease - Exergame-based step training: n=31 - Usual care: n=29 Age in years [Mean (SD)]: - Exergame-based step training: 68 (7) - Usual care: 65 (7) Sex (M/F): - Exergame-based step training: n=15/n=16 - Usual care: n=9/n=20

	Time since diagnosis in years [Mean (SD)]: - Exergame-based step training: 7 (4) - Usual care: 9 (6) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Exergame-based step training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Home based, community Number/frequency of sessions: 3x per week Duration: 12 weeks Practitioner(s): Physiotherapist Exergame (Dance Dance Revolution "Stepmania") for minimum 15-minutes per session. Participants were given a small computer to link to their television or monitor and a customised step mat with 6 arrows (right, left, two front and back) and two middle panels to stand on once completing step sequences. Participants needed to be on the "ON" phase of medication whilst playing and were to match direction and timing of arrows from the television screen. Three types of randomly shown targets also appeared during the game to increase cognitive load. This involved immediate response steps, holding a step, or avoiding a particular step. On screen feedback was provided after each step and points appeared after each game. Each game lasted 2- to 3-minutes and optional music was not syncronised to the game to avoid auditory cues. There were 4 levels of difficulty and all participants started with the easy level. Physiotherapists visited in the first 2 sessions to teach the game and adjust difficulty level and then 6-weeks later to check progress. They also phoned participants every two weeks to check-in. Participants recorded exercise and adverse events in a log book. **Control**

	Name: Usual care Protocol description: Control (usual care) Delivery setting: Community Number/frequency of sessions: Not applicable Duration: 12 weeks Practitioner(s): Not applicable No intervention was received by participants and they were asked to continue usual healthcare.
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=60 - Exergame-based step training: n=31 - Usual care: n=29

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Exergame-based step training versus usual care: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by FGA - Polarity - Higher values are better

Outcome	Exergame-based step training, Post-intervention vs Baseline, N = 28	Usual care, Post-intervention vs Baseline, N = 25
TUG Mean (SD)	0.41 (1.21)	-0.5 (1.54)
FGA Mean (SD)	-0.4 (3.6)	-1.2 (2.8)

FGA: functional gait assessment; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation by computer-generated table with randomly blocks, and allocation sent via email to the trial manager and physiotherapist administering the training. No statistically significant differences between groups on baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were not blinded to allocation. Appropriate modified intention-to-treat analysis applied and although one participant in the intervention group that found the intervention too difficult did not adhere to protocol (family member instead provided instruction to step on random places on the mat), there are no reasons to indicate deviations from allocations due to trial context.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Missing outcome data for 3/31 (10%) in the intervention arm and 4/29 (14%) in*

Section	Question	Answer
		the comparator arm. Reasons for missing outcome data in the intervention group were not clear as the study did not differentiate reasons between participants that did and did not contribute outcome data to the analysis (all reasons cited were death (n=2), lower back pain exacerbated during training but reported to not be due to stepping exercise (n=2), knee injury from fall external to training (n=1), family challenges (n=1). Reasons for missing outcome data in the control arm were only provided for one participant lost to follow-up, which was due to ankle injury. No methods were undertaken to investigate missingness. It is unclear whether missingness in outcome depends on true value for the control arm.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome measurement appropriate and assessors were blinded to allocation at each time point.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(For outcomes and data of interest, pre-specified protocol contains adequate information and all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of partiicpants

Steib, 2017

Bibliographic Reference	Steib, Simon; Klamroth, Sarah; Gasner, Heiko; Pasluosta, Cristian; Eskofier, Bjorn; Winkler, Jurgen; Klucken, Jochen; Pfeifer, Klaus; Perturbation During Treadmill Training Improves Dynamic Balance and Gait in Parkinson's Disease: A Single-Blind Randomized Controlled Pilot Trial.; Neurorehabilitation and neural repair; 2017; vol. 31 (no. 8); 758-768

Study details

Country/ies where study was carried out	Germany
Study type	Randomised controlled trial (RCT)
Study dates	May 2014 - July 2016
Inclusion criteria	- Diagnosis of idiopathic Parkinson’s disease, - The Hoehn and Yahr stages 1 to 3.5, - The Unified Parkinson's Disease Rating Scale-III "gait" and/or "postural stability" subscore ≥1, - Ability to walk independently without an assistive device.
Exclusion criteria	- Diagnosed with a neurological disease other than Parkinson’s disease, - Severe cardiovascular or orthopedic condition affecting assessments or intervention, - Cognitive impairment preventing following instructions, - Major change in medication during the training period.
Patient characteristics	N=43 adults with idiopathic Parkinson’s disease - Perturbation treadmill training: n=21 - Conventional treadmill training: n=22 Age in years [Mean (SD)]: - Perturbation treadmill training: 67.6 (8.2) - Conventional treadmill training: 62.5 (7.9)

	Sex (M/F): - Perturbation treadmill training: n=11/n=7 - Conventional treadmill training: n=16/n=4 Time since diagnosis in years [Mean (SD)]: - Perturbation treadmill training: 7.9 (4.0) - Conventional treadmill training: 7.3 (4.4) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed at post-intervention (n=18 perturbation treadmill training and n=20 for conventional treadmill training).
Intervention(s)/control	**Intervention** Name: Perturbation treadmill training Protocol intervention group: Rehabilitation interventions to address stability – Perturbation training Delivery setting: Movement Disorder Unit and the Institute of Sport Science and Sport Number/frequency of sessions: 2x 40-minute session per week Duration: 8 weeks Practitioner(s): Physiotherapist Thirty-minutes of perturbation treadmill training with 5-minutes each of warm up and cooldown (non-perturbated treadmill walking). A standard medical treadmill (Mercury, h/p/cosmos medical GmbH) with handrails was mounted on a tiltable platform (zebris Medical GmbH) with 3 pneumatic actuators, inducing small, audible, three-dimensional tilting

	movements. These movements perturb the participant's balance during walking. Participants were secured with a safety harness and received a familiarisation session before the first training. They were encouraged to walk with minimal handrail support. Treadmill speed was individually adjusted based on self-perceived exertion (Borg 6-20 scale; target range 12-15) and difficulty (Likert scale 1-7; target ≤5). Instructions and feedback from therapists were limited to step length, heel strike, arm swing, and posture. One of these four instructions was given every 10-minutes, with a maximum of 3 instructions during the 30-minute training session. **Control** Name: Conventional treadmill training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Movement Disorder Unit and the Institute of Sport Science and Sport Number/frequency of sessions: 2x 40-minute session per week Duration: 8 weeks Practitioner(s): Physiotherapist Thirty-minutes of treadmill training with 5-minutes each of warm up and cooldown. Participants in the control group walked on the same treadmill device but without perturbations.
Duration of follow-up	3 months follow-up (5 months from baseline)
Sources of funding	Not industry funded
Sample size	N=43 - Perturbation treadmill training: n=21 - Conventional treadmill training: n=22

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (8-weeks from baseline)
- 3 months follow-up (5 months from baseline)

Perturbation treadmill training versus conventional treadmill training: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by Mini-BESTest - Polarity - Higher values are better

Outcome	Perturbation treadmill training, Post-intervention vs Baseline, N = 18	Perturbation treadmill training, 3 months follow-up vs Baseline, N = 16	Conventional treadmill training, Post-intervention vs Baseline, N = 20	Conventional treadmill training, 3 months follow-up vs Baseline, N = 19
TUG Mean (SD)	-0.8 (1.6)	-0.4 (2.9)	0.3 (1.2)	0.5 (2)
Mini-BESTest Mean (SD)	0.6 (2.4)	-0.1 (3)	-0.3 (1.5)	-0.9 (2.5)

Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Perturbation treadmill training versus conventional treadmill training: Exercise capacity

Exercise capacity as measured by 2MWT - Polarity - Higher values are better

Outcome	Perturbation treadmill training, Post-intervention vs Baseline, N = 18	Perturbation treadmill training, 3 months follow-up vs Baseline, N = 16	Conventional treadmill training, Post-intervention vs Baseline, N = 20	Conventional treadmill training, 3 months follow-up vs Baseline, N = 19
2MWT Mean (SD)	6.4 (12.2)	7.6 (28.7)	-1.9 (19.9)	-2 (27)

N/n: number of participants; SD: standard deviation; 2MWT: 2 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer-generated block randomisation (block size of 6) was used and allocation concealment preserved. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Personnel and participants were probably aware of interventions allocated. 12/21 (57.1%) of participants in the perturbation group disclosed their group allocation during the visits. 1/22 (4.5%) participants received control instead of experimental condition due to orthopaedic advice. A naïve per-protocol analysis was used.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(3/21 (14.3%) and 2/22 (9.1%) of participants in the intervention and control groups, respectively were not analysed post-intervention (Reasons for intervention: medication change (n=1), injurious fall at night (n=1) and increase of pre-existing back pain during training (n=1); reasons for control: medical conditions such as leukemia diagnosis (n=1), transient ischemic attack at home (n=1)), and 2/21 (9.5%) and 1/22 (4.5%) at 3 months follow-up due to*

Section	Question	Answer
		assessment not possible because of current health condition (intervention and patient unavailable (control).. Missingness could depend on true value; methods to explore missingness were not undertaken.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation..)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Pre-specified analysis plan was published; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Straudi, 2013

Bibliographic Reference	Straudi, S; Benedetti, M G; Venturini, E; Manca, M; Foti, C; Basaglia, N; Does robot-assisted gait training ameliorate gait abnormalities in multiple sclerosis? A pilot randomized-control trial.; NeuroRehabilitation; 2013; vol. 33 (no. 4); 555-63

Study details

Country/ies where study was carried out	Italy

Study type	Randomised controlled trial (RCT)
Study dates	October 2009 - May 2011
Inclusion criteria	- Diagnosed with primary or secondary progressive or relapse remitting multiple sclerosis, - Males and females, - Aged 18 and above, - No relapse in the past 6 months - Expanded Disability Status Scale score 4.5 to 6.5.
Exclusion criteria	- Other medical condition that impacts motor function, - Impacted cognitive function with Mini-Mental Status Examination score lower than 24.
Patient characteristics	N=18 adults with multiple sclerosis - Robot-assisted gait training (Lokomat): n=9 - Conventional physiotherapy: n=9 Age in years [Mean (SD)]: - Robot-assisted gait training (Lokomat): 49.6 (12.0) - Conventional physiotherapy: 61.0 (8.8) Sex (M/F): - Robot-assisted gait training (Lokomat): n=4/n=4 - Conventional physiotherapy: n=1/n=7

	Time since diagnosis in years [Mean (SD)]: - Robot-assisted gait training (Lokomat): 17.1 (12.0) - Conventional physiotherapy: 18.6 (10.8) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=8 per arm)
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training (Lokomat) Intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Not reported Number/frequency of sessions: 2x per week Duration: 6-weeks Practitioner(s): Not reported Participants walked on a treadmill with assistance of Lokomat robotic-driven gait orthosis and wore a harness for bodyweight support. Sessions were 1-hour in length with half consisting of real walking time. Knee and hip torque was adjusted from 100 to 0% for 1 or both legs. Treadmill speed ranged from 0 to 3 kilometres per hour and bodyweight support ranged from 0 to 100%. Speed and bodyweight support was adjusted based on individual performance. **Control** Name: Conventional physiotherapy Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient

	Number/frequency of sessions: 2x per week Duration: 6-weeks Practitioner(s): Not reported One-hour sessions of outpatient conventional therapy whereby the initial 10- to 15-minutes was for lower-limb and core stretching exercises and then followed by lower-limb muscle strengthening exercises adjusted according to individual. Gait, coordination and balance exercises were optional during sessions.
Duration of follow-up	6 weeks follow-up (12-weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=18 - Robot-assisted gait training (Lokomat): n=9 - Conventional physiotherapy: n=9

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6-weeks from baseline)
- 6-weeks follow-up (12-weeks from baseline)

Robot-assisted gait training (Lokomat) versus conventional physiotherapy: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Robot-assisted gait training (Lokomat), Post-intervention vs Baseline, N = 8	Robot-assisted gait training (Lokomat), 6-weeks follow-up vs Baseline, N = 8	Conventional physiotherapy, Post-intervention vs Baseline, N = 8	Conventional physiotherapy, 6-weeks follow-up vs Baseline, N = 8
TUG Mean (SD)	-5.9 (10)	-5.5 (11.9)	0.6 (2.4)	0.7 (2.3)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Robot-assisted gait training (Lokomat) versus conventional physiotherapy: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training (Lokomat), Post-intervention vs Baseline, N = 8	Robot-assisted gait training (Lokomat), 6-weeks follow-up vs Baseline, N = 8	Conventional physiotherapy, Post-intervention vs Baseline, N = 8	Conventional physiotherapy, 6-weeks follow-up vs Baseline, N = 8
6MWT Mean (SD)	33.2 (25.1)	32.1 (26.2)	-0.7 (31.4)	-3.8 (32.9)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Study reports stratified randomisation was performed with no further*

Section	Question	Answer
		information provided. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and practitioners were aware of the interventions and no deviations arising from the experimental context were apparent. Modified intention-to-treat was used appropriately.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data was not available for n=1/8 (12%) in each arm with reasons for loss to follow-up unlikely to be related to outcome (n=1 in intervention due to medical issues not related to multiple sclerosis and n=1 in control arm withdrawal for personal reasons).)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Straudi, 2016

Bibliographic Reference	Straudi, Sofia; Fanciullacci, Chiara; Martinuzzi, Carlotta; Pavarelli, Claudia; Rossi, Bruno; Chisari, Carmelo; Basaglia, Nino; The effects of robot-assisted gait training in progressive multiple sclerosis: A randomized controlled trial.; Multiple sclerosis (Houndmills, Basingstoke, England); 2016; vol. 22 (no. 3); 373-84

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Aged 18 or over, - Diagnosed with primary or secondary progressive multiple sclerosis based on McDonald criteria, - Major disruption to gate based on Expanded Disability Status Scale rating 6.0 to 7.0.
Exclusion criteria	- Other neurological conditions, - Major medical medical conditions, - Issues with cognitive functioning with Mini-Mental Status Examination scoring lower than than 24.
Patient characteristics	N=58 adults with primary or secondary progressive multiple sclerosis - Robot-assisted gait training (Lokomat): n=30 - Conventional walking therapy: n=28 Age in years [Mean (SD)]:

	- Robot-assisted gait training (Lokomat): 52.26 (11.11) - Conventional walking therapy: 54.12 (11.44) Sex (M/F): - Robot-assisted gait training (Lokomat): n=10/n=17 - Conventional walking therapy: n=8/n=17 Time since diagnosis in years [Mean (SD)]: - Robot-assisted gait training (Lokomat): 13.30 (6.55) - Conventional walking therapy: 17.77 (8.66) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported n=27 participants for robot-assisted gait training (Lokomat) and n=25 participants for conventional walking therapy.
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training (Lokomat) Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Not reported Number/frequency of sessions: 2x per week Duration: 6 weeks Practitioner(s): Not reported

	Participants walked on a treadmill with assistance of Lokomat robotic-driven gait orthosis and wore a harness for bodyweight support. Sessions were 1 hour in length with half used as walking time. Knee and hip torque was adjusted from 100 to 0% for 1 or both legs (Set to 100% for first sessions). Treadmill speed ranged from 0 to 3 kilometres per hour and bodyweight support ranged from 0 to 100%. Bodyweight support was initially set to 50%. Speed and bodyweight support was adjusted by 10% at each session based on individual performance. **Control** Name: Conventional walking therapy Protocol description: Control (standard rehabilitation care alone) Delivery setting: Not reported Number/frequency of sessions: 2x per week Duration: 6 weeks Practitioner(s): Not reported Participants underwent 1-hour of conventional walking therapy with the initial 10- to 15-minutes focused on lower limb and core stretching and then lower limb muscle stretching for 10-minutes, followed by motor coordination and gait and balance exercises for 30-minutes with adjustment to the individual's baseline.
Duration of follow-up	6 weeks follow-up (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=58 - Robot-assisted gait training (Lokomat): n=30 - Conventional walking therapy: n=28
Other information	Outcomes also reported at 3-weeks but not extracted as intervention not completed.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6-weeks from baseline)
- 6-weeks follow-up (12-weeks from baseline)

Robot-assisted gait training (Lokomat) versus conventional walking therapy: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by 10MWT - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Robot-assisted gait training (Lokomat), Post-intervention vs Baseline, N = 25	Robot-assisted gait training (Lokomat), 6-weeks follow-up vs Baseline, N = 25	Conventional walking therapy, Post-intervention vs Baseline, N = 23	Conventional walking therapy, 6-weeks follow-up vs Baseline, N = 23
TUG Mean (SD)	2.66 (13.79)	4.16 (15.3)	-3.96 (10.5)	-3.63 (10.61)
10MWT Mean (SD)	0.07 (0.15)	0.03 (0.15)	0.01 (0.1)	-0.02 (0.11)
BBS Mean (SD)	3.24 (4.99)	1.72 (6.05)	0.87 (6.45)	-0.17 (6.04)

BBS: Berg balance scale; m/s: metres per second; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; 10MWT: 10 metre walk test

Robot-assisted gait training (Lokomat) versus conventional walking therapy: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training (Lokomat), Post-intervention vs Baseline, N = 25	Robot-assisted gait training (Lokomat), 6-weeks follow-up vs Baseline, N = 25	Conventional walking therapy, Post-intervention vs Baseline, N = 23	Conventional walking therapy, 6-weeks follow-up vs Baseline, N = 23
6MWT Mean (SD)	23.22 (32.23)	10.64 (35.07)	-0.75 (26.4)	4.51 (33.59)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Stratified randomisation based on severity of gait and then block randomisation of 4 within each stratum (Expanded Disability Status Scale rating: scores 6, 6.5, and 7). Separate random lists were generated via randomisation generator website for the 2 centres and managed by an administrator external to the research groups to prevent selection bias. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and practitioners were aware of allocation, however, there was no indication of deviations from protocol and analysis was modified intention-to-treat.)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Last observation carried forward methods used for multiple imputation towards modified intention-to-treat analysis, which is unlikely to remove bias as this includes data for participants that were too weak to do functional tests (n=2/30, 6% in intervention and n=2/28, 7% in control arm). Authors also compare modified and full intention-to-treat analysis, with full intention-to-treat analysis assuming poor outcome (worst-case scenario) for drop-outs. This was only presented for primary outcomes and given the modified intention-to-treat reasons above, unable to determine true extent of the difference between results of the two analyses.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	High *(6MWT, BBS, TUG (some concerns): Published protocol available online but with minimal detail provided on analysis plan. 10MWT (high): Intention-to-treat results were reported for 6MWT but not 10MWT, despite methods stating this analysis would be carried out on both outcome categories.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; N/n: number of participants; TUG: timed up and go test; 10MWT: 10 metre walk test; 6MWT: 6 minute walk test

Straudi, 2020

Bibliographic Reference	Straudi, Sofia; Manfredini, Fabio; Lamberti, Nicola; Martinuzzi, Carlotta; Maietti, Elisa; Basaglia, Nino; Robot-assisted gait training is not superior to intensive overground walking in multiple sclerosis with severe disability (the RAGTIME study): A randomized controlled trial.; Multiple sclerosis (Houndmills, Basingstoke, England); 2020; vol. 26 (no. 6); 716-724

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Men and women, - Aged 18 to 65, - Diagnosed with primary or secondary progressive multiple sclerosis, - Major disruption to gate based on Expanded Disability Status Scale rating 6.0 to 7.0.
Exclusion criteria	- Unable to undertake the timed 25-foot walk test, - Decline of multiple sclerosis in the prior 3 months to intervention, - Modified Ashworth score of lower than 3, - Clinical conditions other than multiple sclerosis that could impede the completion of the protocol in a safe manner, - Issues with cognitive functioning with Mini-Mental Status Examination scoring lower than than 24, - Changes to medication during the study, - Rehabilitation treatment, - Botulinum toxin injections in the 3 months prior to the study.

Patient characteristics	N=72 adults with primary or secondary progressive multiple sclerosis - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: n=36 - Overground walking therapy plus stretching and strengthening exercises: n=36 Age in years [Mean (SD)]: - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: 56 (11) - Overground walking therapy plus stretching and strengthening exercises: 55 (11) Sex (M/F): - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: n=12/n=24 - Overground walking therapy plus stretching and strengthening exercises: n=11/n=25 Time since diagnosis in months [Mean (SD) not reported] [Median (IQR)] - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: 12 (6-19) - Overground walking therapy plus stretching and strengthening exercises: 18 (19-25) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises Protocol intervention group: Rehabilitation interventions to address mobility – Gait training

	Delivery setting: Not reported Number/frequency of sessions: 12 sessions, frequency not reported Duration: 4 weeks Practitioner(s): Physiotherapist Participants underwent up to 60-minutes of their allocated training and then, common to both arms, 1-hour of lower limb and core stretching exercises as well as lower limbs strengthening exercises. For the intervention, participants walked on a treadmill with assistance of Lokomat robotic-driven gait orthosis. The session ran for 40-minutes including set up time and familiarisation with about 30-minutes of real walking time. Participants wore a harness for bodyweight support. Knee and hip torque was adjusted from 100 to 0% for 1 or both legs (Set to 100% for first sessions). Treadmill speed ranged from 0 to 3 kilometres per hour and bodyweight support ranged from 0 to 100%. Bodyweight support was initially set to 50%. Speed and bodyweight support was adjusted by 10% at each session based on individual performance. **Control** Name: Overground walking therapy plus stretching and strengthening exercises Protocol description: Control (standard rehabilitation care alone) Delivery setting: Indoors, no further information Number/frequency of sessions: 12 sessions, frequency not reported Duration: 4 weeks Practitioner(s): Physiotherapist One-on-one physiotherapy sessions including overground walking for about 40-minutes as well as 10-minutes of warm up and cool-down. Participants walked without along an 80 metre corridor with no incline using their usual walking aid. Rest pauses were allowed and gait speed was based on individual tolerance. Afterwards participants underwent the 60-minute session common to both arms as described above.
Duration of follow-up	3 months follow-up (4 months from baseline)
Sources of funding	Not industry funded

Sample size	N=72 - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises: n=36 - Overground walking therapy plus stretching and strengthening exercises: n=36
Other information	Outcomes also reported after 6 sessions but not extracted as intervention not completed. Outcomes reported in the article as mean (95% CI). Converted to mean (SD) using agreed calculations for this report.

CI: confidence interval; IQR: interquartile range; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)
- 3 months follow-up (4 months from baseline)

Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises versus overground walking therapy plus stretching and strengthening exercises: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait as measured by T25FWT - Polarity - Higher values are better

Gait as measured by MSWS-12 - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises, Post-intervention vs Baseline, N = 36	Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises, 3 months follow-up vs Baseline, N = 36	Overground walking therapy plus stretching and strengthening exercises, Post-intervention vs Baseline, N = 36	Overground walking therapy plus stretching and strengthening exercises, 3 months follow-up vs Baseline, N = 36
TUG Mean (SD)	1.3 (23.19)	7.1 (30.42)	-6.3 (28.43)	0 (28.6)
T25FWT Mean (SD)	0.05 (0.24)	0.02 (0.24)	0.06 (0.29)	0.03 (0.29)
MSWS-12 Mean (SD)	-8 (14.89)	0 (14.18)	-10 (17.3)	-4 (16.72)
BBS Mean (SD)	3 (10.02)	0 (10.45)	2 (10.02)	0 (10.45)

BBS: Berg balance scale; m/s: metres per second; MSWS-12: multiple sclerosis walking scale-12; N/n: number of participants; SD: standard deviation; TUG: timed up and go test; T25FWT: timed 25 foot walk test

Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises versus overground walking therapy plus stretching and strengthening exercises: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises, Post-intervention vs Baseline, N = 36	Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises, 3 months follow-up vs Baseline, N = 36	Overground walking therapy plus stretching and strengthening exercises, Post-intervention vs Baseline, N = 36	Overground walking therapy plus stretching and strengthening exercises, 3 months follow-up vs Baseline, N = 36
6MWT Mean (SD)	19 (73.41)	5 (70.5)	14 (84.4)	0 (81.5)

N/n: number of participants; SD: standard deviation; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Restricted randomisation with stratification by Expanded Disability Status Scale and computer-generated central allocation run by an external administrator. There were no statistically significant baseline differences between groups.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and practitioners were aware of allocation, however, there was no indication of deviations from protocol and analysis was modified intention-to-treat)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Authors conduct multiple imputation to address missing outcome data for all participants without outcome data, however, do not provide justification for variables included nor elaborate upon the form of imputation model used. As 6/36 (17%) in the control arm had missing outcome data with the majority related to disease status, the assumptions would need to be known. Authors do compare an intention-to-treat and per-protocol analyses of outcomes,*

Section	Question	Answer
		however, do not provide data for secondary outcomes and without detail of intention-to-treat imputation methodology, the true extent of the difference between results of the two analyses is unclear.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(All measures validated and commonly used tools. MSWS-12 (some concerns): Likely that assessment outcome could be influenced by knowledge of allocation as is a self-reported measure by unblinded participants and control is an active intervention which lowers the risk of bias. BBS, TUG, T25FT and 6MWT (low): Outcome assessors were blind to allocation such that objective measurements of distance time, and so on were unlikely influenced by knowledge of intervention received.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Published pre-specified protocol available with analysis plan; all relevant scales, time points reported. The data for per-protocol analyses was not provided for BBS, MSWS-12, TUG and 6MWT (to compare with intention-to-treat outcomes) and it is only written in text by authors that results were comparable.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; m/s: metres per second; MSWS-12: multiple sclerosis walking scale-12; TUG: timed up and go test; 6MWT: 6 minute walk test

Szefler-Derela, 2020

Bibliographic Reference	Szefler-Derela, J; Arkuszewski, M; Knapik, A; Wasiuk-Zowada, D; Gorzkowska, A; Krzystanek, E; Effectiveness of 6-Week Nordic Walking Training on Functional Performance, Gait Quality, and Quality of Life in Parkinson's Disease; Medicina (Kaunas, Lithuania); 2020; vol. 56 (no. 7)

Study details

Country/ies where study was carried out	Poland
Study type	Randomised controlled trial (RCT)
Study dates	2013 - 2014
Inclusion criteria	- Idiopathic Parkinson’s disease with diagnosis based on UK Parkinson’s Disease Society Brain Bank criteria, - Hoehn and Yahr disease stages 2 to 3, - Selection of participant from outpatients' database in the centre in which the study as conducted,
Exclusion criteria	- Those with a score of less than 24 on the Mini-Mental State Examination, - Severe motor fluctuations and freezing, - Orthostatic hypotension, - Disabling dyskinesia, - Severe depression, - Medical conditions greatly impacting on mobility and being able to exercise., - No prior rehabilitation, - No changes to medication for Parkinson’s disease within the 4 weeks before enrolment, - Optimised medication treatment for Parkinson’s disease.

Patient characteristics	N=40 adults with idiopathic Parkinson's disease - Nordic walking training: n=20 - Standard rehabilitation: n=20 Age in years [Mean (SD) not reported] [Median (range)] - Nordic Walking training: 62.5 (50–75) - Standard rehabilitation: 65.5 (54–75) Sex (M/F): - Nordic Walking training: n=10/n=10 - Standard rehabilitation: n=10/n=10 Time since diagnosis in months [Mean (SD) not reported] [Median (range)] - Nordic Walking training: 6.0 (3 to 18) - Standard rehabilitation: 5.0 (2 to 14) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Nordic walking training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training

	Delivery setting: Outdoors (park) Number/frequency of sessions: 2x per week totalling 12 sessions Duration: 6 weeks Practitioner(s): Physiotherapist qualified in Nordic Walking Each Nordic Walking session was 90-minutes in length with 5-10 minutes of warm-up, Nordic Walking training for 60-minutes which involved training to increase walking intensity and distance, and then cool down with stretching for 5-10 minutes. **Control** Name: Standard rehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Indoors (rehabilitation facility) Number/frequency of sessions: 2x per week totalling 12 sessions Duration: 6 weeks Practitioner(s): Physiotherapist Standard rehabilitation sessions were held for 45-minutes with personalised, standard, general exercises for fine and gross motor skills in addition to active exercises to increase muscle strength, flexibility, balance, gait and transfers.
Duration of follow-up	Post-intervention (6 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=40 - Nordic Walking training: n=20 - Standard rehabilitation: n=20

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6 weeks from baseline)

Nordic Walking training versus standard rehabilitation: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Gait and balance as measured by DGI - Polarity - Higher values are better

Outcome	Nordic Walking training, Post-intervention vs Baseline, N = 20	Standard rehabilitation, Post-intervention vs Baseline, N = 20
TUG Median (IQR)	-0.96 (-2.75 to -0.18)	-1.18 (-3.16 to -0.1)
DGI Median (IQR)	8 (NR)	5.5 (NR)

DGI: dynamic gait index scoring form; IQR: interquartile range; N/n: number of participants; NR: not reported; TUG: timed up and go test

Nordic walking training versus standard rehabilitation: Limb/joint/muscle function

Motor functioning as measured by UPDRS III - Polarity - Lower values are better

Outcome	Nordic Walking training, Post-intervention vs Baseline, N = 20	Standard rehabilitation, Post-intervention vs Baseline, N = 20
UPDRS III Median (IQR)	-8.5 (NR)	-6 (NR)

N/n: number of participants; NR: not reported; IQR: interquartile range; UPDRS III: unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Study reports random assignment controlling for gender with no further detail provided. Baseline characteristics were comparable with no statistically significant differences between arms.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and those delivering the intervention/comparator were aware of the allocations, however, there were no apparent deviations from intended interventions due to the trial context and an appropriate intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data were reported for all participants randomised.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation at each time point.)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.. Not all interquartile ranges are reported in text, although are available in graphical form.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Szymura, 2020

Bibliographic Reference	Szymura, Jadwiga; Kubica, Jadwiga; Wiecek, Magdalena; Pera, Joanna; The Immunomodulary Effects of Systematic Exercise in Older Adults and People with Parkinson's Disease.; Journal of clinical medicine; 2020; vol. 9 (no. 1)

Study details

Country/ies where study was carried out	Poland
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Aged 60 years or older, - Diagnosis of idiopathic Parkinson's disease (Hoehn and Yahr stage 2 to 3),

	- No changes in medication in month preceding study, - No orthopaedic conditions limiting physical exercise or deep brain stimulation surgery, - Independent gait, and physical fitness enabling participation in training.
Exclusion criteria	- Lack of informed consent to participate in the study, - Musculoskeletal injuries or prostheses, - Diabetes, - Diagnosed dementia (Mini-Mental State Examination score lower than 25), - Previous stroke or severe traumatic brain injury, - Other central nervous system diseases, - Participation in regular physical exercise.
Patient characteristics	N=29 adults with idiopathic Parkinson's disease - Moderate-intensity balance exercises: n=16 - Waitlist control: n=13 Age in years [Mean (SD)]: - Moderate-intensity balance exercises: 66.00 (2.59) - Waitlist control: 65.23 (7.40) Sex (M/F): - Moderate-intensity balance exercises: n=11/n=5

	- Waitlist control: n=8/n=5 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Moderate-intensity balance exercises Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Not reported Number/frequency of sessions: 3x 60-minutes per week totalling 36 sessions Duration: 12 weeks Practitioner(s): Physiotherapist Sessions comprised 5-minutes warm-up, 50-minutes of balance training, and 5 minutes cool down. To allow for adaptation, sessions only lasted for 30-minutes in the first week (with training limited to 20-minutes). **Control** Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s) Not applicable

	Participants with Parkinson's disease that did not receive any intervention during the 12 week intervention period but were able to take part in the balance programme after this period (not assessed in this review).
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=29 - Moderate-intensity balance exercises: n=16 - Waitlist control n=13
Other information	Study included a third and fourth arm investigating intervention and control in n=32 healthy older adult participants. Data not extracted as population not in protocol.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Moderate-intensity balance exercises versus waitlist control: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Outcome	Moderate-intensity balance exercises, Post-intervention vs Baseline, N = 16	Waitlist control, Post-intervention vs Baseline, N = 13
TBG Mean (SD)	1.75 (1.56)	-0.69 (1.86)

N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No details regarding randomisation although concealment methods. Groups appear balanced at baseline (however, significance testing not reported).)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(No information regarding possible deviations; analysis approach not reported, however, 1 participant with Parkinson's disease was excluded from the study and analysis after randomisation due to change in dose of medication (allocation arm unclear, although for each arm, this would lead to >5% excluded such that there is potential for a substantial impact on the result.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data not available for all participants (n=1, allocation arm unclear but would lead to >5% missing in each arm), however, missingness is not related to true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(No information provided about whether outcome assessors were aware of allocation, while there is a possibility that assessment of outcome was influenced by knowledge of intervention received, this was not likely due to the*

Section	Question	Answer
		standardised protocol for assessments and objective nature of tasks performed.)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Taylor, 2014

Bibliographic Reference	Taylor, Paul; Barrett, Catherine; Mann, Geraldine; Wareham, Wendy; Swain, Ian; A feasibility study to investigate the effect of functional electrical stimulation and physiotherapy exercise on the quality of gait of people with multiple sclerosis.; Neuromodulation : journal of the International Neuromodulation Society; 2014; vol. 17 (no. 1); 75-84

Study details

Country/ies where study was carried out	UK
Study type	Cross-over randomised controlled trial
Study dates	Not reported
Inclusion criteria	- People with secondary progressive multiple sclerosis,

	- Extended Disability Scale score equal to 6.5 or less, - One dropped foot impacting gait (defined by the study as reduced dorsiflexion and eversion during swing phase with absent or irregular heel strike), - Weakness in gluteal muscle weakness (defined by study as Medical Research Council scale score equal to 4 or less), - Motor control instability of truck, pelvis, or hip which impairs walking ability, - No previous history of functional electrical stimulation and positive response to common peroneal and gluteal stimulations (defined by study as minimum dorsiflexion to neutral and evidence of hip extension following electrical stimulus).
Exclusion criteria	- Cognitive issues affecting adherence to treatment, - Comorbidities affect gait, - Contra-indicating treatments, - Unable to walk without functional electrical stimulation or ankle-foot orthoses.
Patient characteristics	N=25 adults with secondary progressive multiple sclerosis and one dropped foot - Functional electrical stimulation: n=11 - Core stability physiotherapy programme: n=14 Age in years [Mean (SD)]: - Functional electrical stimulation: 54.6 (9.4) - Core stability physiotherapy programme: 56.9 (7.8) Sex (M/F): - Functional electrical stimulation: n=4/n=8

	- Core stability physiotherapy programme: n=4/n=10 Time since diagnosis in years [Mean (SD)]: - Functional electrical stimulation: 12.2 (8.6) - Core stability physiotherapy programme: 14.5 (7.5) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants enrolled rather than those randomised (n=12 for functional electrical stimulation and n=14 for core stability physiotherapy programme).
Intervention(s)/control	**Intervention** Name: Functional electrical stimulation Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics Delivery setting: In clinic Number/frequency of sessions: Not reported Duration: 12 weeks (common peroneal stimulation - 6 weeks, common peroneal and gluteal stimulation - 6 weeks) Practitioner(s): Not reported Participants received common peroneal stimulation for dropped foot correction for initial 6 weeks, adding gluteal stimulation for hip extension for the last 6 weeks of the intervention period. During peroneal stimulation, self-adhesive skin electrodes were placed over the fibula head of within the popliteal fossa, and over the anterior tibialis muscle. Stimulation began at heel off until just after heel strike gait phases. For gluteal stimulation, the same type of electrodes were placed over the motor points of the gluteus maximus and gluteus medius (or only the gluteus maximus if extension was not needed). Stimulation began at heel strike on the ipsilateral side, through to heel off. Current levels measured 20-100mA to allow functional muscle contraction, pulse width 200 microseconds, frequency 40 Hz.

	Control Name: Core stability physiotherapy programme Protocol description: Control (standard rehabilitation care alone) Delivery setting: In clinic and at home Number/frequency of sessions: Not reported Duration: 12 weeks Practitioner(s): Not reported Participants received 6 in-clinic core physiotherapy sessions, progressing in difficulty. After this, the exercises were continued at home (and difficulty was not progressed during this period). No further details reported.
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=25 - Functional electrical stimulation: n=11 - Core stability physiotherapy and home-based exercise programme: n=14
Other information	Crossover randomised controlled trial design whereby only outcomes from first time period included and analysed. Outcomes at 18 and 24 weeks follow-up have not been reported. Outcomes also reported after 6 weeks but not extracted as intervention not completed. Reporting makes it unclear whether 24/25 (96%) participants were included in the analysis or 20/25 (80%) were. For all reporting in this review, the smaller numbers have been used.

Hz: hertz; mA: milliamperes; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Functional electrical stimulation versus core stability physiotherapy and home-based exercise programme: Gait and balance

Gait and balance as measured by RVGA (with device) - Polarity - Lower values are better

Gait as measured by 10MWT (with device) - Polarity - Higher values are better

Outcome	Functional electrical stimulation, Post-intervention, N = 9	Core stability physiotherapy programme, Post-intervention, N = 11
RVGA (with device) Median (IQR)	12 (8 to 19.5)	16 (15 to 22.5)
10MWT (with device) Median (IQR)	0.79 (0.54 to 1.32)	0.81 (0.44 to 0.94)

IQR: interquartile range; m/s: metres per second; N/n: number of participants; RVGA: Rivermead visual gait assessment; 10MWT: 10 metre walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No information on randomisation sequence or allocation concealment. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(No information on blinding of participants, carers or personnel but nature of intervention and control hard to blind against; no information on deviations from intended intervention due to trial context. Naïve per protocol analysis performed: unclear reporting means not possible to determine whether will impact results - 24/25 (96%) participants completed first period of study (12 weeks) but 20/25 (80%) completed full cross-over study. Paper simply states that those who completed the protocol were included in the analysis, but not if this was at each assessment period.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Extent of missing outcome data is unclear and no methods to control for this. Reasons given for loss to follow-up (loss of mobility) mean that missingness could depend on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Appropriate outcome measurement method, unlikely to differ between groups; outcome assessors not aware of group assignment.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Taylor, 2021

Bibliographic Reference	Taylor, Paul N; Sampson, Trish; Beare, Ben; Donavon-Hall, Maggie; Thomas, Peter W; Marques, Elsa; Strike, Paul; Seary, Coralie; Stevenson, Valerie L; Padiachy, Diran; Lee, James; Nell, Sheila; The effectiveness of peroneal nerve functional electrical simulation for the reduction of bradykinesia in Parkinson's disease: A feasibility study for a randomised control trial.; Clinical rehabilitation; 2021; vol. 35 (no. 4); 546-557

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	2016 - 2017
Inclusion criteria	- Aged 18 years or older, - Idiopathic Parkinson’s disease, - Hoehn and Yahr stages 1 to 4 under medication, - Bradykinesia demonstrated by a 10 metre walking speed below 1.25 milliseconds, - Difficulty with one or more aspects of gait (reduced dorsiflexion or eversion in the swing or weight acceptance phase of gait, akinesia or hypokinesia demonstrated by walking with a short stride length), - Able to walk 10 metres with appropriate walking aids independently, - Able to obtain standing from sitting independently, - Medically stable, - Able to understand and comply with the treatment and assessments.
Exclusion criteria	- Treatments other than standard oral drug therapy, - Untreated or refractory epilepsy (seizure in previous 3 months),

	- Pregnancy, - Active medical implanted devices, - Other neurological conditions known to cause dropped foot, - Severe osteoarticular pathology, malignancy or dermatological conditions in the area of the electrodes, - Major cognitive impairment.
Patient characteristics	N=64 adults with idiopathic Parkinson's disease - Functional electrical stimulation plus standard care: n=32 - Standard care: n=32 Age in years [Mean (SD)]: - Functional electrical stimulation plus standard care: 69.3 (8.7) - Standard care: 71.3 (7.8) Sex (M/F): - Functional electrical stimulation plus standard care: n=23/n=9 - Standard care: n=23/n=9 Time since diagnosis: Not reported Chronic neurological disorder category: Progressive neurological diseases

Intervention(s)/control	**Intervention** Name: Functional electrical stimulation plus standard care Protocol intervention group: Rehabilitation interventions to address mobility – Lower limb wearables, electrical stimulation and lower-body robotics Delivery setting: Clinic then home-based Number/frequency of sessions: Unstructured for intervention, not reported for standard care Duration: 18 weeks Practitioner(s): Physiotherapist or clinical scientist for intervention and specialists nurses, otherwise not reported for standard care Functional electrical stimulation (Odstock Dropped Foot Stimulator - ODFS®Pace) to common peroneal nerve. Participants had the foot stimulator fitted in clinic (to the leg the treating clinician identified as having the greatest deficit in dorsiflexion and eversion) and were shown how to fit it themselves in their own home. Participants did not receive guidance on how often to wear the foot stimulator. Both groups received standard care consisting of medication, attendance at medical clinics, exercise classes or visits from specialist nurses. **Control** Name: Standard care Protocol description: Control (standard rehabilitation care alone) Delivery setting: Not reported Number/frequency of sessions: Not reported Duration: 18 weeks

	Practitioner(s): Specialists nurses, otherwise not reported Both groups received standard care consisting of medication, attendance at medical clinics, exercise classes or visits from specialist nurses.
Duration of follow-up	4 weeks follow-up (22 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=64 - Functional electrical stimulation plus standard care: n=32 - Standard care: n=32
Other information	Outcomes also reported after 6 weeks but not extracted as intervention not completed. Outcome measurements all recorded in the 'ON' phase of Parkinson's disease.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (18 weeks from baseline)
- 4 weeks follow-up (22 weeks from baseline)

Functional electrical stimulation plus standard care versus standard care: Gait and balance

Gait and balance as measured by TUG (without device) - Polarity - Lower values are better

Gait and balance as measured by Mini-BESTest (without device) - Polarity - Higher values are better

Gait as measured by 10MWT (without device) - Polarity - Higher values are better

Outcome	Functional electrical stimulation plus standard care vs Standard care, Post-intervention vs Baseline, N2 = 26, N1 = 25	Functional electrical stimulation plus standard care vs Standard care, 4 weeks follow-up vs Baseline, N2 = 26, N1 = 25
TUG (without device) Mean (95% CI) (adjusted for baseline and site, as per author analysis)	-1.58 (-9.71 to 6.56)	2.37 (-10.07 to 14.82)
Mini-BESTest (without device) Mean (95% CI) (adjusted for baseline and site, as per author analysis)	0.83 (-0.89 to 2.56)	0.83 (-9.3 to 1.97)
10MWT (without device) Mean (95% CI) (adjusted for baseline and site, as per author analysis)	0.14 (0.03 to 0.26)	0.1 (-0.05 to 0.25)

CI: confidence interval; Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; TUG: timed up and go test; 10MWT: 10 metre walk test

Functional electrical stimulation plus standard care versus standard care: Limb/joint/muscle function

Motor functioning as measured by MDS-UPDRS III - Polarity - Lower values are better

Outcome	Functional electrical stimulation plus standard care vs Standard care, Post-intervention vs Baseline, N2 = 26, N1 = 25	Functional electrical stimulation plus standard care vs Standard care, 4 weeks follow-up vs Baseline, N2 = 26, N1 = 25
MDS-UPDRS III (without device) Mean (95% CI) (adjusted for baseline and site, as per author analysis)	-3.65 (-8.97 to 1.67)	-0.91 (-6.21 to 4.4)

CI: confidence interval; N/n: number of participants; MDS-UPDRS III: movement disorder society sponsored revision of unified Parkinson's disease rating scale part 3

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(External, computer-generated randomisation used and the groups appear balanced at baseline (however, significance testing is not reported).)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Although participants and practitioners were not blinded there do not appear to have been any deviations from the intended interventions. Those that dropped out or withdrew during the intervention period (5/32 (15%) in the control arm) and those lost to follow-up were not included in the analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Missing outcome data for a total of 6/32 (19%) in intervention arm and 7/32 (22%) in control arm. Reported reasons at 6 weeks from baseline were due to personal reasons (n=3 control), medication induced psychosis (n=1 control), fractured femur due to fall (n=1 control); from 6-18 weeks since baseline reported reasons were withdrew for personal reasons (n=2 intervention), medication induced psychosis (n=1 intervention), device difficulties (n=1*

Section	Question	Answer
		intervention), did not tolerate intervention sensation (n=1 intervention), increase in Parkinson's disease symptoms (n=1 intervention) and from 18-22 weeks from baseline reported reasons were medical problems unrelated to the study (n=1 control) and increase in Parkinson's disease symptoms (n=1 control). Missingness probably dependent on true value for some missing outcome data (unpleasant sensation, and possibly increase in symptoms). These participants were excluded from the analysis and authors state that imputation approach was not used. No further details regarding methods to control for missing data reported.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Assessor blinding was reported to be maintained for 81% of participants. Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Tollár, 2018

Bibliographic Reference	Tollár, Jozsef; Nagy, Ferenc; Kovacs, Norbert; Hortobagyi, Tibor; A High-Intensity Multicomponent Agility Intervention Improves Parkinson Patients' Clinical and Motor Symptoms.; Archives of physical medicine and rehabilitation; 2018; vol. 99 (no. 12); 2478-2484e1

Study details

Country/ies where study was carried out	Hungary
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	Not reported
Exclusion criteria	- Cognitive impairment (Mini-Mental State Examination score lower than 24), - Depression (Beck's Depression Inventory score above 40), - Severe cardiac disease, - Uncontrolled diabetes, - History of stroke, traumatic brain injury, or seizure disorder, - Current participation in a self-directed or formal exercise program.
Patient characteristics	N=64 adults with Parkinson's disease - Sensorimotor and visuomotor agility training: n=35 - Usual care: n=29 Age in years [Mean (SD)]: - Sensorimotor and visuomotor agility training: 67.3 (3.4) - Usual care: 67.6 (4.1)

	Sex (M/F): - Sensorimotor and visuomotor agility training: n=17/n=18 - Usual care: n=12/n=8 Time since diagnosis in years [Mean (SD)]: - Sensorimotor and visuomotor agility training: 6.7 (2.3) - Usual care: 7.1 (2.8) Chronic neurological disorder category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=35 for sensorimotor and visuomotor agility training and n=20 for usual care).
Intervention(s)/control	**Intervention** Name: Sensorimotor and visuomotor agility training Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Sensorimotor exercises Delivery setting: University hospital's physical therapy gym Number/frequency of sessions: 5x 60-minute sessions per week Duration: 3 weeks Practitioner(s): Physiotherapist The intervention targeted Parkinson’s disease participants’ postural instability and mobility deficits with a high-intensity, high-frequency sensorimotor and visuomotor agility training program. Participants exercised in small groups under supervision in the hospital's physical therapy gym, following verbal encouragement and strict safety guidelines. Sessions included:

	- 10-minute warm-up: spinal mobilisation and stabilisation using large fitness balls and coordination exercises, - 20-minutes of agility training: sensorimotor and visuomotor exercises focused on gait, coordination, posture, and balance, with and without augmented sensory input and assistive devices, - 20-minutes of Xbox virtual reality exergames: using Xbox virtual reality, focusing on movement accuracy and reaction to visual and auditory cues, - 10-minute cooldown: to conclude the session. The Xbox exergames provided feedback and adjusted difficulty based on performance. Participants kept logs of their symptoms, and attendance was monitored daily. **Control** Name: Usual care Protocol description: Control (usual care) Delivery setting: Community setting Number/frequency of sessions: Not applicable Duration: 3 weeks Practitioner(s): Not applicable The control group continued their usual activities without exercise therapy and took prescribed medications.
Duration of follow-up	Post-intervention (3 weeks from baseline)
Sources of funding	Not reported
Sample size	N=64 - Sensorimotor and visuomotor agility training: n=35 - Usual care: n=29

Other information	To minimise motor fluctuations, all participants stayed on medication (Levodopa) during the study. MDS-UPDRS Motor Experiences of Daily Living (measure of activities of daily living) and Schwab and England Activities of Daily Living (measure of activities of daily living) also reported but not extracted as not global measures of functioning.

MDS-UPDRS: movement disorders society-unitifed Parkinson disease rating scale; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (3 weeks from baseline)

Sensorimotor and visuomotor agility training versus usual care: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Sensorimotor and visuomotor agility training, Post-intervention vs Baseline, N = 35	Usual care, Post-intervention vs Baseline, N = 20
TUG Mean (SD)	-6.2 (2.45)	-0.4 (2.91)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	High *(No information on randomisation process or allocation concealment. The assignment was biased toward the intervention group for the fifth or sixth participant to anticipate dropouts. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Participants and personnel were aware of interventions allocated, there were no deviations from intended interventions. 9/29 (31%) participants in the control arm did not receive the programme after randomisation due to refusal to be tested after allocation and were excluded from analysis.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data not available for all participants randomised (missing outcome data for 9/29 (31%) in control arm), however, missingness is not related to true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were likely not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable *(Intervention includes 1/4 visuomotor aspect but does not reach threshold for downgrading.)*

Section	Question	Answer
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Tollár, 2019

Bibliographic Reference	Tollár, Jozsef; Nagy, Ferenc; Hortobagyi, Tibor; Vastly Different Exercise Programs Similarly Improve Parkinsonian Symptoms: A Randomized Clinical Trial.; Gerontology; 2019; vol. 65 (no. 2); 120-127

Study details

Country/ies where study was carried out	Hungary
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosed with Parkinson’s disease based on UK Parkinson's Disease Brain Bank criteria, - Hoehn and Yahr disease stage 2 to 3, - Pharmacological and neurological stability for at least 6 months, - Any mobility, balance, and postural challenges.
Exclusion criteria	- Mini-Mental State Examination score lower than 24, - Beck Depression Inventory score over 40, - Major cardiac disease such as congestive heart failure, ischemic disease, presence of a pacemaker, and orthostatic hypotension,

	- Diabetes without medication, - Prior stroke, traumatic brain injury or seizure disorder, - Undergoing deep brain stimulation, - Continual orthopedic surgeries, - Using a pacemaker, - Hemophilia, - Clinically significant motor fluctuations - Levadopa-induced dyskinesia, - Were participating in self-led or structured group exercise training.
Patient characteristics	N=49 adults with Parkinson's disease - Exergame-based rehabilitation programme: n=25 - Waitlist control: n=24 Age in years [Mean (SD)]: - Exergame-based rehabilitation programme: 70.0 (4.69) - Waitlist control: 67.5 (4.28) Sex: Not reported Time since diagnosis in months [Mean (SD)]:

	- Exergame-based rehabilitation programme: 7.5 (1.76) - Waitlist control: 7.3 (2.21) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Exergame-based rehabilitation programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR Delivery setting: Hospital outpatient gym Number/frequency of sessions: 5x 60-minute sessions per week Duration: 5 weeks Practitioner(s): Up to three physical therapists (supervised by the principal investigator) 60-minute exergame-based rehabilitation sessions were held for groups of 4-8 participants at the same time in the day. Initially there was a 5-minute warm up, then 45-minutes of the intervention and 5-minute cooldown. Five minutes of rest was also incorporated into sessions. The intervention aimed to improve postural control, gait mobility, gait stability, turning, and dynamic and static. The intervention used three visual feedback modules of Xbox 360 for 15-minutes per module. These were Reflex Ridge, whereby participants needed to respond to stimuli; Space Pop, whereby participants needed to achieve goals with all their limbs and their whole body to assist with spatial orientation; Just Dance, whereby participants needed to undergo a series of movement sequences. **Control** Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable

	Duration: 5 weeks Practitioner(s): Not applicable Continued normal activity with offer for enrolment into supervised exercise after the study. Participants were asked to not change their diet, medication or exercise routines during the study period.
Duration of follow-up	Post-intervention (5 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=49 - Exergame-based rehabilitation programme: n=25 - Waitlist control: n=24
Other information	Study included a third arm (n=25 participants) who were assigned an aerobic cycling intervention. Data not extracted as intervention not in protocol. MDS-UPDRS Motor Experiences of Daily Living and SE-ADL (activities of daily living) also reported by not extracted as not a global measure of functioning. All participants underwent assessments and exercised when "ON" medication. No participant was enrolled into physical therapy within 2 years before the study.

AR: augmented reality; MDS-UPDRS: movement disorders society-unitifed Parkinson disease rating scale; N/n: number of participants; SD: standard deviation; SE-ADL: Schwab and England activities of daily living scale; VR: virtual reality

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)

Exergame rehabilitation programme versus waitlist control: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Gait and balance as measured by BESTest - Polarity - Higher values are better

Gait and balance as measured by DGI - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Exergame-based rehabilitation programme, Post-intervention vs Baseline, N = 25	Waitlist control, Post-intervention vs Baseline, N = 24
TBG Mean (SD)	-5 (13.79)	-0.2 (1.59)
BESTest Mean (SD)	3.2 (5.6)	-0.3 (8.22)
DGI Mean (SD)	0.7 (1.77)	-0.5 (1.31)
BBS Mean (SD)	8.8 (4.61)	-1.4 (5.91)

AR: augmented reality; BESTest: balance evaluation systems test; BBS: Berg balance scale; DGI: dynamic gait index scoring form; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait; VR: virtual reality

Exergame rehabilitation programme versus waitlist control: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Exergame-based rehabilitation programme, Post-intervention vs Baseline, N = 25	Waitlist control, Post-intervention vs Baseline, N = 24
6MWT Mean (SD)	129.6 (68.9)	-16.3 (81.61)

AR: augmented reality; N/n: number of participants; SD: standard deviation; VR: virtual reality; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	High *(The principle investigator drew ribbons (coloured differently to signify each arm) from a covered box and attached these to each participant's folder. Therefore allocation was not concealed. No statistical significant differences between baseline characteristics of each arm.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and practitioners were aware of allocation, although the study investigators made an active effort for the participants in each arm to not interact with each other (for example, separate rooms, lockers, entrances) despite requiring exercise at the same time of day due to timing after medication intake in the morning. All participants received their allocated intervention and were analysed in the group to which they were allocated with intention-to-treat analysis.)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(All participants completed the study and analysed with no report of missing outcome data.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(The physical therapists and a physical therapy assistant that ran the assessments at baseline and after intervention were blinded to participant allocation. Unlikely that outcome measurement differed between groups. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(The authors had registered the protocol on clinicaltrials.gov. The authors did not pre-specify any of the relevant outcomes listed in the paper (BBS, BESTest, TBG DGI, 6MWT) in the protocol such that no data analysis plan was available. It is unclear whether results were selected on the basis of multiple eligible analyses, however, it is unlikely that results were selected on the basis of multiple outcome mesurements.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BESTest: Balance evaluation systems test; BBS: Berg balance scale; DGI: dynamic gait index scoring form; TBG: Tinetti balance and gait; 6MWT: 6 minute walk test

Tollár, 2020

Bibliographic Reference	Tollár, Jozsef; Nagy, Ferenc; Toth, Bela E; Torok, Katalin; Szita, Kinga; Csutoras, Bence; Moizs, Mariann; Hortobagyi, Tibor; Exercise Effects on Multiple Sclerosis Quality of Life and Clinical-Motor Symptoms.; Medicine and science in sports and exercise; 2020; vol. 52 (no. 5); 1007-1014

Study details

Country/ies where study was carried out	Hungary
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Aged 30 years or older, - Expanded Disability Status Scale score 4 to 6, - Relapse frequency of one or less per year over the past 5 years, - Mini-Mental State Examination score 24 or more.
Exclusion criteria	- Current receipt of steroid therapy, or receipt of steroid therapy during previous month, - Acute exacerbation of multiple sclerosis within 3 months of starting the programme, - Radiological change in disease progression over the previous 2 years, - Substantial change in medication over the past year, - Use of a cane or walker, - Depression (Beck Depression Inventory score of more than 40), - Serious unstable medical condition, - Severe cardiac disease (such as congestive heart failure, ischemic disease, pacemaker, orthostatic hypotension), - Uncontrolled diabetes, - History of stroke, - Traumatic brain injury,

	- Epileptic seizure during past year, - Current participation in a self-directed or formal group exercise programme.
Patient characteristics	N=40 adults with multiple sclerosis - Balance training programme: n=14 - Exergame-based rehabilitation programme: n=14 - Waitlist control: n=12 Age in years [Mean (SD)]: - Balance training programme: 46.9 (6.6) - Exergame-based rehabilitation programme: 48.2 (5.8) - Waitlist control: 44.4 (6.76) Sex (M/F): - Balance training programme: n=2/n=12 - Exergame-based rehabilitation programme: n=2/n=12 - Waitlist control: n=1/n=11 Time since diagnosis in years [Mean (SD)]: - Balance training programme: 13.6 (4.07) - Exergame-based rehabilitation programme: 12.1 (2.68) - Waitlist control: 14 (4.11)

	Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	Name: Balance training programme Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Outpatient (hospital physiotherapy gym). Group based sessions (4-8 participants) Number/frequency of sessions: 5x 60-minute sessions per week Duration: 5 weeks (25 hours) Practitioner(s): Physical therapist (x3) Designed to improve clinical and motor symptoms of multiple sclerosis, quality of life, postural stability, and mobility. Each session was comprised of a 10-minute warm-up, 40-minutes of training, and a 10-minute cool-down. Training consisted of dynamic and static balance and stepping exercises performed in multiple directions. Participants were asked not to change their diet, medication (including vitamins), or exercise habits for the duration of the intervention period. Name: Exergame-based rehabilitation programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Exergaming and AR/VR Delivery setting: Outpatient (hospital physiotherapy gym). Group based sessions (4-8 participants) Number/frequency of sessions: 5x 60-minute sessions per week Duration: 5 weeks (25 hours) Practitioner(s): Physical therapist (x3) Designed to improve clinical and motor symptoms of multiple sclerosis, quality of life, postural stability, and mobility. Each session was comprised of a 10-minute warm-up, 40-minutes of training, and a 10-minute cool-down. Training was comprised of sensorimotor and visuomotor agility training using an Xbox 360 core. Participants were asked not to change their diet, medication (including vitamins), or exercise habits for the duration of the intervention period.

	Control Name: Waitlist control Protocol description: Control (waitlist) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Practitioner(s): Not applicable Participants in this group were instructed to continue with standard physical therapy and their usual activities. Participants were asked not to change their diet, medication (including vitamins), or exercise habits for the duration of the intervention period.
Duration of follow-up	Post-intervention (5 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=40 - Balance training programme: n=14 - Exergame-based rehabilitation programme: n=14 - Waitlist control: n=12

AR: augmented reality; N/n: number of participants; SD: standard deviation; VR: virtual reality

Outcomes

Study timepoints

- Baseline
- Post-intervention (5 weeks from baseline)

Balance training programme versus exergame-based rehabilitation programme versus waitlist control: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Balance training programme, Post-intervention vs Baseline, N = 14	Exergame-based rehabilitation programme, Post-intervention vs Baseline, N = 14	Waitlist control, Post-intervention vs Baseline, N = 12
TBG Mean (SD)	1.7 (1.9)	3.1 (2.71)	0.3 (0.97)
BBS Mean (SD)	3.9 (2.25)	6.1 (3.52)	-0.2 (2.62)

AR: augmented reality; BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait; VR: virtual reality

Balance training programme vs exergame-based rehabilitation programme versus waitlist control: Exercise capacity

Exercise capacity as measured by 6MWT - Polarity - Higher values are better

Outcome	Balance training programme, Post-intervention vs Baseline, N = 14	Exergame-based rehabilitation programme, Post-intervention vs Baseline, N = 14	Waitlist control, Post-intervention vs Baseline, N = 12
6MWT Mean (SD)	19.2 (35.4)	57.4 (52.09)	6.3 (49.27)

AR: augmented reality; N/n: number of participants; SD: standard deviation; VR: virtual reality; 6MWT: 6 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(A physical therapist not involved in the trial drew ribbons (coloured differently to signify each arm) from a covered box and attached these to each participant's folder. Allocation was reported to be concealled. No statistically significant differences between baseline characteristics of each arm.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Participants and practitioners were aware of allocation. No information provided as to whether any deviations from intended intervention occurred. Participants were analysed in the group to which they were allocated and no information if intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(There were missing outcome data for 2/14 (14%) in the control arm who were not included in the analysis with no reasons provided as to why these participants withdrew and therefore it is unclear whether missingness in the outcome depended on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessors were blinded to allocation and outcome measurements were appropriate. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(The study has a protocol registered on clinicaltrials.gov which does not list the Tinetti balance and gait as an outcome and lists the Berg balance scale and the 6 minute walk test as primary outcomes whereas the paper reports these as secondary outcomes. No information is provided on the analysis in the protocol and relevant scales and timepoints have been reported.)*
Overall bias and Directness	Risk of bias judgement	High

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Tramontano, 2018

Bibliographic Reference	Tramontano, Marco; Martino Cinnera, Alex; Manzari, Leonardo; Tozzi, Federico Francesco; Caltagirone, Carlo; Morone, Giovanni; Pompa, Alessandra; Grasso, Maria Grazia; Vestibular rehabilitation has positive effects on balance, fatigue and activities of daily living in highly disabled multiple sclerosis people: A preliminary randomized controlled trial.; Restorative neurology and neuroscience; 2018; vol. 36 (no. 6); 709-718

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	April 2015 - November 2016
Inclusion criteria	- Clinically definite multiple sclerosis, - Age > 20 and < 65 years, - Disability between 5 and 7 on the Expanded Disability Status Scale, - Walking ability per Expanded Disability Status Scale score, - Minimal leg spasticity (≤1 on the Modified Ashworth spasticity scale).

Exclusion criteria	- Neurological, orthopaedic, and severe cardiac comorbidities and peripheral vestibular disorders, - Legal blindness in one or both eyes, - Multiple Sclerosis-related exacerbation in the past 3 months, - Involvement in other research studies.
Patient characteristics	N=30 adults with multiple sclerosis - Vestibular rehabilitation: n=15 - Standard neurorehabilitation: n=15 Age in years [Mean (SD)]: - Vestibular rehabilitation: 50.64 (11.73) - Standard neurorehabilitation: 45.77 (10.91) Sex (M/F): - Vestibular rehabilitation: n=6/n=9 - Standard neurorehabilitation: n=7/n=8 Time since diagnosis in years [Mean (SD)]: - Vestibular rehabilitation: 13.5 (7.49) - Standard neurorehabilitation: 13.69 (4.52) Chronic neurological disorder category: Progressive neurological diseases

Intervention(s)/control	**Intervention** Name: Vestibular rehabilitation Protocol intervention group: Rehabilitation interventions to address stability – Vestibular exercise, including optokinetic training Delivery setting: Inpatient multiple sclerosis unit Number/frequency of sessions: 5x 40 minutes per session and 5x 20 minutes per session Duration: 4 weeks Practitioner(s): Physiotherapist Vestibular rehabilitation treatment included gaze stability and postural stability exercises on a foam cushion. Exercises were adapted to each participant's motor competence and needs. Gaze Stability Exercises: Participants held their gaze on a firm target (VORx1) during active horizontal and vertical head movements (1-minute each axis). Exercises lasted no more than 10-minutes, including a quick break, and were performed seated and standing. A trained physiotherapist ensured gaze stability, recording any errors, execution time, and head movement frequency. Postural Control Exercises: Participants stood on a 5 centimetre thick foam cushion, blindfolded, and held their position or marched in place for 1-minute. After 1-minute, they turned 90° clockwise and repeated the exercise for a total of 4-minutes (90°, 180°, 270°). If participant moved during the exercise, the physiotherapist used verbal cues to help them recover their position. The total exercise duration was 10-minutes, including quick rest periods. **Control** Name: Standard neurorehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Inpatient multiple sclerosis unit

	Number/frequency of sessions: 5x 40 minutes per week Duration: 4 weeks Practitioner(s): Physiotherapist Standard neurorehabilitation included muscle stretching, postural alignment, active-assisted mobilisations, and neuromuscular facilitation to improve motor recruitment. Balance training involved standing and dynamic tasks with progressive restrictions of the support base, using unstable surfaces such as wobble boards, balance pads, or stability balls in various positions (bridge, sitting, quadrupedal, half-kneeling, kneeling, standing, one-leg standing). Dual-task exercises with a ball were incorporated to create open tasks, performed with eyes open and closed.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=30 - Vestibular rehabilitation: n=15 - Standard neurorehabilitation: n=15
Other information	Follow-up results of 30 days post-intervention and 60 days post-intervention were not reported.

N/n: number of participants; SD: standard deviation; VOR: vestibular-ocular reflex

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Vestibular rehabilitation versus standard neurorehabilitation: Gait and balance

Gait and balance as measured by TBG - Polarity - Higher values are better

Gait as measured by T25FWT - Polarity - Lower values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Vestibular rehabilitation, Post-intervention vs Baseline, N = 13	Standard neurorehabilitation, Post-intervention vs Baseline, N = 10
TBG Mean (SD)	4.9 (4.11)	1.5 (3.88)
T25FWT Mean (SD)	-15.2 (19.93)	4.7 (34.33)
BBS Mean (SD)	9.5 (9.73)	1.4 (7.36)

BBS: Berg balance scale; N/n: number of participants; SD: standard deviation; TBG: Tinetti balance and gait; T25FWT: timed 25 foot walk test

Vestibular rehabilitation versus standard neurorehabilitation: Exercise capacity

Exercise capacity as measured by 2MWT - Polarity - Higher values are better

Outcome	Vestibular rehabilitation, Post-intervention vs Baseline, N = 13	Standard neurorehabilitation, Post-intervention vs Baseline, N = 10
2MWT	10.6 (16.88)	5.2 (20.45)

Outcome	Vestibular rehabilitation, Post-intervention vs Baseline, N = 13	Standard neurorehabilitation, Post-intervention vs Baseline, N = 10
Mean (SD)		

N/n: number of participants; SD: standard deviation; 2MWT: 2 minute walk test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(No information on randomisation process or allocation concealment. No statistically significant differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	High *(Participants and personnel were probably aware of interventions allocated, however, due to nature of intervention blinding most likely not possible. There were no deviations from intended interventions. Intention-to-treat analysis was not performed. 1/15 (7%) participant from the intervention group and 4/15 (27%) participants from the control group were reported as released before the end of the intervention and excluded from the analysis with no further details reported.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Missing outcome data for 2/15 (13.3%) in the intervention group and 5/15 (33.3%) in the control arm and were not included in the analysis. Reasons for missing outcome data reported to be due to being released before end of intervention (n=1 intervention, n=14 control), referred a side effect (n=1 intervention) and refused to continue for reasons not related to trial (n=1 control). No methods used to control for missingness. Missingness in outcome could be related to true value for participant with side effect.)*

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(All assessments for each participant were conducted using the same devices, orthosis, and shoes. No information if assessor blinded to allocation; assessment of outcome could be influenced by knowledge of allocation but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan. The study considered two further follow-up periods of 30 and 60 days for a different measure not considered in this review but does not provide rationale as to why the follow-up period was restricted to only this measure such that there could be the possibility of selective reporting of time points.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Tramontano, 2020

Bibliographic Reference	Tramontano, Marco; Morone, Giovanni; De Angelis, Sara; Casagrande Conti, Laura; Galeoto, Giovanni; Grasso, Maria Grazia; Sensor-based technology for upper limb rehabilitation in patients with multiple sclerosis: A randomized controlled trial.; Restorative neurology and neuroscience; 2020; vol. 38 (no. 4); 333-341

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	January 2018 - December 2019
Inclusion criteria	- Aged between 30 and 70 years, - Diagnosis of multiple sclerosis according to the McDonald criteria, - Upper limb deficits, - Disability between 5 and 8.5 on the Expanded Disability Status Scale.
Exclusion criteria	- Modified Ashworth Scale score above 3 at the upper limb, - Cognitive deficits affecting the ability to understand task instructions (Mini-Mental State Examination score lower than 24), - Medical Research Council scale with score 0 or 5, - Presence of clinically evaluated severe comorbidities, - Pregnancy, - Subjects with artificial pacemaker, - Subjects involved in other studies.
Patient characteristics	N=31 adults with multiple sclerosis - Robot-assisted upper limb training (PABLO-Tyromotion): n=15 - Upper limb sensorimotor training: n=16 Age in years [Mean (SD)]:

	- Robot-assisted upper limb training (PABLO-Tyromotion): 46.7 (10.4) - Upper limb sensorimotor training: 52.3 (5.4) Sex (M/F): - Robot-assisted upper limb training (PABLO-Tyromotion): n=6/n=8 - Upper limb sensorimotor training: n=6/n=10 Time since diagnosis in years [Mean (SD)]: - Robot-assisted upper limb training (PABLO-Tyromotion): 17.3 (7.06) - Upper limb sensorimotor training: 22.4 (9.50) Chronic neurological disease category: Progressive neurological diseases Note: Baseline characteristics were only reported for participants analysed (n=14 for robot-assisted upper limb training (PABLO-Tyromotion) and n=16 for upper limb sensorimotor training).
Intervention(s)/control	**Intervention** Name: Robot-assisted upper limb training (PABLO-Tyromotion) Protocol intervention group: Rehabilitation interventions to address upper limb functioning – Robotics and repetitive task training Delivery setting: Institute for Research and Health Care Number/frequency of sessions: 3x 40-minute sessions per week Duration: 4 weeks

	Practitioner(s): Physiotherapist Participants completed 12 sessions of upper limb training using PABLO®-Tyromotion. Each session involved virtual reality-based interactive games, providing task-oriented exercises and neurocognitive feedback. The exercises required precision tasks and one-dimensional and two-dimensional reactions, training attention, strength control, movement control, coordination, and precision. All tasks required the participant's full collaboration and motivation, with games selected from the Tyromotion PABLO® System. **Control** Name: Upper limb sensorimotor training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Institute for Research and Health Care Number/frequency of sessions: 3x 40-minute sessions per week Duration: 4 weeks Practitioner(s): Physiotherapist Participants completed upper limb sensory-motor training without robotic support, focusing on recovering global upper limb functions, controlling hand grasp, and improving fine hand movements. *Training in both groups were performed in addition to the conventional neurorehabilitation.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not reported
Sample size	N=31 - Robot-assisted upper limb training (PABLO-Tyromotion): n=15 - Upper limb sensorimotor training: n=16

Other information	Medical Research Council scale for muscle strength (measure of muscle function) also reported but not extracted as only sub-domain scores reported.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)

Robot-assisted upper limb training (PABLO-Tyromotion) versus upper limb sensorimotor training: Gait and balance

Gait and balance as measured by RMI - Polarity - Higher values are better

Outcome	Robot-assisted upper limb training (PABLO-Tyromotion), Post-intervention vs Baseline, N = 14	Upper limb sensorimotor training, Post-intervention vs Baseline, N = 16
RMI Mean (SD)	0.7 (3.65)	0.5 (2.35)

N/n: number of participants; RMI: Rivermead mobility index; SD: standard deviation

Robot-assisted upper limb training (PABLO-Tyromotion) versus upper limb sensorimotor training: Limb/joint/muscle function

Hand function as measured by 9HPT - Polarity - Lower values are better

Outcome	Robot-assisted upper limb training (PABLO-Tyromotion), Post-intervention vs Baseline, N = 14	Upper limb sensorimotor training, Post-intervention vs Baseline, N = 16
9HPT Mean (SD)	-15.3 (57.47)	-0.5 (48.09)

N/n: number of participants; SD: standard deviation; 9HPT: 9 hole peg test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Block randomization was done using a computer-generated list with a specified block size. Allocation concealment was ensured using an automatic random number generator. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(No information on blinding of personnel, however due to nature of intervention blinding most likely not possible. No information if there were deviations from intended interventions. No information if intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Missing outcome data for 1/15 (6.7%) in the intervention arm that dropped out during the intervention and was not included in the analysis. Reason for dropping out cited as not being related to the study such that it is unlikely that missingness depends on true value.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Relevant outcomes were measured by the same blinded assessor. Outcome*

Section	Question	Answer
		measures were appropriate and measurement unlikely to have differed between groups. Same time points and measurement tools used.)
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan.)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Tramontano, 2022

Bibliographic Reference	Tramontano, Marco; Belluscio, Valeria; Bergamini, Elena; Allevi, Giulia; De Angelis, Sara; Verdecchia, Giorgia; Formisano, Rita; Vannozzi, Giuseppe; Buzzi, Maria Gabriella; Vestibular Rehabilitation Improves Gait Quality and Activities of Daily Living in People with Severe Traumatic Brain Injury: A Randomized Clinical Trial.; Sensors (Basel, Switzerland); 2022; vol. 22 (no. 21)

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Age 15-65 years,

	- Level of Cognitive Functioning score of ≥ 7.
Exclusion criteria	- Prior traumatic brain injury, - Cognitive deficits affecting task comprehension (Mini-Mental State Examination score of below 24), - Severe unilateral spatial neglect, - Severe aphasia, - Presence of other neurological and psychiatric diseases, - Orthopaedic or cardiac comorbidities limiting participation in training.
Patient characteristics	N=30 adults with severe traumatic brain injury - Vestibular rehabilitation plus standard neurorehabilitation: n=15 - Conventional balance rehabilitation plus standard neurorehabilitation: n=15 Age in years [Mean (SD)]: - Vestibular rehabilitation plus standard neurorehabilitation: 34.7 (12.8) - Conventional balance rehabilitation plus standard neurorehabilitation: 36.8 (12.9) Sex (M/F): - Vestibular rehabilitation plus standard neurorehabilitation: n=7/n=8 - Conventional balance rehabilitation plus standard neurorehabilitation: n=12/n=3 Time since injury in months [Mean (SD)]: - Vestibular rehabilitation plus standard neurorehabilitation: 11.6 (7.3)

	- Conventional balance rehabilitation plus standard neurorehabilitation: 9.3 (6.1) Chronic neurological disorder category: Acquired brain injury
Intervention(s)/control	**Intervention** Name: Vestibular rehabilitation plus standard neurorehabilitation Protocol intervention group: Rehabilitation interventions to address stability – Vestibular exercise, including optokinetic training Delivery setting: Inpatient neurorehabilitation unit Number/frequency of sessions: 3x 20-minutes sessions per week Duration: 4 weeks Practitioner(s): Physiotherapist Vestibular Rehabilitation involved two types of exercises: gaze stability and dynamic postural stability. Gaze stability exercises: Participants focused on a firm target during horizontal and vertical head movements for one minute per axis under physiotherapist supervision. These exercises lasted up to 10-minutes, including brief rests, and were performed seated, standing, and stepping on the spot. Dynamic postural stability exercises: Participants stepped on a 5 centimetre foam cushion while blindfolded, maintaining a stable posture. They performed steps in place for 1-minute, followed by 1-minute for each 90°, 180°, and 270° clockwise rotation, totaling four minutes. If they veered off course, the physiotherapist used verbal cues to correct their position. After a 1-minute treadmill warm-up with eyes open, participants walked blindfolded on the treadmill for four minutes, guided by verbal cues if needed. Each exercise session, including rests, lasted up to 5-minutes. Participants also received standard neurorehabilitation, but details were not reported. **Control**

	Name: Conventional balance rehabilitation plus standard neurorehabilitation Protocol description: Control (standard rehabilitation care alone) Delivery setting: Inpatient neurorehabilitation unit Number/frequency of sessions: 3x 20-minutes sessions per week Duration: 4 weeks Practitioner(s): Physiotherapist Conventional balance rehabilitation focused on trunk stabilisation through 3 exercises: seated on a Bobath ball blindfolded for 5-minutes, with physiotherapist support, standing on a Freeman board for 5-minutes, and transferring bodyweight while standing using parallel bars for 10-minutes. Participants also received standard neurorehabilitation, but details were not reported.
Duration of follow-up	8 weeks follow-up (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=30 - Vestibular rehabilitation plus standard neurorehabilitation: n=15 - Conventional balance rehabilitation plus standard neurorehabilitation: n=15

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (4 weeks from baseline)
- 4 weeks follow-up (8 weeks from baseline)

- 8 weeks follow-up (12 weeks from baseline)

Vestibular rehabilitation plus standard neurorehabilitation versus conventional balance rehabilitation plus standard neurorehabilitation: Gait and balance

Gait and balance as measured by DGI - Polarity - Higher values are better

Gait and balance as measured by CB&M - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Vestibular rehabilitation plus standard neurorehabilitation, Post-intervention vs Baseline, N = 14	Vestibular rehabilitation plus standard neurorehabilitation, 4 weeks follow-up vs Baseline, N = 13	Vestibular rehabilitation plus standard neurorehabilitation, 8 weeks follow-up vs Baseline, N = 12	Conventional balance rehabilitation plus standard neurorehabilitation, Post-intervention vs Baseline, N = 13	Conventional balance rehabilitation plus standard neurorehabilitation, 4 weeks follow-up vs Baseline, N = 13	Conventional balance rehabilitation plus standard neurorehabilitation, 8 weeks follow-up vs Baseline, N = 11
DGI Mean (SD)	3.2 (3.37)	3.9 (3.4)	4.7 (3.4)	2.4 (3.06)	3 (3.04)	3.7 (2.98)
CB&M Mean (SD)	9.5 (18.59)	10.4 (17.33)	11.1 (17.53)	5.3 (15.5)	13.7 (17.5)	16 (16.94)
BBS Mean (SD)	2.1 (4.18)	2.6 (3.95)	3.4 (4.04)	3.7 (7.2)	5.3 (7.02)	5 (7.03)

CB&M: community balance and mobility scale; BBS: Berg balance scale; DGI: dynamic gait index scoring form; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer-generated randomisation list and random numbers were concealed in opaque envelopes. No statistically significant differences in baseline characteristics.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants were not aware of interventions allocated. Although personnel were probably aware of interventions allocated, there were no deviations from intended interventions. Modified intention-to-treat analysis performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(4/15 (27%) and 2/15 (13%) of participants in the intervention and control groups had missing outcome data due to dropping out or loss to follow-up and were not considered in analyses when outcome data became missing. 2/15 and 1/15 in intervention and control, respectively had dropped out during the intervention period due to neurological complications not related to training (n=2 intervention) and Covid-19 infection (n=1 control). Missingness of outcomes for the intervention likely to depend on true value. Loss to follow-up was otherwise due to Covid-19 infection (n=1 in control at 4 weeks follow-up, n=2 at 8 weeks in intervention arm) whereby missingness unlikely to depend on true value as all drop-outs were due to Covid-19 emergencies.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol available. All relevant scales, time points and analysis results reported.)*

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Covid-19: coronavirus disease; N/n: number of participants

van den Heuvel, 2014

Bibliographic Reference	van den Heuvel, Maarten R C; Kwakkel, Gert; Beek, Peter J; Berendse, Henk W; Daffertshofer, Andreas; van Wegen, Erwin E H; Effects of augmented visual feedback during balance training in Parkinson's disease: a pilot randomized clinical trial.; Parkinsonism & related disorders; 2014; vol. 20 (no. 12); 1352-8

Study details

Country/ies where study was carried out	The Netherlands
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosis of idiopathic Parkinson's disease according to UK Brain Bank criteria, - Mild to moderate stage (Hoehn and Yahr stages 2 and 3), - Able to participate in either training program.
Exclusion criteria	- Presence of other neurological, orthopaedic, or cardiopulmonary problems that could impair participation,

	- Mini-Mental State Examination score below 24, - Recent change in dopaminergic medication, - Cognitive, visual, and/or language problems impeding participation.
Patient characteristics	N=33 adults with idiopathic Parkinson's disease - Interactive balance training with augmented visual feedback: n=17 - Conventional balance training: n=16 Age in years [Mean (SD)]: - Interactive balance training with augmented visual feedback: 66.3 (6.39) - Conventional balance training: 68.8 (9.68) Sex (M/F): - Interactive balance training with augmented visual feedback: n=12/n=5 - Conventional balance training: n=8/n=8 Time since diagnosis in years [Mean (SD) not reported] [Median (IQR)] - Interactive balance training with augmented visual feedback: 9.0 (4.0 to 13.25) - Conventional balance training: 8.8 (2.5 to 11.5) Chronic neurological disorder category: Progressive neurological diseases

Intervention(s)/control	**Intervention** Name: Interactive balance training with augmented visual feedback Protocol intervention group: Rehabilitation interventions to address stability – Balance exercises Delivery setting: Outpatient Number/frequency of sessions: 2x 60-minute sessions per week Duration: 5 weeks Practitioner(s): 'Senior therapist' (no details reported) Visual feedback was provided via use of computer and monitor connected to a force plate and inertia sensors which converted participants body movements to an avatar on screen. The exercises that participants carried out challenged control of body lean as well as functional ability (such as stepping forward and sit to stand movements). The exercises could be adjusted in terms of difficulty (for example, in speed or duration). Each session included 45-minutes of balance training. This consisted of dynamic balance exercises focusing on controlling body posture in the forward, backward, and sideways directions (for example, shifting weight from one foot to another, sit-to-stand movements) and included dual-task exercises. Participants worked in pairs, taking turns in performing the exercise or resting. **Control** Name: Conventional balance training Protocol description: Control (standard rehabilitation care alone) Delivery setting: Outpatient Number/frequency of sessions: 2x 60-minute sessions per week Duration: 5 weeks Practitioner(s): 'Senior therapist' (no details reported) Each session included 45-minutes of balance training. This consisted of dynamic balance exercises focusing on controlling body posture in the forward, backward, and sideways directions (for example, shifting weight between feet, sit-to-stand movements) and included dual-task exercises. Participants worked in pairs, taking turns in performing the exercise or resting.

	The exercises which participants completed were taken from national physical therapy guidelines. These exercises focused on training standing balance and included exercises completed under different conditions such as standing on one leg or with eyes closed, stepping exercises, dual-task exercises, sit-to-stand exercises, and exercises on the balancing beam or other challenging support surfaces.
Duration of follow-up	6 weeks follow-up (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=33 - Interactive balance training with augmented visual feedback: n=17 - Conventional balance training: n=16

IQR: interquartile range; N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (6 weeks from baseline)
- 6 week follow-up (12 weeks from baseline)

Interactive balance training with augmented visual feedback versus conventional balance training: Gait and balance

Gait as measured by 10MWT - Polarity - Higher values are better

Outcome	Interactive balance training with augmented visual feedback, Post-intervention vs Baseline, N = 17	Interactive balance training with augmented visual feedback, 6 week follow-up vs Baseline, N = 17	Conventional balance training, Post-intervention vs Baseline, N = 14	Conventional balance training, 6 week follow-up vs Baseline, N = 13
10MWT Mean (SD)	0.15 (0.36)	0.021 (0.24)	0.001 (0.17)	0.031 (0.17)

m/s: metres per second; N/n: number of participants; SD: standard deviation; 10MWT: 10 metre walk test

Interactive balance training with augmented visual feedback versus conventional balance training: Gait and balance

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Interactive balance training with augmented visual feedback, Post-intervention vs Baseline, n=17	Interactive balance training with augmented visual feedback, 6 week follow-up vs Baseline, n=17	Conventional balance training, Post-intervention vs Baseline, n=14	Conventional balance training, 6 week follow-up vs Baseline, n=13
BBS Median (IQR)	1 (-0.25 to 2)	0 (-1 to 1)	-1 (-2 to 2)	0 (-1.25 to 1.25)

BBS: Berg balance scale; IQR: interquartile range; N/n: number of participants

Interactive balance training with augmented visual feedback versus conventional balance training: Gait and balance

Balance as measured by FRT - Polarity - Higher values are better

Outcome	Interactive balance training with augmented visual feedback, Post-intervention vs Baseline, N = 16	Interactive balance training with augmented visual feedback, 6 week follow-up vs Baseline, N = 16	Conventional balance training, Post-intervention vs Baseline, N = 14	Conventional balance training, 6 week follow-up vs Baseline, N = 13
FRT Mean (SD)	0.18 (6.04)	1.31 (6.1)	-0.05 (4.62)	-1.04 (5.87)

FRT: functional reach test; N/n: number of participants; SD: standard deviation

Interactive balance training with augmented visual feedback versus conventional balance training: Functioning

Functioning as measured by UPDRS - Polarity - Lower values are better

Outcome	Interactive balance training with augmented visual feedback, Post-intervention vs Baseline, N = 15	Interactive balance training with augmented visual feedback, 6 week follow-up vs Baseline, N = 17	Conventional balance training, Post-intervention vs Baseline, N = 11	Conventional balance training, 6 week follow-up vs Baseline, N = 11
UPDRS Median (IQR)	2 (-4 to 4.75)	-3 (-9 to 4.25)	5 (-0.5 to 10.75)	-1 (-4 to 6)

N/n: number of participants; IQR: interquartile range; UPDRS: unified Parkinson's disease rating scale

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Adequate randomisation and concealment methods were used and there were no apparent differences between groups at baseline (significance testing reported).)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Some concerns *(Although participants and practitioners were not blinded to group assignment, no deviations occurred as a result of the experimental context. Authors also exclude 1 participant from the control group due to change of medication, which is a post-randomisation exclusion based on eligibility criteria. A complete-case analysis was chosen over an intention-to-treat analysis as authors report similarity between results of both analyses).)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Missing outcomes based on available case results for intervention and control, respectively were: 10MWT (post-intervention: 0/17 (0%), 2/16 (13%); 6 weeks follow-up: 0/17 (0%), 3/16 (19%), BBS (post-intervention: 0/17 (0%), 2/16 (12.5%); 6 weeks follow-up: 0/17 (0%), 3/16 (18.8%), FRT (post-intervention: 1/17 (6%), 2/16 (13%); 6 weeks follow-up: 1/17 (6%), 3/16 (19%), UPDRS (post-intervention: 2/17 (12%), 3/16 (19%); 6 weeks follow-up: 0/17 (0%), 5/16 (31%). Complete-case analysis does not substitute a sensitivity analysis when outcome data are missing not at random. Possible that this could be related to true value, but reasons given in paper make it unlikely (control only: n=1 discontinuing intervention due to unrelated medical issues; n=1 unavailable for follow-up assessment, n=1 excluded from analysis due to necessary change of medication; n=2 unreported).)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Method of outcome assessment was standard and appropriate and outcome assessors were blinded to allocation.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No information on protocol or pre-specified analysis plan. Methods in the*

Section	Question	Answer
		paper state the selection of a complete-case over intention-to-treat analysis as results between the two analyses were found to be similar when viewed by the authors (intention-to-treat data not presented).)
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

BBS: Berg balance scale; FRT: functional reach test; N/n: number of participants; UPDRS: unified Parkinson's disease rating scale; 10MWT: 10 metre walk test

Wallén, 2018

Bibliographic Reference	Wallén, Martin Benka; Hagstromer, Maria; Conradsson, David; Sorjonen, Kimmo; Franzen, Erika; Long-term effects of highly challenging balance training in Parkinson's disease-a randomized controlled trial.; Clinical rehabilitation; 2018; vol. 32 (no. 11); 1520-1529

Study details

Country/ies where study was carried out	Sweden
Study type	Randomised controlled trial (RCT)
Study dates	See Conradsson 2015
Inclusion criteria	See Conradsson 2015
Exclusion criteria	See Conradsson 2015

Patient characteristics	N=100 adults with Parkinson's disease - Hi Balance training programme: n=51 - Usual care: n=49 Age in years: See Conradsson 2015 Sex: See Conradsson 2015 Time since diagnosis: See Conradsson 2015 Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	See Conradsson 2015
Duration of follow-up	42 weeks follow-up (12 months from baseline)
Sources of funding	See Conradsson 2015
Sample size	See Conradsson 2015
Other information	Mini-BESTest outcomes also reported at post-intervention (10 weeks from baseline) but not extracted as has previously been extracted in Condradsson 2015 (original study paper). UPDRS II (measure of activities of daily living) also reported but not extracted as not a global measure of functioning.

Mini-BESTest: mini balance evaluation systems test; UPDRS II: unified Parkinson's disease rating scale part 2

Outcomes

Study timepoints

- Baseline
- 16 weeks follow-up (6 months from baseline)
- 42 weeks follow-up (12 months from baseline)

Hi Balance training programme versus usual care: Gait and balance

Gait and balance as measured by Mini-BESTest - Polarity - Higher values are better

Outcome	Hi Balance training programme, 16 weeks follow-up vs Baseline, N = 41	Hi Balance training programme, 42 weeks follow-up vs Baseline, N = 39	Usual care, 16 weeks follow-up vs Baseline, N = 39	Usual care, 42 weeks follow-up vs Baseline, N = 35
Mini-BESTest Mean (SD)	0.7 (2.65)	0.7 (2.92)	0 (2.98)	0.3 (2.85)

Mini-BESTest: mini balance evaluation systems test; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Web-based software used for randomisation; sealed opaque envelopes used for allocation concealment, no apparent differences in baseline characteristics (significance testing reported).)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Although blinding of participants and practitioners would not have been possible and the issue of deviations from the intended interventions is not discussed specifically, it is unlikely that deviations did occur or that these would*

Section	Question	Answer
		have arisen due to the experimental context. Analysis was conducted on the basis of modified intention-to-treat.)
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(The analysis included participants with cancellations due to other medical issues at 6 months (4/51 intervention, 1/44 control) but did not include drop outs from each arm. At 6 month follow-up this occurred for 2/51 (4%) and 5/49 (10%) in the intervention and control arms respectively, with reasons due to aggravated Parkinson's disease symptoms (n=1 per arm), declined further participation (n=1 per arm) and other medical issues (n=1 control) and at 12 months follow-up this occurred for 6/51 (12%) and 5/49 (10%) in the intervention and control arms respectively, with reasons due to declined further participation n=1 intervention and n=3 control, other medical issues n=4 intervention and n=2 control, conflicting treatment n=1 intervention). No sensitivity analyses were performed and it is possible that missingness relates to true value as details relating to health status were unclear.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Measurement of outcomes were appropriate and did not differ by group. Outcome assessors were not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation as assessors unblinded, but not likely as measures are standardised, validated and reproducible. Same time points and measurement tools used.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(Published protocol with pre-specified analysis plan as well as pre-registration on clinicaltrials.gov. The protocol was submitted for publication in May 31 2012 and data collection was reported to begin in Spring 2012. The protocol analysis plan did not mention analysis intentions relating to intention-to-treat. While the short term paper Conraddson 2015 chose per protocol over intention-to-treat analysis, this paper chose the intention-to-treat analysis and did not mention per protocol methods. Trial registration and protocol reports plans of 6 and 12 month follow-up which are reported in the current paper.)*

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Wirz, 2017

Bibliographic Reference	Wirz, Markus; Mach, Orpheus; Maier, Doris; Benito-Penalva, Jesus; Taylor, Julian; Esclarín, Ana; Dietz, Volker; Effectiveness of Automated Locomotor Training in Patients with Acute Incomplete Spinal Cord Injury: A Randomized, Controlled, Multicenter Trial.; Journal of neurotrauma; 2017; vol. 34 (no. 10); 1891-1896

Study details

Country/ies where study was carried out	Switzerland
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Subacute traumatic Spinal Cord Injury, - Initial Spinal Cord Injury classed as American Spinal Injury Association Impairment Scale score B or C based on International Standards for Neurological Classification of Spinal Cord Injury, - American Spinal Injury Association Impairment Scale motor level between C4 and T12, - Restricted ability to walk based on Walking Index for Spinal Cord Injury (WISCI II) score 5 or lower,

	- If included in the study 60 days after trauma, - Can understand and comply with intervention and assessment protocols.
Exclusion criteria	- Height and weight exceeding limits of Lokomat (weight of over 130 kilograms, height of over 200 centimetres, or leg length differs by more than 2 centimetres), - Other injuries or prior medical conditions that impede participation in study such as osteoporosis, unstable lower extremity fracture, limited range of motion, lower extremity decubitus ulcer, lower extremity fractures, unstable spine fractures, joint instability limiting weight bearing, severe soft tissue lesion, traumatic brain injury, total joint replacement, chronic pain, osteoarthritis, polyneuropathy, or cardiopulmonary disease, - Less than 18 years of age or older than 60 years of age, - Prior participation in other rehabilitation or pharmacological study.
Patient characteristics	N=21 adults with subacute traumatic spinal cord injury - High-intensity (50 mins) robotic-assisted gait training sessions (Lokomat): n=11 - Low-intensity (25 mins) robotic-assisted gait training sessions (Lokomat): n=10 Age in years [Mean (SD)]: - High-intensity (50-minutes) robotic-assisted gait training sessions (Lokomat): 35.56 (13.80) - Low-intensity (25-minutes) robotic-assisted gait training sessions (Lokomat): 34.33 (15.96) Sex (M/F): - High-intensity (50-minutes) robotic-assisted gait training sessions (Lokomat): n=8/n=1 - Low-intensity (25-minutes) robotic-assisted gait training sessions (Lokomat): n=8/n=1

	Time since injury: Not reported Chronic neurological disorder category: Acquired spinal cord injury Note: Baseline characteristics were reported for n=9 in each arm
Intervention(s)/control	**Intervention** Name: High-intensity (50-minutes) robotic-assisted gait training sessions (Lokomat) Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Not reported Number/frequency of sessions: 3-5 days per week Duration: 8 weeks Practitioner(s): Not reported Robotic assisted locomotor training using Lokomat with a minimum of 50-minutes training session walking time. For both groups, the first five training sessions were devoted to optimisation of set up and participant familiarisation with the Lokomat. Following this, both groups had legs loaded with bodyweight as much as could be tolerated, speed ranging 1.6 to 3.5 kilometres per hour, force of 100 percent to lowest tolerated (no resistance of 0% guidance force) and there was feedback of hip and knee joints by line graphs placed on a screen in front of participant. Each session involved 3-minutes of walking without specification and every third minute, speed and force were changed or feedback was switched on or off to avoid monotony. **Control** Name: Low intensity (25-minutes) robotic-assisted gait training sessions (Lokomat) Protocol description: Same intervention (different intensity) Delivery setting: Not reported Number/frequency of sessions: 3-5 days per week

	Duration: 8 weeks Practitioner(s): Not reported Robotic assisted locomotor training using Lokomat with a minimum of 25-minutes training session walking time. Otherwise, protocol was identical to described above.
Duration of follow-up	Post-intervention (8 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=21 - High-intensity (50 minutes) robotic-assisted gait training sessions (Lokomat): n=11 - Low intensity (25 minutes) robotic-assisted gait training sessions (Lokomat): n=10
Other information	Modified Penn Spasm Frequency (measure of limb/joint/muscle functioning) also reported but not extracted as only presented per sub-domain, and not total scores. SCIM3 (measured of functioning) also reported but not extracted as presented as median (range) with no statistical analysis performed between groups.

C: cervical; N/n: number of participants; SCIM3: spinal cord independence measure 3rd revision; SD: standard deviation; T: thoracic; WISCI II: walking index for spinal cord injury

Outcomes

Study timepoints

- Baseline
- Post-intervention (8 weeks from baseline)

High-intensity (50 minutes) robotic-assisted gait training sessions (Lokomat) versus low intensity (25 minutes) robotic-assisted gait training sessions (Lokomat): Limb/joint/muscle function

Spasticity as measured by MAS - Polarity - Lower values are better

Outcome	High-intensity (50 minutes) robotic-assisted gait training sessions (Lokomat), Post-intervention, N = 9	Low-intensity (25 minutes) robotic-assisted gait training sessions (Lokomat), Post-intervention, N = 9
MAS Number of items not reported, scale not reported. Median (range)	0.75 (0-4)	1.75 (0-3)

MAS: modified Ashworth scale; N/n: number of participants

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Computer generated randomisation in blocks of four. Allocation was conducted in a coordinating centre by a research assistant independent to the study. Protocol states that the study researchers received the allocation by mail. Unable to determine potential imbalances between randomised participants at baseline as characteristics are only presented for participants analysed rather than randomised.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were not blinded to allocated intervention, however, there was no reason to suggest that deviations occurred due to trial context and likely modified intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	High *(Outcome data was not available in the intervention arm for 2/11 (18%) due to spinal surgery reported to not be related to training (n=1), wheelchair accident*

Section	Question	Answer
		with resulting foot lesion (n=1) and for 1/10 (10%) in the control arm due to knee pain which was not specified whether pre-existing or not. The study did not use analysis methods or sensitivity analysis to check for bias related to missing outcome, proportions of missing data are different between arms. There is a chance that missingness in the outcome was related to true value as knee pain in the control arm could have had an impact on spasticity.)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to allocation. Outcome measurement could be influenced by knowledge of group allocation but unlikely as measured using standardised, validated measurement tool, and control group received an active intervention.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	High *(The authors had published a protocol prior to analysis and also registered the protocol on clinicaltrials.gov. The authors pre-specified that their primary outcome would be the 10 metre walking test and this outcome was omitted in the study. Further, the pre-specified outcome spinal cord injury classification was not reported. Authors report median and interquartile range for the Modified Ashworth Scale while other outcomes are reported in mean and standard deviation. It is unclear whether this was deliberately chosen or not. The protocol also states 6 month follow-up times and the study does not report on these.)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

N/n: number of participants

Wroblewska, 2019

Bibliographic Reference	Wroblewska, Agata; Gajos, Agata; Smyczynska, Urszula; Bogucki, Andrzej; The Therapeutic Effect of Nordic Walking on Freezing of Gait in Parkinson's Disease: A Pilot Study.; Parkinson's disease; 2019; vol. 2019; 3846279

Study details

Country/ies where study was carried out	Poland
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosed with Parkinson’s disease based on UK Parkinson's Disease Brain Bank criteria, - Had freezing of gait during "ON" state of medication, - Hoehn and Yahr stages 2 to 3, - Stable medicine for minimum of 4 weeks prior to study commencement, - General health in a condition that was able to tolerate for training intervention, - No prior experience with Nordic Walking, - No form of physiotherapy or regular sports training attendance for minimum 4 months prior to enrollment.
Exclusion criteria	Not reported
Patient characteristics	N=40 adults with Parkinson’s disease - Nordic walking training: n=20 - No intervention: n=20

	Age in years [Mean (SD)]: - Nordic walking training: 72.1 (7.5) - No intervention: 67.6 (6.6) Sex (M/F): - Nordic walking training: n=8/n=12 - No intervention: n=9/n=11 Time since diagnosis in years [Mean (SD)]: - Nordic walking training: 5.2 (1.1) - No intervention: 6.0 (1.2) Chronic neurological disorder category: Progressive neurological diseases
Intervention(s)/control	**Intervention** Name: Nordic walking training Protocol intervention group: Rehabilitation interventions to address mobility – Gait training Delivery setting: Outdoors, location not reported Number/frequency of sessions: 2x per week Duration: 12 weeks Practitioner(s): Physiotherapist

	Participants had 3 initial sessions for farmiliarisation with the Nordic Walking technique. Each session was 60-minutes in length with warm up and stretching, Nordic Walking and then final stretch and cool down. No other programme or physiotherapy was undertaken by participants during the intervention period. Participants were advised not to change current lifestyle or discontinue any leisure activities. **Control** Name: No intervention Protocol description: Control (no intervention) Delivery setting: Not applicable Number/frequency of sessions: Not applicable Duration: 12 weeks Practitioner(s): Not applicable Participants did not use any form of physiotherapy and advised not to change current lifestyle or discontinue any leisure activities.
Duration of follow-up	Post-intervention (12 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=40 - Nordic walking training: n=20 - No intervention: n=20
Other information	Immediate post-intervention follow-up was not reported for the control arm.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Baseline
- Post-intervention (12 weeks from baseline)

Nordic walking training versus no intervention: Gait and balance

Gait and balance as measured by TUG - Polarity - Lower values are better

Outcome	Nordic walking training, Post-intervention vs Baseline, N = 20	No intervention, Post-intervention vs Baseline, N = 20
TUG Scale not applicable, meters walked. Mean (SD)	-4.6 (0.99)	2 (1.06)

N/n: number of participants; SD: standard deviation; TUG: timed up and go test

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Randomisation performed by online service randomizer.org. No information on allocation concealment. There were borderline statistically significant differences for age between groups (p-value=0.051) and difference in disease duration was statistically significant (p-value=0.04) but this was likely due to chance.)*

Section	Question	Answer
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were likely aware of interventions allocated, there were no reported deviations from intended interventions. Intention-to-treat analysis likely performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(All participants completed the study with no report of missing outcome data.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were likely not blinded to allocation. Assessment of outcome could be influenced by knowledge of allocation as it is timed by the assessor but this is unlikely.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns *(No protocol with pre-specified analysis plan available, measurements for the Nordic Walking group available 3 months after the programme but this is not presented for the control group (outcome not collected at this time point).)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

Zivi, 2018

Bibliographic Reference	Zivi, Ilaria; Maffia, Sara; Ferrari, Vanessa; Zarucchi, Alessio; Molatore, Katia; Maestri, Roberto; Frazzitta, Giuseppe; Effectiveness of aquatic versus land physiotherapy in the treatment of peripheral neuropathies: a randomized controlled trial.; Clinical rehabilitation; 2018; vol. 32 (no. 5); 663-670

Study details

Country/ies where study was carried out	Italy
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	- Diagnosed with peripheral neuropathy of any aetiology based on clinical and electromyography data, - Lower limb motor deficit from neuropathy, - Can stay in an upright position walk with or without assistance.
Exclusion criteria	- Severe cardiovascular and respiratory diseases, - Other neurological diseases, - Rehabilitation treatment 6 months before enrolment, - Wounds or bedsores, - Skin diseases, - Urinary incontinence, - Fear of water. Note: protocol also included pain of water
Patient characteristics	N= adults with general peripheral neuropathies - Hydrotherapy plus inpatient rehabilitation programme: n=21 - Land-based therapy plus inpatient rehabilitation programme: n=19

	Age in years [Mean (SD)]: - Hydrotherapy plus inpatient multidisciplinary rehabilitation programme: 66.3 (13.0) - Land-based therapy plus inpatient multidisciplinary rehabilitation programme: 71.8 (7.7) Sex (M/F): - Hydrotherapy plus inpatient multidisciplinary rehabilitation programme: n=11/n=10 - Land-based therapy plus inpatient multidisciplinary rehabilitation programme: n=8/n=11 Time since diagnosis or injury: Not reported Chronic neurological disorder category: Mixed (General peripheral neuropathies)
Intervention(s)/control	**Intervention** Name: Hydrotherapy plus inpatient multidisciplinary rehabilitation programme Protocol intervention group: Rehabilitation interventions to address limb functioning, stability and mobility together – Hydrotherapy Delivery setting: Inpatient Number/frequency of sessions: 3x per week of aquatic based therapy and daily rehabilitation programme Duration: 4 weeks Practitioner(s): Multidisciplinary (physiotherapist, physical therapist, occupational therapist) All participants underwent a rehabilitation programme specific to peripheral neuropathy with daily sessions involving standard individual training with a physical therapist (one hour per day for five days per week), exercise with a device

	such as treadmill, cycloergometer, cyclette, stabilometric platform with physical therapist (1-hour per day for 5 days per week) and occupational therapy for 1-hour per day for 6 days per week. On three alternate days of the week the first session was carried out in a swimming pool with temperature of 32 degrees. Sessions lasted 1-hour and involved of relaxation and breath control, balance and posture and gait exercises. **Control** Name: Land-based therapy plus inpatient multidisciplinary rehabilitation programme Protocol descrption: Control (standard rehabilitation care alone) Delivery setting: Inpatient Number/frequency of sessions: 3x per week of land based therapy and daily rehabilitation programme Duration: 4 weeks Practitioner(s): Multidisciplinary (physiotherapist, physical therapist, occupational therapist) Same protocol above, except on 3 alternate days of the week the first session was carried out overground. As for aquatic therapy, sessions lasted 1-hour and involved relaxation and breath control, balance and posture and gait exercises.
Duration of follow-up	Post-intervention (4 weeks from baseline)
Sources of funding	Not industry funded
Sample size	N=40 - Hydrotherapy plus inpatient multidisciplinary rehabilitation programme: n=21 - Land-based therapy plus inpatient multidisciplinary rehabilitation programme: n=19
Other information	Functional Ambulation Classification (measure of gait) also reported but not extracted as does not appear to be validated in people with peripheral neuropathies. Overall Neuropathy Limitations Scale (measure of disability) also reported but not extracted as not a global measures of functioning.

N/n: number of participants; SD: standard deviation

Outcomes

Study timepoints

- Post-intervention (4 weeks from baseline)

Hydrotherapy plus inpatient multidisciplinary rehabilitation programme versus land-based therapy plus inpatient multidisciplinary rehabilitation programme: Gait and balance

Gait and balance as measured by DGI - Polarity - Higher values are better

Balance as measured by BBS - Polarity - Higher values are better

Outcome	Hydrotherapy plus inpatient multidisciplinary rehabilitation programme, Post-intervention, N = 21	Land-based therapy plus inpatient multidisciplinary rehabilitation programme, Post-intervention, N = 19
DGI 8 items, scale 0-24. Mean (SD)	5.8 (2.1)	3.9 (3.2)
BBS 14 items, scale 0-56. Mean (SD)	11.1 (4.9)	11.4 (6.9)

BBS: Berg balance scale; DGI: dynamic gait index scoring form; N/n: number of participants; SD: standard deviation

Hydrotherapy plus inpatient multidisciplinary rehabilitation programme versus land-based therapy plus inpatient multidisciplinary rehabilitation programme: Functioning

Functioning as measured by FIM - Polarity - Higher values are better

Outcome	Hydrotherapy plus inpatient multidisciplinary rehabilitation programme, Post-intervention, N = 21	Land-based therapy plus inpatient multidisciplinary rehabilitation programme, Post-intervention, N = 19
FIM 18 items, scale 18-126. Mean (SD)	25.8 (8.2)	26.1 (11.5)

FIM: functional independence measure; N/n: number of participants; SD: standard deviation

Critical appraisal – Cochrane RoB 2

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Block randomisation (block size of 4) by web-based random generator with single investigator performing randomisation and report of allocation concealment until assignment. No statistically significant baseline differences between groups.)*
Domain 2a: Risk of bias due to deviations from the intended interventions (effect of assignment to intervention)	Risk of bias for deviations from the intended interventions (effect of assignment to intervention)	Low *(Participants and personnel were not blinded to allocated intervention, however, there was no reason to suggest that deviations occurred due to trial context and appropriate intention-to-treat analysis was performed.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data was available for all participants.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Measurement of outcome was appropriate and assessors were blinded to allocation through all time points.)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol pre-registered with clinicaltrials.gov and pre-specified plan; all relevant scales, time points and analysis results reported.)*
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Not applicable

FIM: functional independence measure; ONLS: overall neuropathy limitations scale

Appendix E Forest plots

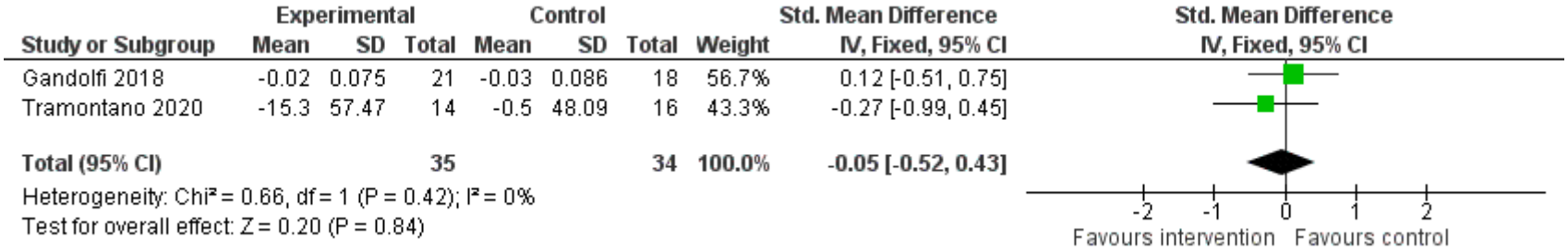
Forest plots for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

This section includes forest plots only for outcomes that are meta-analysed. Outcomes from single studies are not presented here; the quality assessment for such outcomes is provided in the GRADE profiles in appendix F.

Rehabilitation interventions to address upper limb function: Robotics and repetitive task training

Robotics versus control in adults with multiple sclerosis

Figure 2: Limb/joint/muscle function (hand function) as measured by a validated scale; change scores at post-intervention

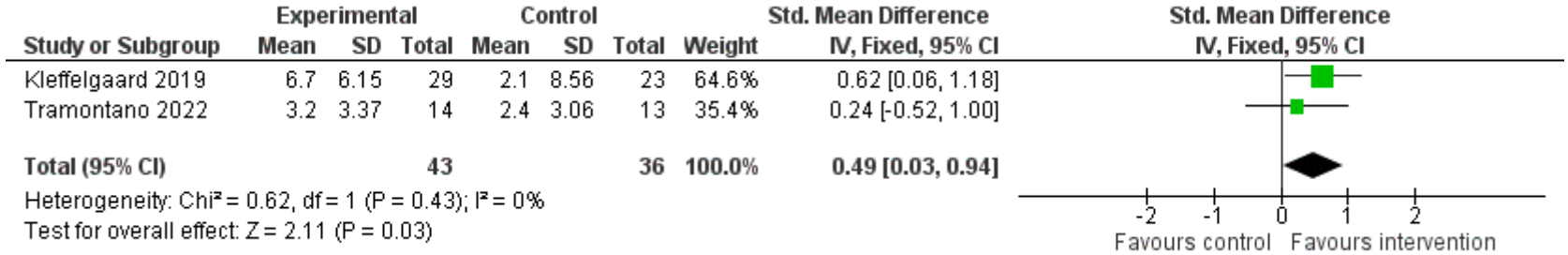


CI: confidence interval; IV: inverse variance
Mean: mean difference between baseline and end-point
Note: Gandolfi 2018 change scores have been inverted to align with scale direction (better indicated by lower values)

Rehabilitation interventions to address stability: Vestibular exercise, including optokinetic training

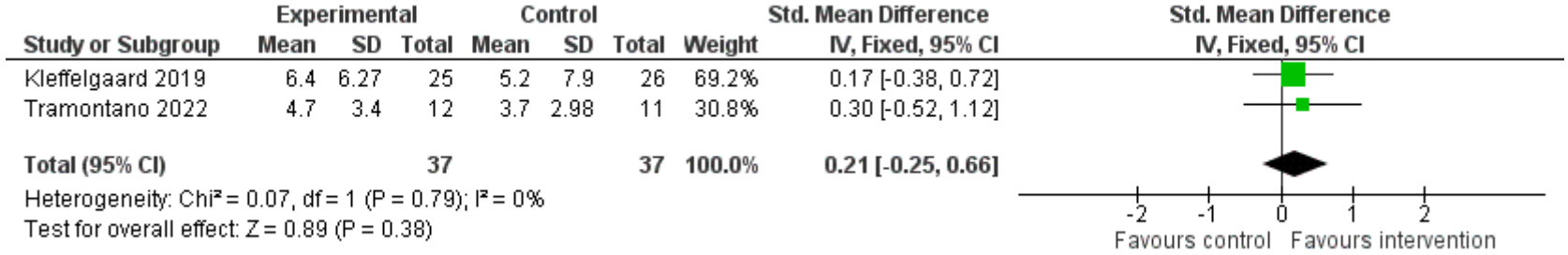
Vestibular exercise versus control in adults with acquired brain injury

Figure 3: Gait and balance as measured by a validated scale; change scores as post-intervention



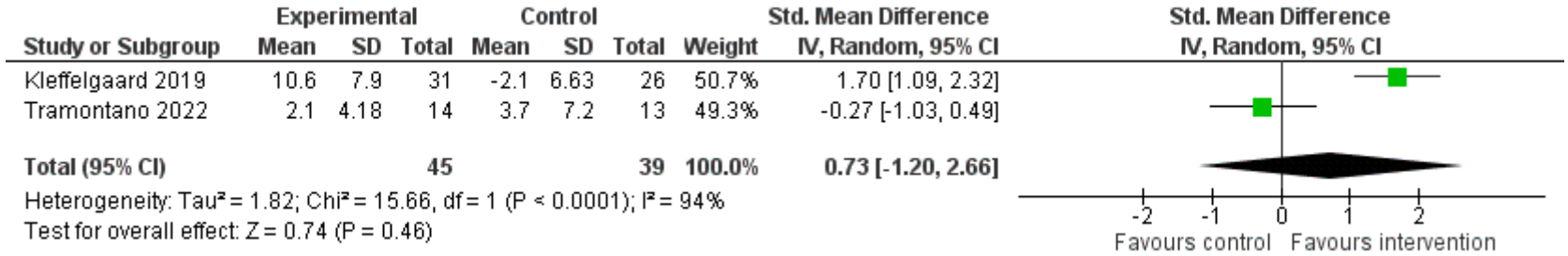
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 4: Gait and balance as measured by a validated scale; change scores at follow-up (2 months)



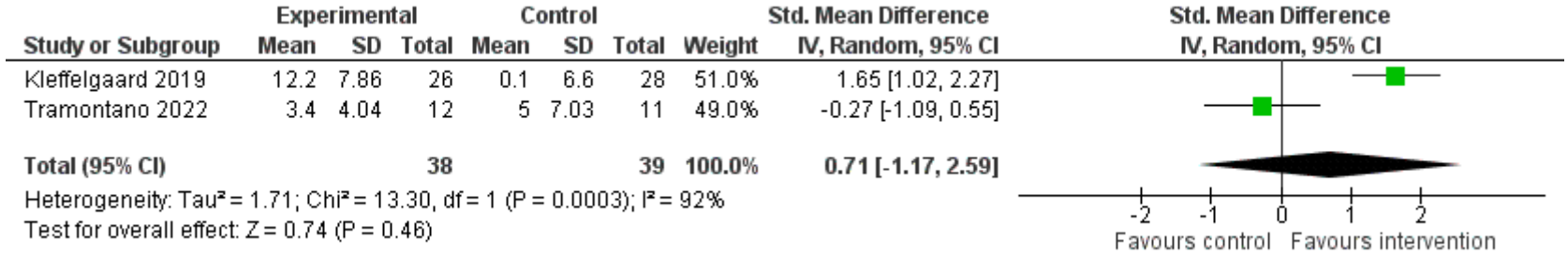
CI: confidence interval IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 5: Balance as measured by a validated scale; change scores at post-intervention



CI: confidence interval IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Kleffelgaard 2019 change scores have been inverted to align with scale direction (better indicated by higher values)

Figure 6: Balance as measured by a validated scale; change scores at follow-up (2 months)

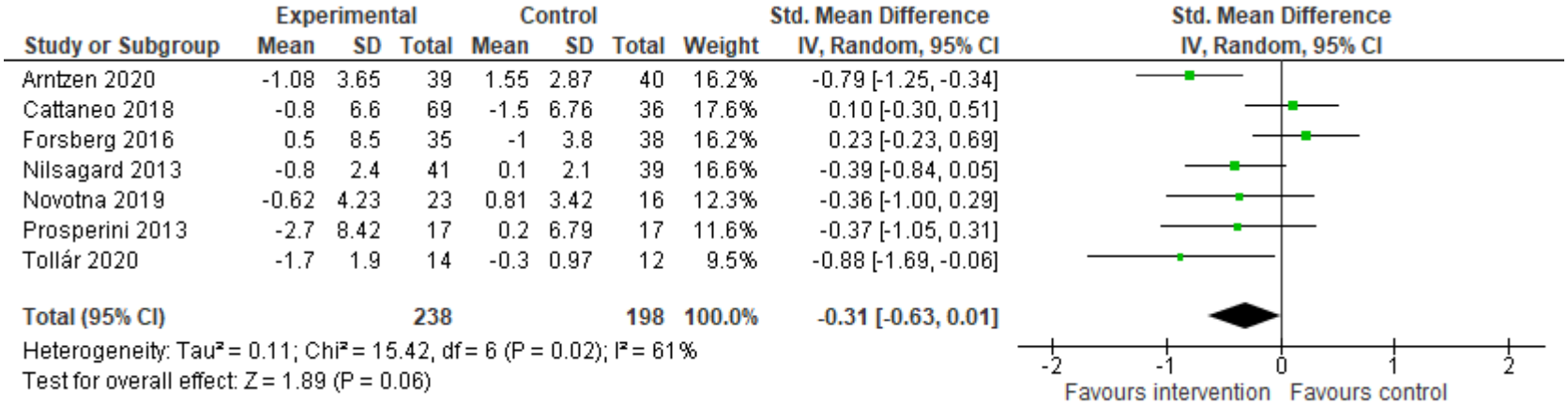


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Kleffelgaard 2019 change scores have been inverted to align with scale direction (better indicated by higher values)

Rehabilitation interventions to address stability: Balance exercises

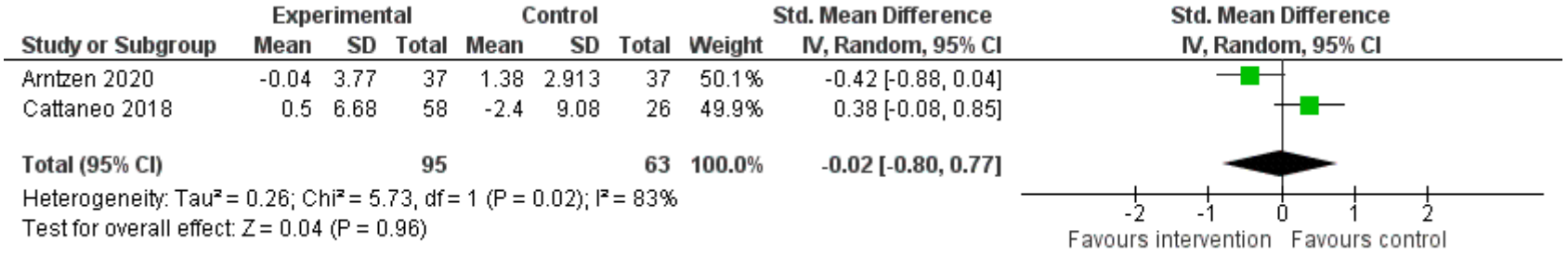
Balance exercises versus control in adults with multiple sclerosis

Figure 7: Gait and balance as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Tollár 2020 change scores have been inverted to align with scale direction (better indicated by lower values)

Figure 8: Gait and balance as measured by a validated scale; change scores at follow-up (8-23 weeks)

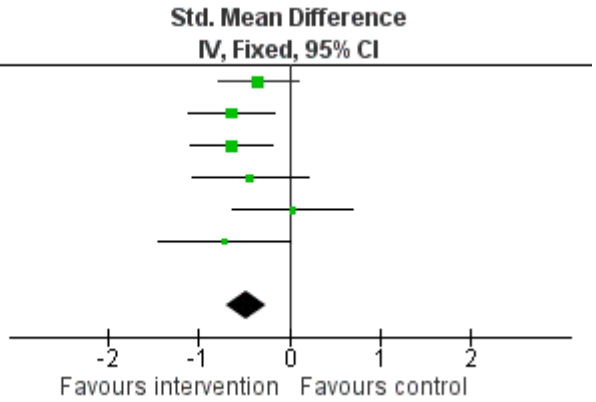


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 9: Gait as measured by a validated scale; change scores at post-intervention

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
Arntzen 2020	-0.37	2.23	39	0.27	1.25	40	24.1%	-0.35 [-0.80, 0.09]
Forsberg 2016	-3.4	5	35	-0.1	5.2	38	21.5%	-0.64 [-1.11, -0.17]
Nilsagard 2013	-5.9	11.5	41	3.95	18.1	39	23.5%	-0.65 [-1.10, -0.20]
Novotna 2019	-1.61	11.79	23	3.44	10.58	16	11.4%	-0.44 [-1.08, 0.21]
Prosperini 2013	-0.7	1.95	17	-0.8	3.3	17	10.5%	0.04 [-0.64, 0.71]
Robinson 2015	-6.1	11.46	16	3.8	15.32	15	9.0%	-0.72 [-1.45, 0.01]
Total (95% CI)			**171**			**165**	**100.0%**	**-0.48 [-0.70, -0.27]**

Heterogeneity: Chi² = 3.97, df = 5 (P = 0.55); I² = 0%
Test for overall effect: Z = 4.35 (P < 0.0001)

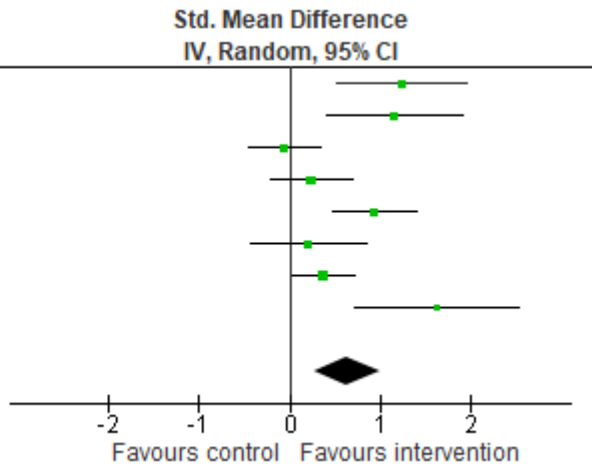


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Robinson 2015 used data from the traditional balance training versus no intervention comparison in this meta-analysis

Figure 10: Balance as measured by a validated scale; change scores at post-intervention

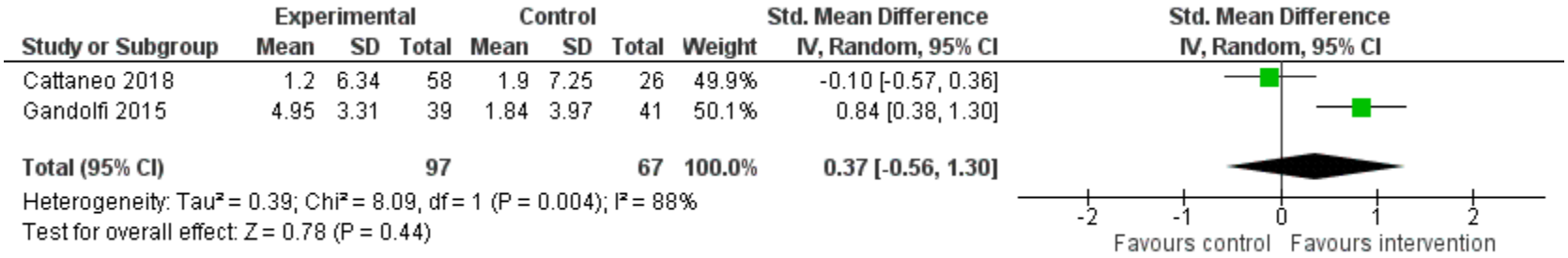
Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Brichetto 2013	5	3.56	18	1	2.61	18	10.7%	1.25 [0.53, 1.97]
Brichetto 2015	6.3	2.38	16	2	4.51	16	10.2%	1.16 [0.41, 1.92]
Cattaneo 2018	2.6	6.15	69	3	7.74	36	14.9%	-0.06 [-0.46, 0.34]
Forsberg 2016	2.6	4.1	35	1.6	4.1	38	14.1%	0.24 [-0.22, 0.70]
Gandolfi 2015	4.8	3.28	39	1.3	4.06	41	14.1%	0.94 [0.47, 1.40]
Novotna 2019	1.87	6.45	23	0.69	4.1	16	11.7%	0.21 [-0.43, 0.85]
Pavlikova 2020	3.27	4.84	93	1.39	5.16	55	15.7%	0.38 [0.04, 0.71]
Tollár 2020	3.9	2.25	14	-0.2	2.62	12	8.6%	1.64 [0.73, 2.55]
Total (95% CI)			**307**			**232**	**100.0%**	**0.63 [0.27, 1.00]**

Heterogeneity: Tau² = 0.19; Chi² = 26.44, df = 7 (P = 0.0004); I² = 74%
Test for overall effect: Z = 3.38 (P = 0.0007)



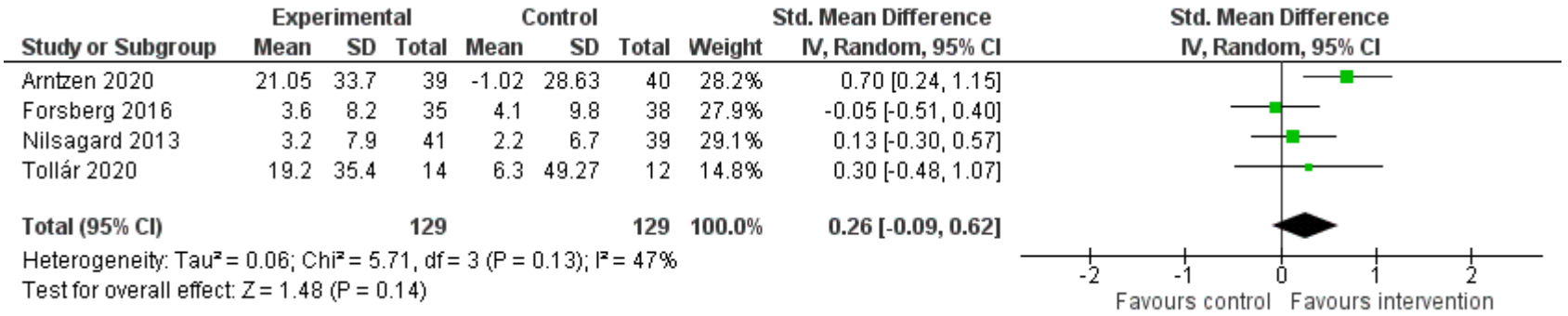
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: For Pavlikova 2020, outcomes from the 2 intervention groups and the 2 control groups have been combined into 1 result for this meta-analysis

Figure 11: Balance as measured by a validated scale; change scores at follow-up (1-2 months)



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

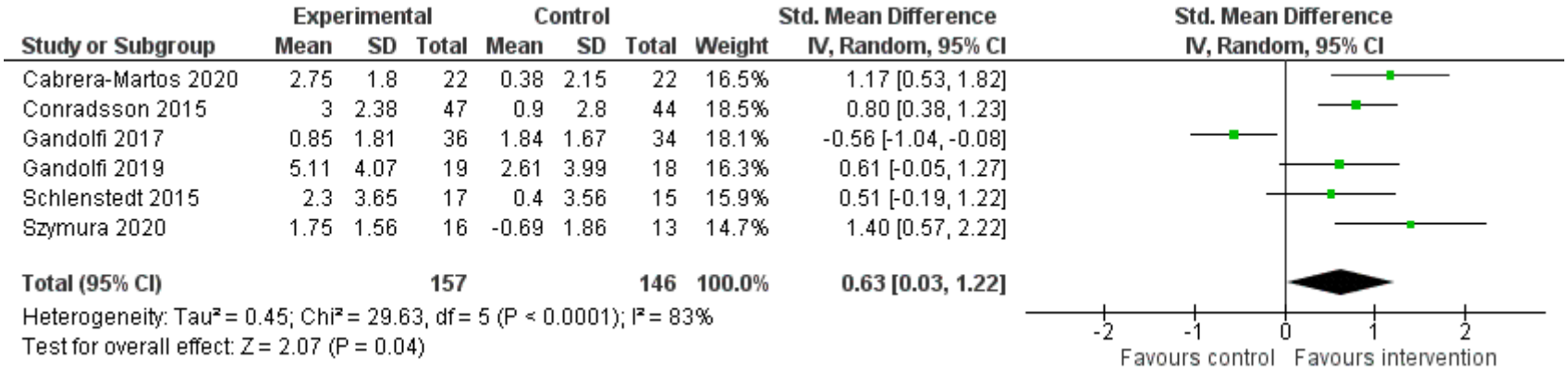
Figure 12: Exercise capacity as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Forsberg 2016 and Nilsagard 2013 change scores have been inverted to align with scale direction (better indicated by higher values)

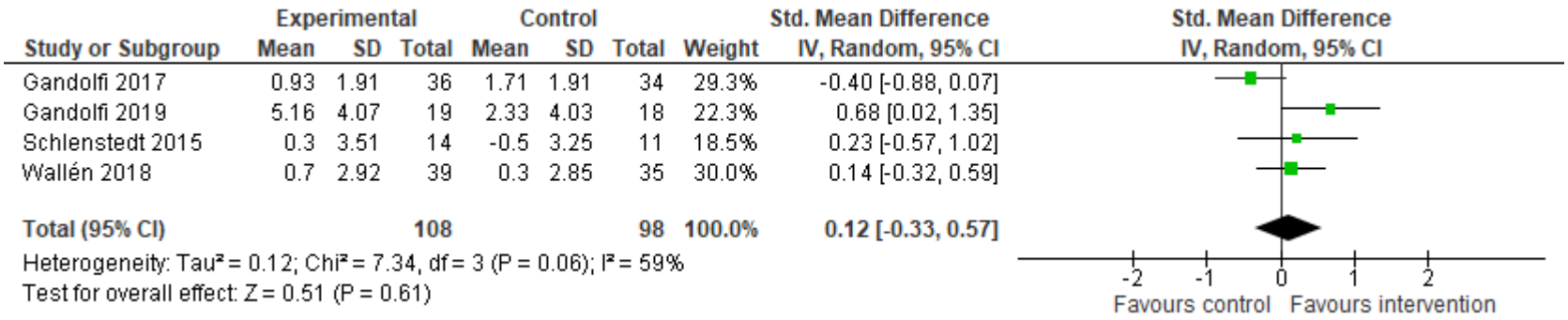
Balance exercises versus control in adults with Parkinson's disease

Figure 13: Gait and balance as measured by a validated scale; change scores at post-intervention



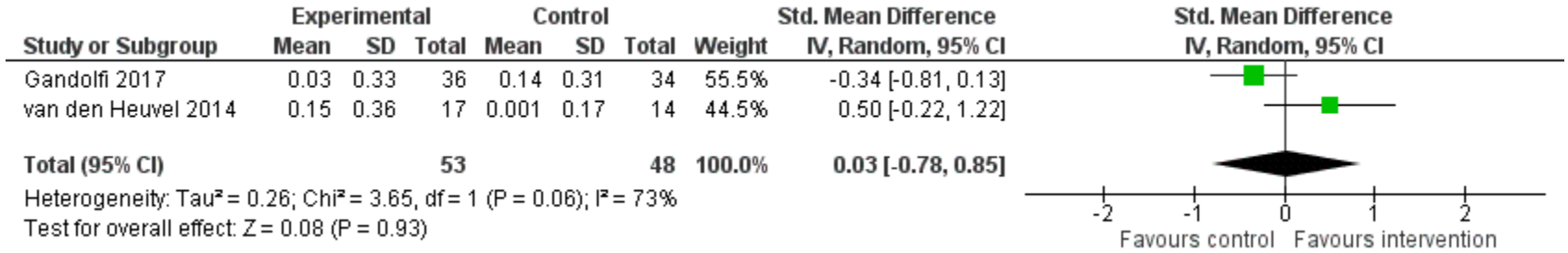
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 14: Gait and balance as measured by a validated scale; change scores at follow-up (4-42 weeks)



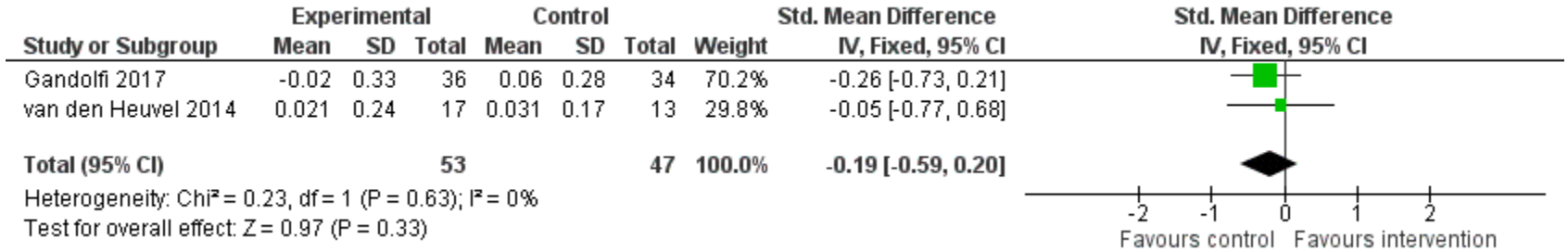
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 15: Gait as measured by a validated scale; change scores at post-intervention



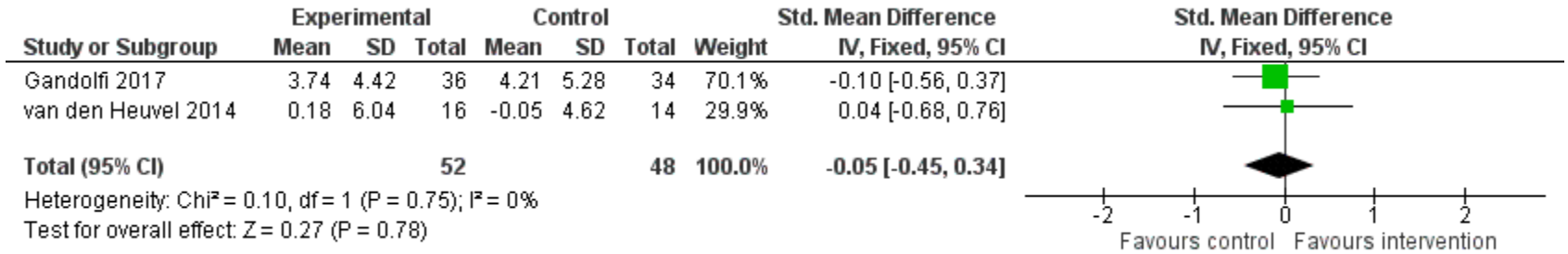
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 16: Gait as measured by a validated scale; change scores at follow-up (4-6 weeks)



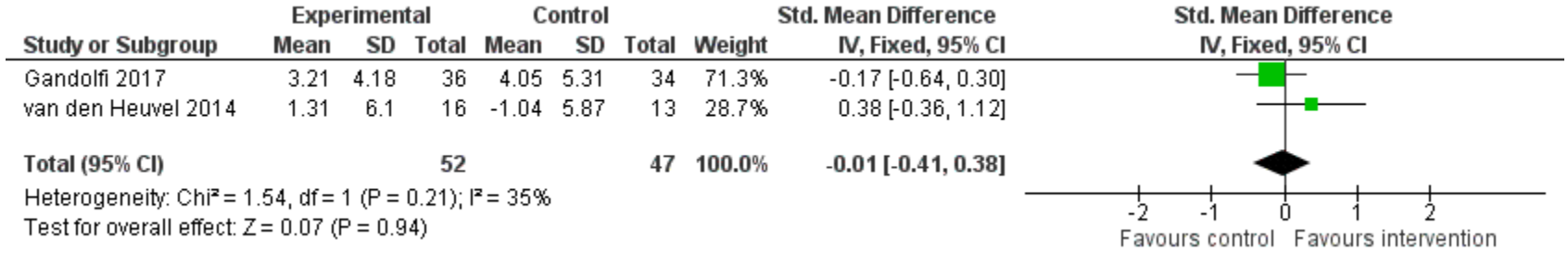
CI: confidence interval; IV: inverse variance; SD: standard deviation.
Mean: mean difference between baseline and end-point

Figure 17: Balance as measured by a validated scale; change scores at post-intervention



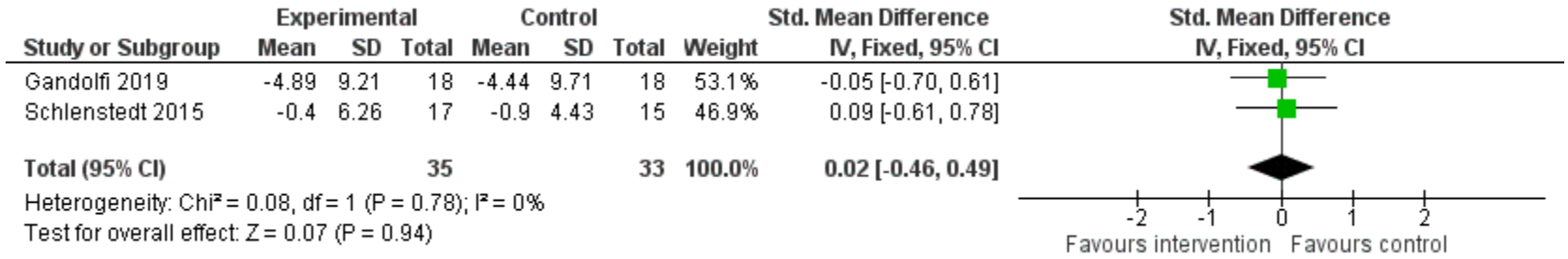
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 18: Balance as measured by a validated scale; change scores at follow-up (4-6 weeks)



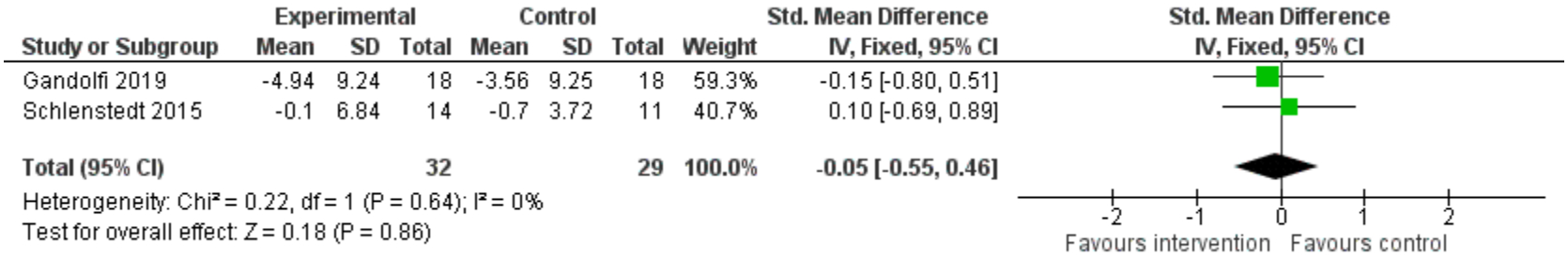
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 19: Limb/joint/muscle function (motor functioning) as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 20: Limb/joint/muscle function (motor functioning) as measured by a validated scale; change scores at follow-up (1-3 months)

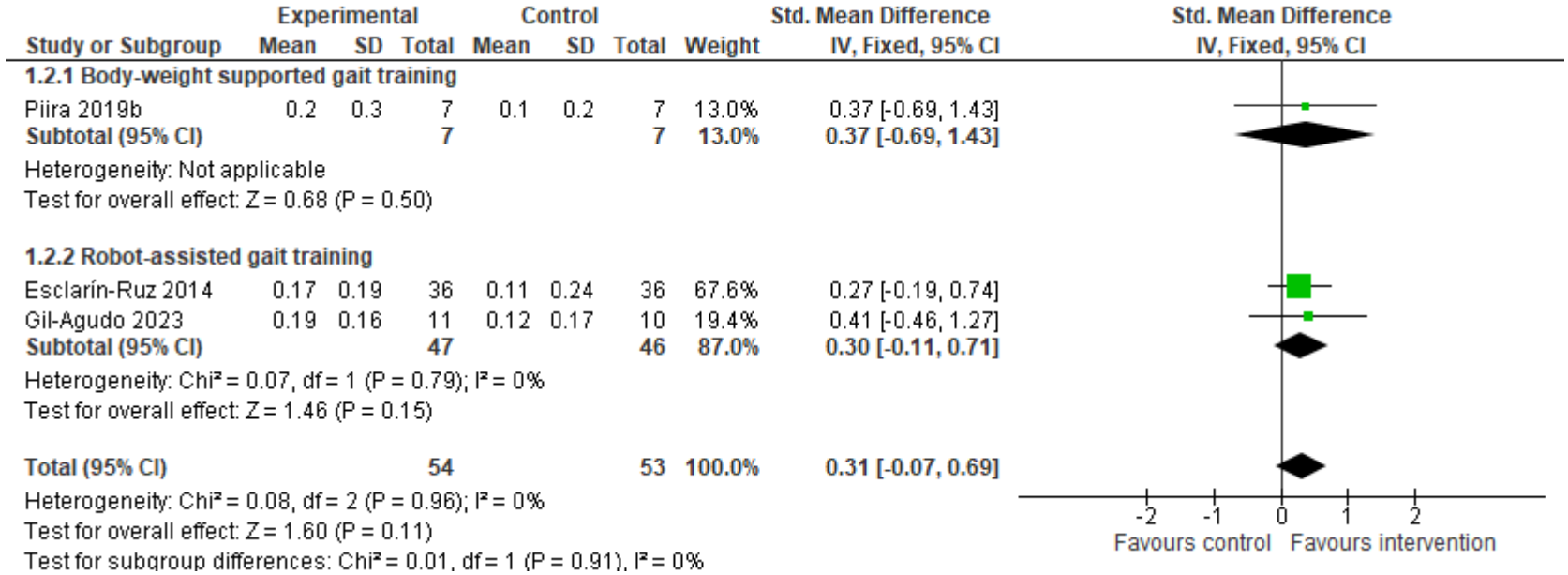


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Rehabilitation interventions to address mobility: Gait training

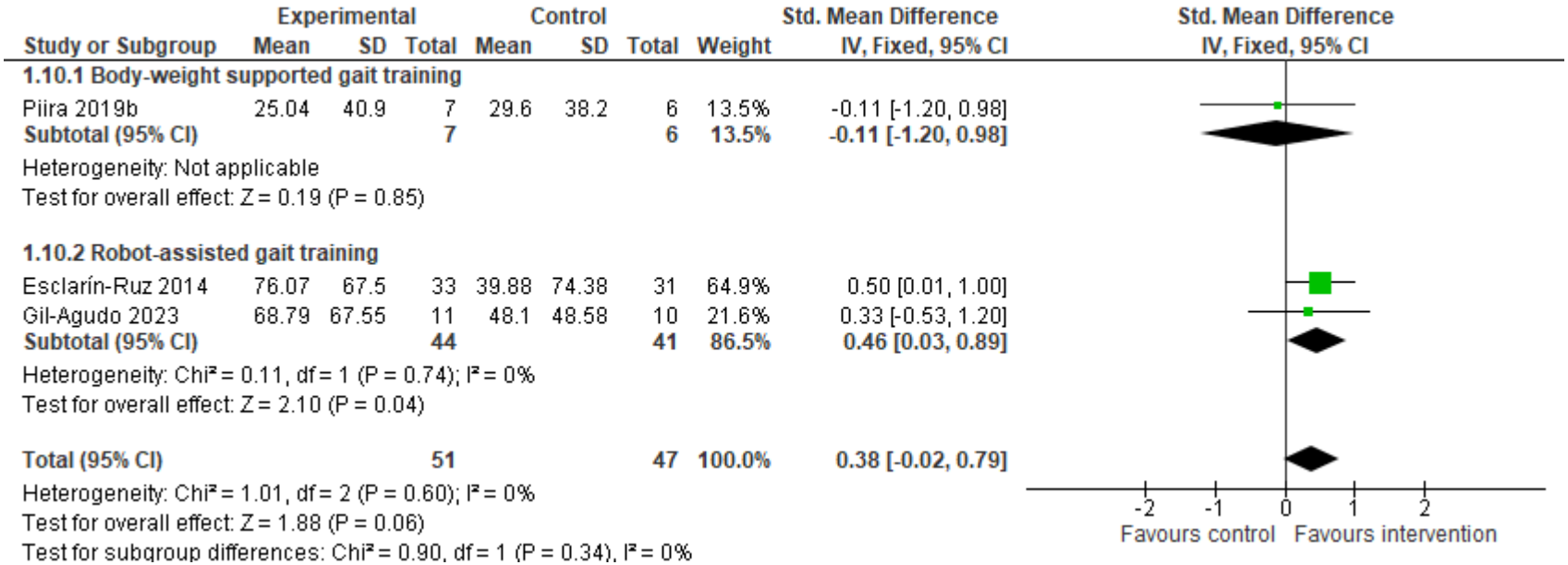
Gait training versus control in adults with acquired spinal cord injury

Figure 21: Gait as measured by a validated scale; change scores at post-intervention



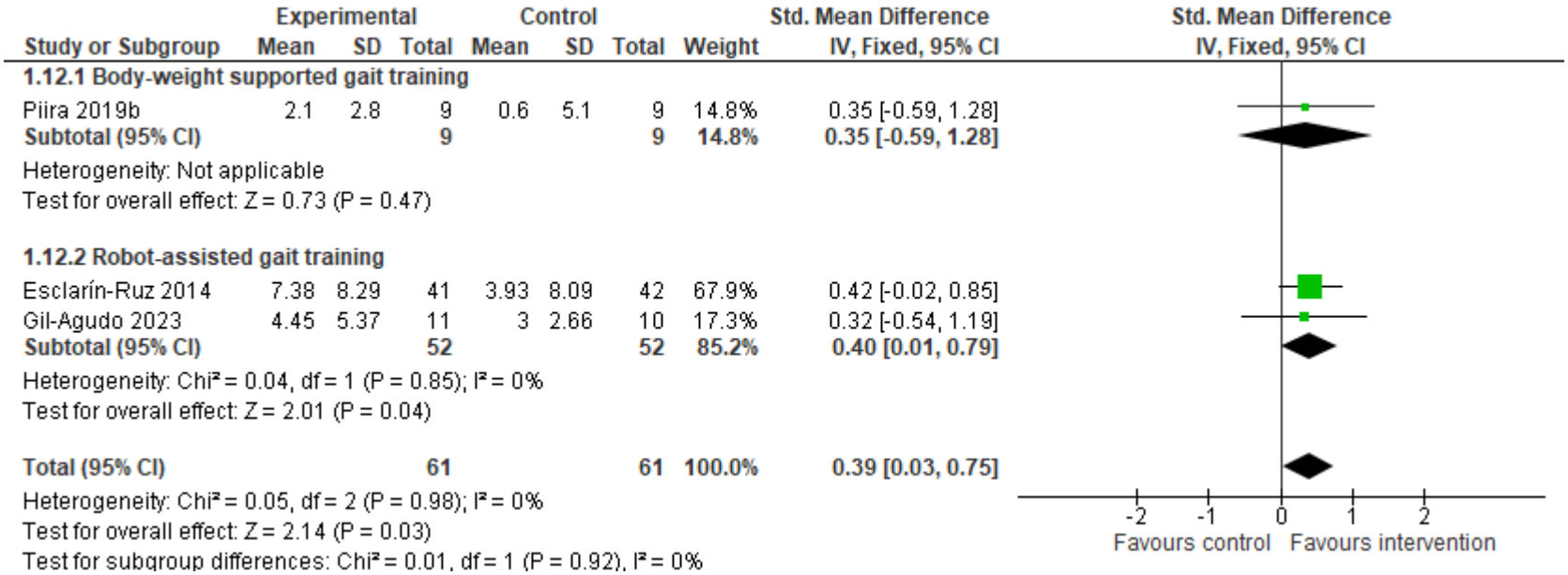
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 22: Exercise capacity as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 23: Limb/joint/muscle function (lower limb function) as measured by a validated scale; change scores at post-intervention

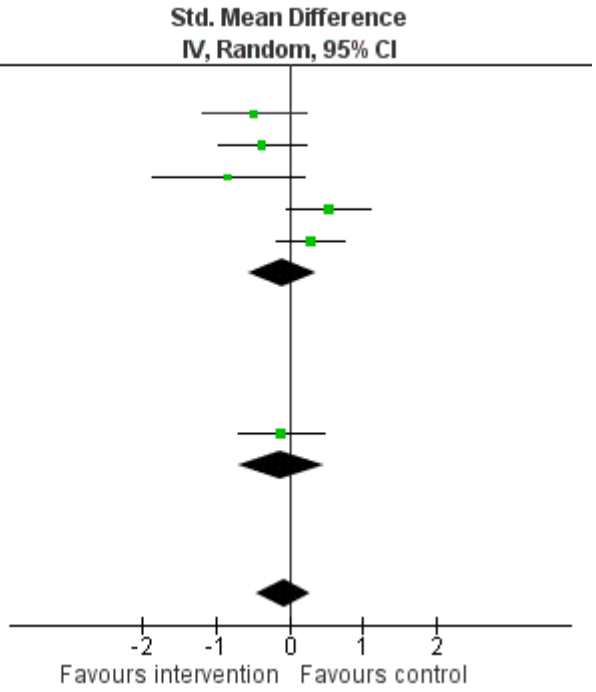


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Gait training versus control in adults with multiple sclerosis

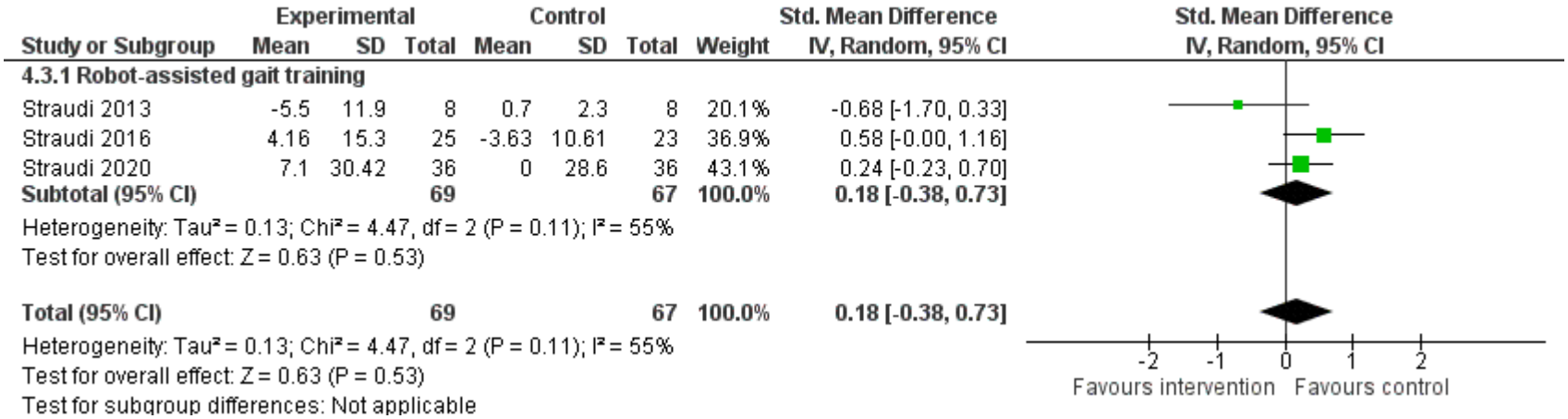
Figure 24: Gait and balance as measured by a validated scale; change scores at post-intervention

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
4.1.1 Robot-assisted gait training								
Berriozabalgoitia 2021	-2.5	8.08	18	1.35	7.54	14	15.0%	-0.48 [-1.19, 0.23]
Pompa 2017	-2	1.74	21	-1.27	2.07	22	17.6%	-0.37 [-0.98, 0.23]
Straudi 2013	-5.9	10	8	0.6	2.4	8	9.3%	-0.85 [-1.88, 0.19]
Straudi 2016	2.66	13.79	25	-3.96	10.5	23	18.4%	0.53 [-0.05, 1.11]
Straudi 2020	1.3	23.19	36	-6.3	28.43	36	21.7%	0.29 [-0.17, 0.75]
Subtotal (95% CI)			**108**			**103**	**82.0%**	**-0.09 [-0.55, 0.38]**
Heterogeneity: Tau² = 0.17; Chi² = 10.48, df = 4 (P = 0.03); I² = 62%								
Test for overall effect: Z = 0.37 (P = 0.71)								
4.1.2 Step training								
Hoang 2016	-0.8	3.64	23	-0.4	3.08	21	18.0%	-0.12 [-0.71, 0.48]
Subtotal (95% CI)			**23**			**21**	**18.0%**	**-0.12 [-0.71, 0.48]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.38 (P = 0.70)								
Total (95% CI)			**131**			**124**	**100.0%**	**-0.08 [-0.45, 0.30]**
Heterogeneity: Tau² = 0.11; Chi² = 10.63, df = 5 (P = 0.06); I² = 53%								
Test for overall effect: Z = 0.41 (P = 0.68)								
Test for subgroup differences: Chi² = 0.01, df = 1 (P = 0.94), I² = 0%								



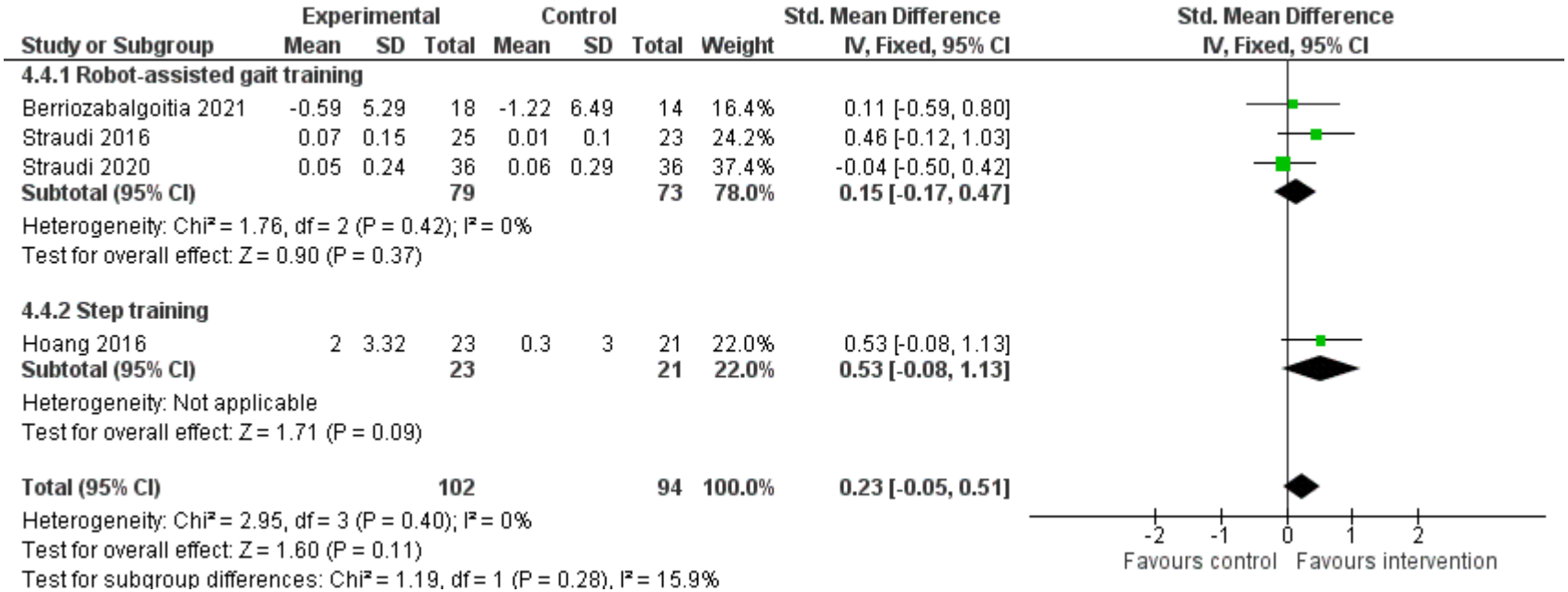
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Pompa 2017 change scores have been inverted to align with scale direction (better indicated by lower values)

Figure 25: Gait and balance as measured by a validated scale; change scores at follow-up (6 weeks to 3 months)



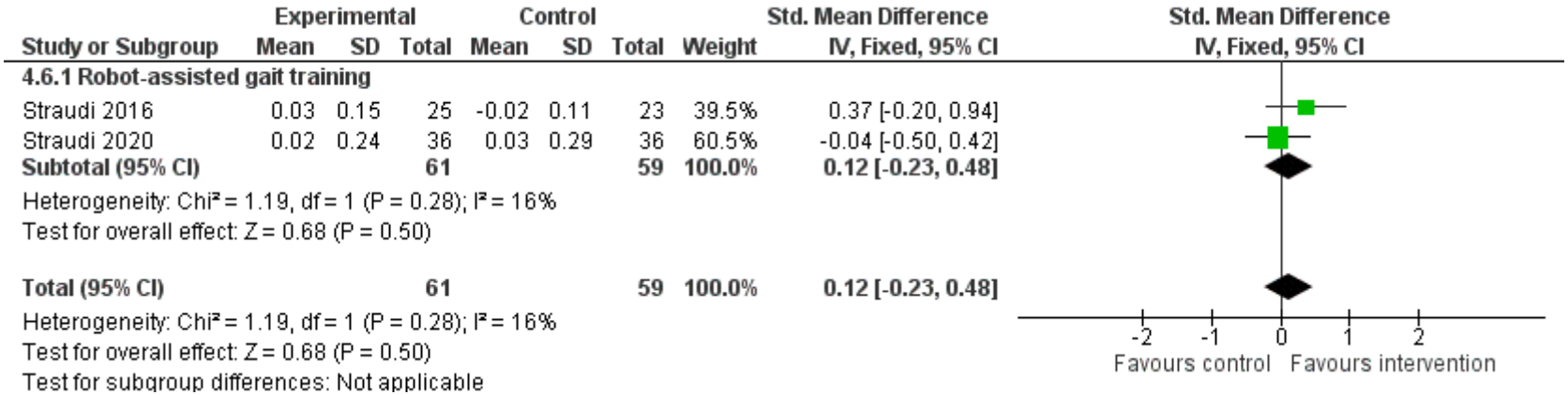
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 26: Gait as measured by a validated scale; change scores at post-intervention



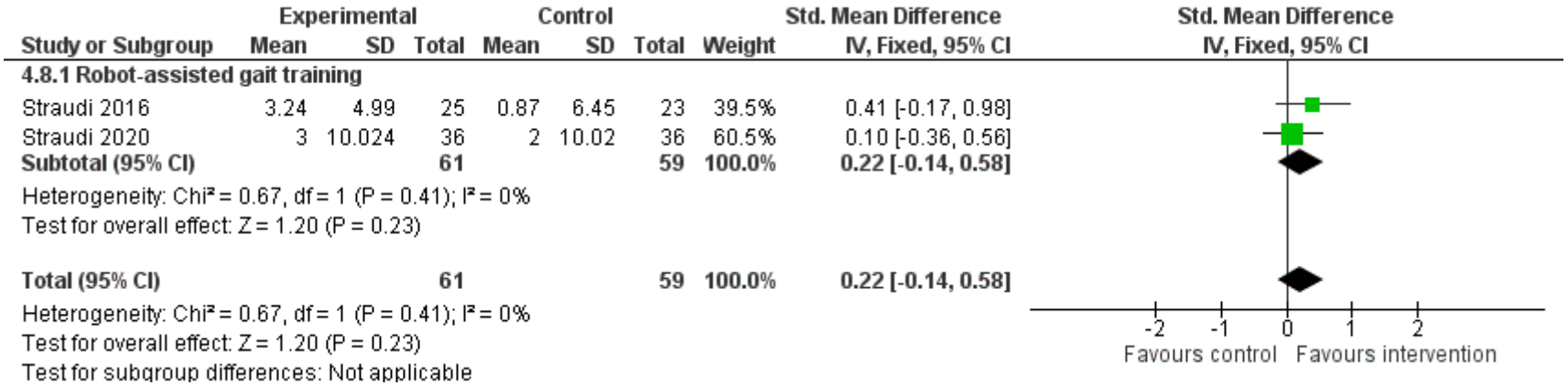
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Berriozabalgoitia 2021 and Hoang 2016 change scores have been inverted to align with scale direction (better indicated by higher values)

Figure 27: Gait as measured by a validated scale; change scores at follow-up (6 weeks to 3 months)



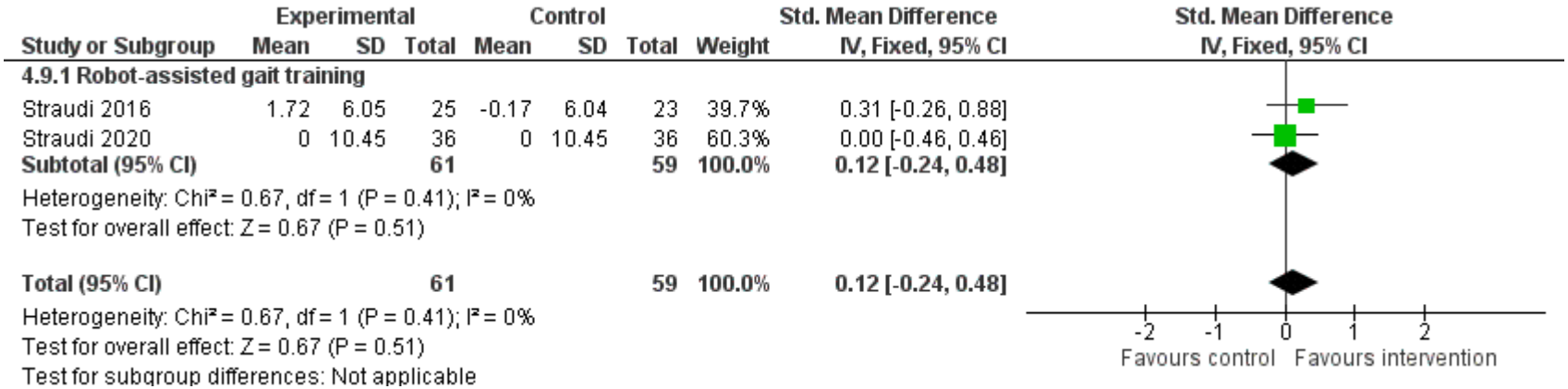
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 28: Balance as measured by a validated scale; change scores at post-intervention



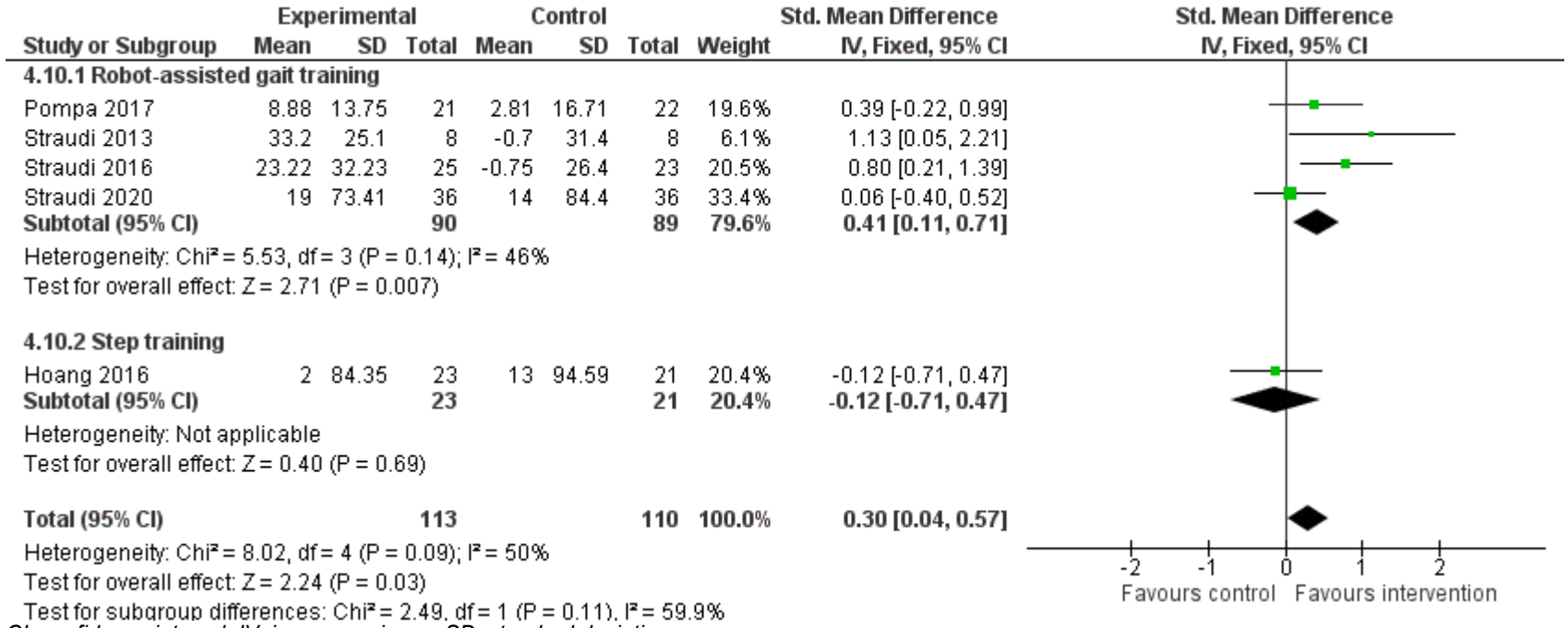
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 29: Balance as measured by a validated scale; change scores at follow-up (6 weeks to 3 months)



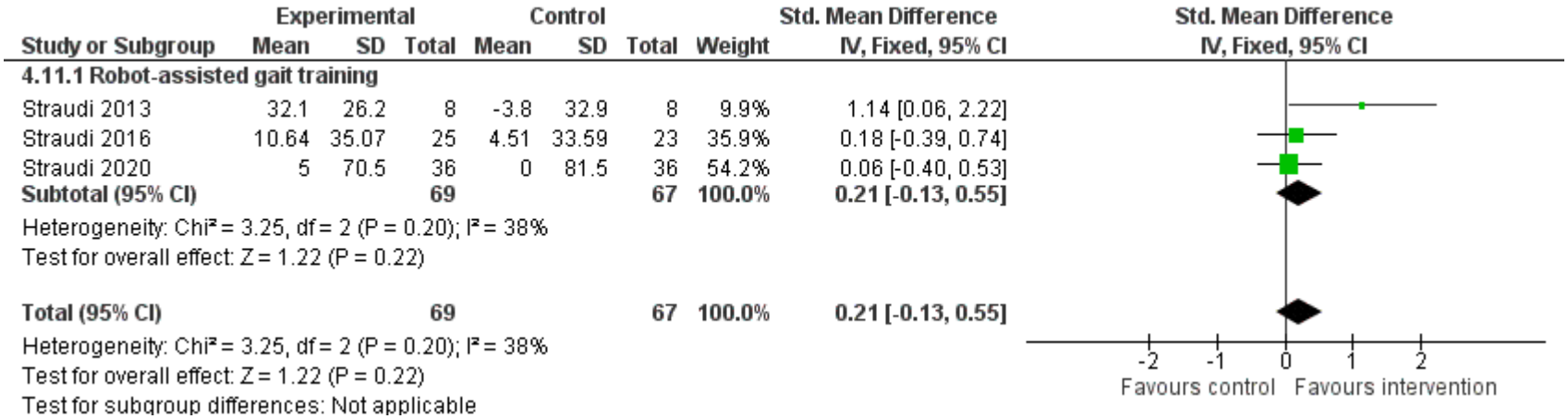
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 30: Exercise capacity as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

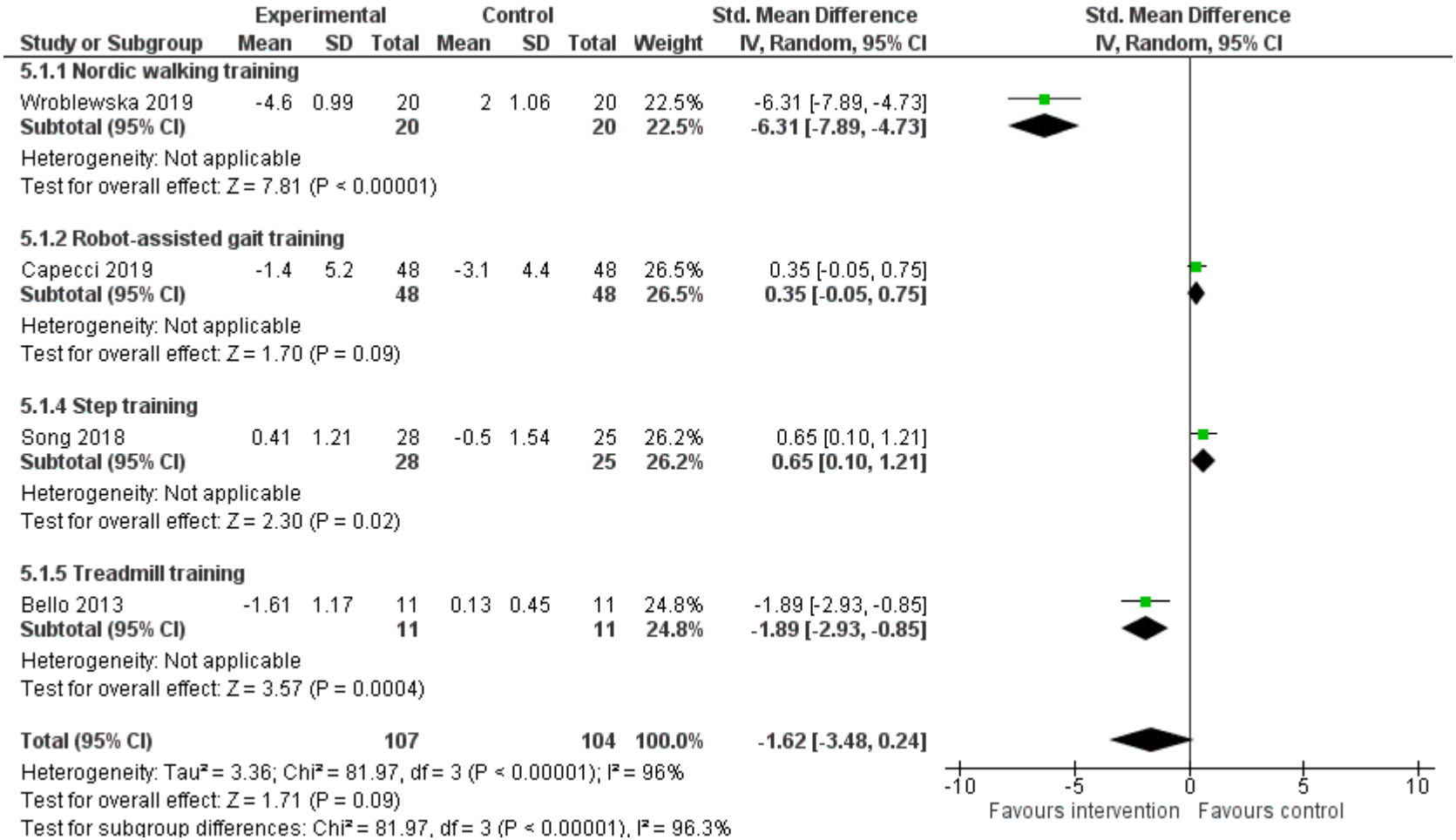
Figure 31: Exercise capacity as measured by a validated scale; change scores at follow-up (6 weeks to 3 months)



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

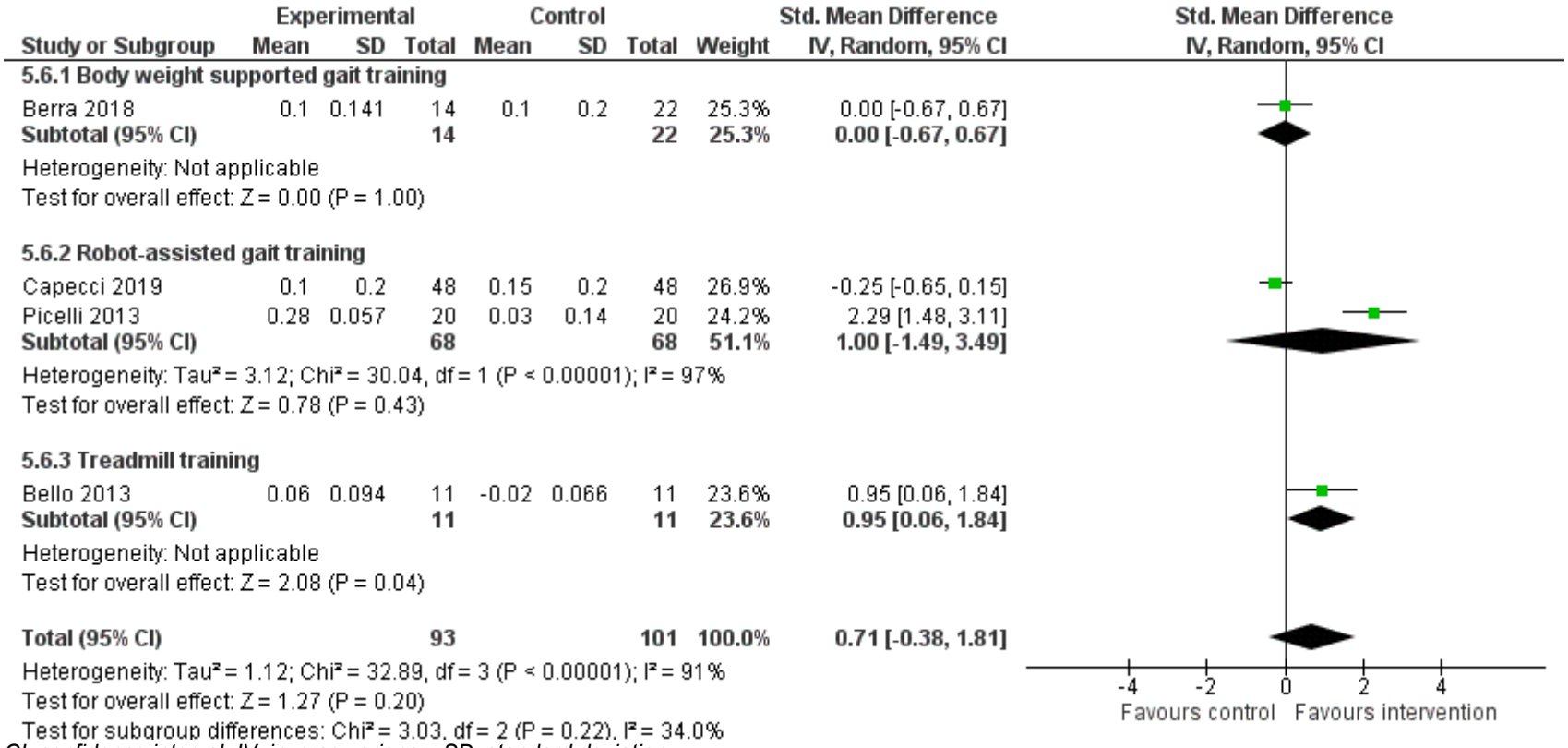
Gait training versus control in adults with Parkinson's disease

Figure 32: Gait and balance as measured by a validated scale; change scores at post-intervention



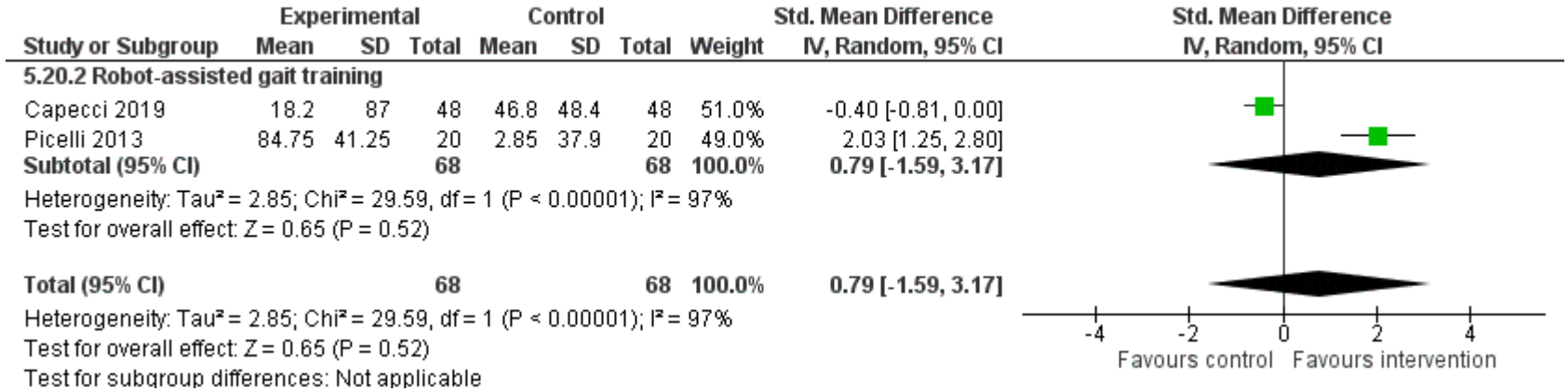
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 33: Gait as measured by a validated scale; change scores at post-intervention



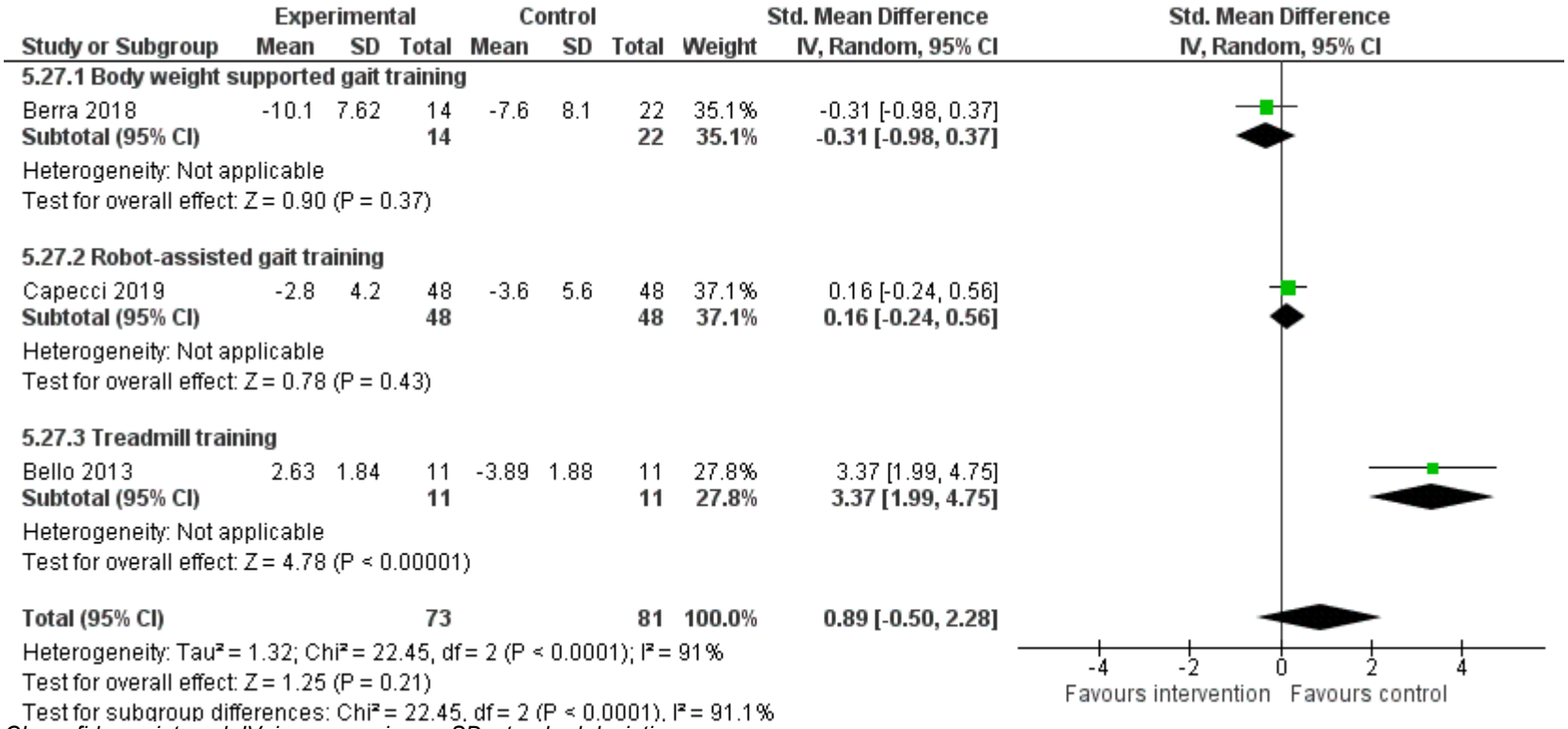
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Picelli 2013 used data from the robot-assisted gait training versus conventional gait training comparison in this meta-analysis

Figure 34: Exercise capacity as measured by a validated scale; change scores at post-intervention



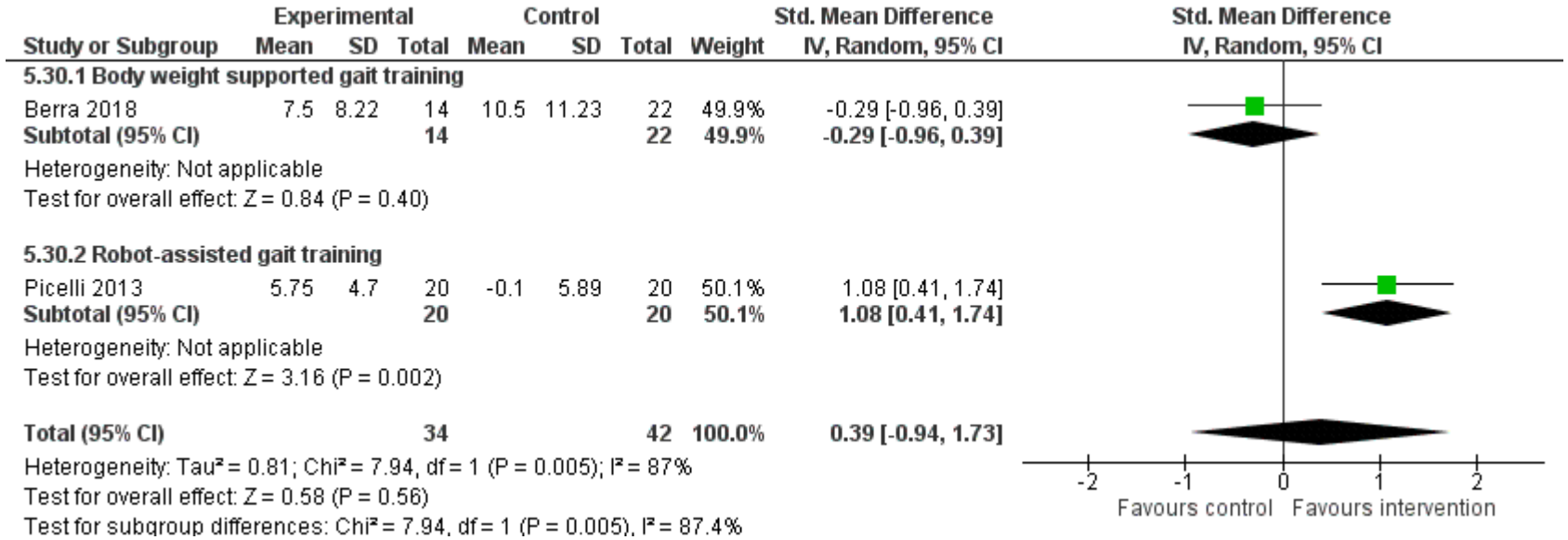
CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Picelli 2013 used data from the robot-assisted gait training versus conventional gait training comparison in this meta-analysis

Figure 35: Limb/joint/muscle function (motor functioning) as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 36: Functioning as measured by a validated scale; change scores at post-intervention

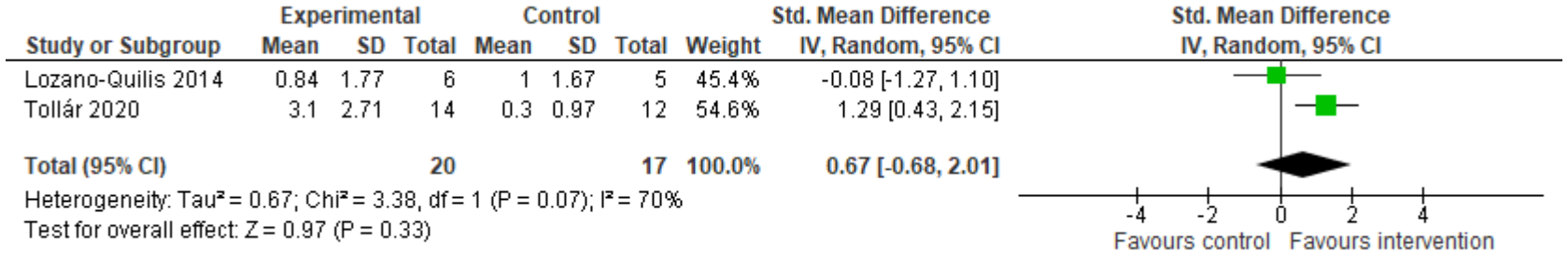


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point
Note: Picelli 2013 used data from the robot-assisted gait training versus conventional gait training comparison in this meta-analysis and change scores have been inverted to align with scale direction (better indicated by higher values)

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Exergaming and AR/VR

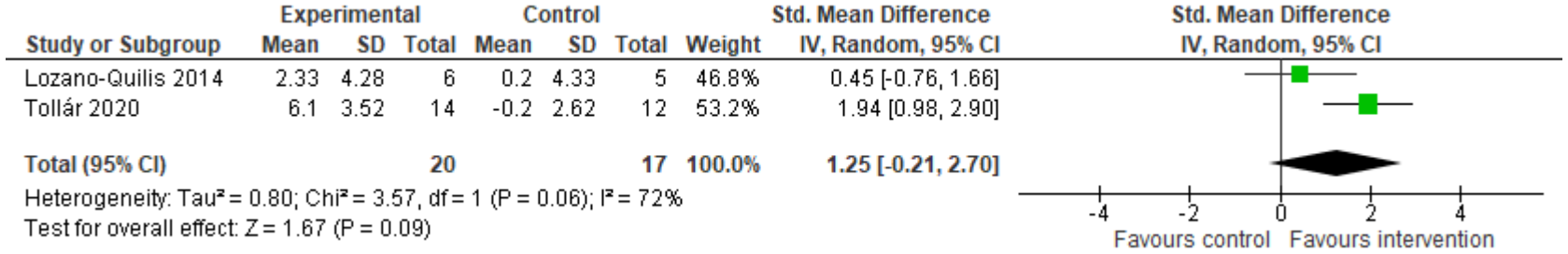
Exergaming and AR/VR versus control in adults with multiple sclerosis

Figure 37: Gait and balance as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

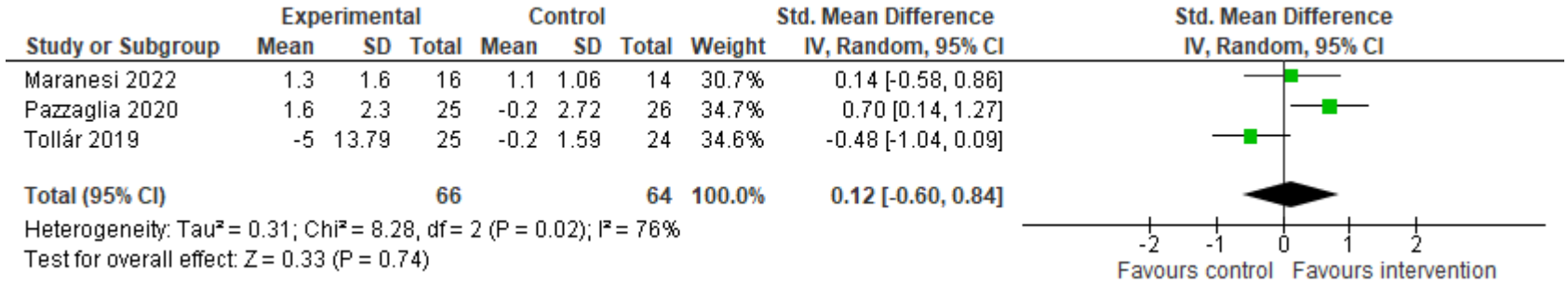
Figure 38: Balance as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

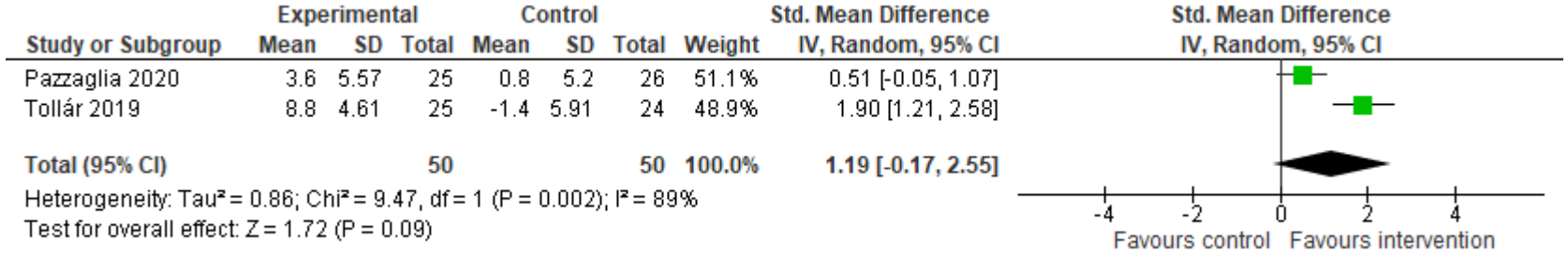
Exergaming and AR/VR versus control in adults with Parkinson's disease

Figure 39: Gait and balance as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 40: Balance as measured by a validated scale; change scores at post-intervention

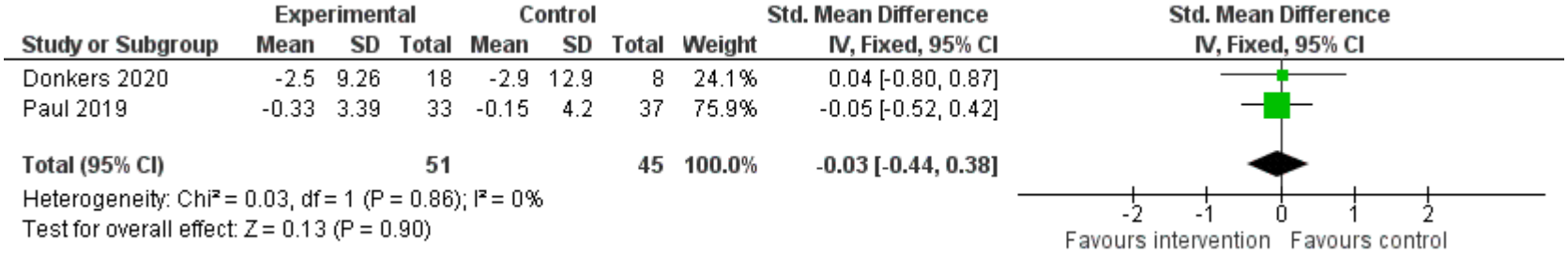


CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Individualised (tailored) exercise programmes

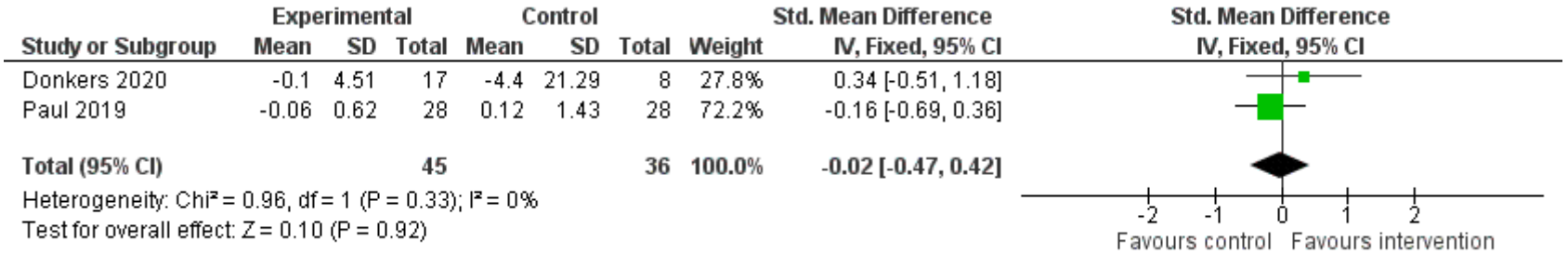
Individualised (tailored) exercise programme versus control in adults with multiple sclerosis

Figure 41: Gait and balance as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Figure 42: Gait as measured by a validated scale; change scores at post-intervention



CI: confidence interval; IV: inverse variance; SD: standard deviation
Mean: mean difference between baseline and end-point

Appendix F GRADE tables

GRADE tables for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Rehabilitation interventions to address upper limb functioning: Robotics and repetitive task training

Table 5: Evidence profile for comparison between robotics and control in adults with acquired spinal cord injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Robotics	Control	Relative (95% CI)	Absolute		
Limb/joint/muscle function (upper limb function) as measured by CUE change scores at post-intervention - Robotic training plus conventional therapy (Better indicated by higher values)												
1 (Lozano-Berrio 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	13	-	SMD 0.28 higher (0.49 lower to 1.06 higher)	VERY LOW	CRITICAL
Functioning as measured by SCIM3 change scores at post-intervention - Robotic training plus conventional therapy (Better indicated by higher values)												
1 (Lozano-Berrio 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	13	13	-	SMD 0.12 lower (0.89 lower to 0.65 higher)	VERY LOW	CRITICAL

CI: confidence interval; CUE: capabilities of upper extremity questionnaire; SCIM3: spinal cord independence measure 3rd revision; SMD: standardised mean difference
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 6: Evidence profile for comparison between robotics and control in adults with multiple sclerosis

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Robotics	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by RMI change scores at post-intervention - Robot-assisted upper limb training (PABLO-Tyromotion) (Better indicated by higher values)												
1 (Tramontano 2020)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	14	16	-	SMD 0.06 higher (0.65 lower to 0.78 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by ARAT change scores at post-intervention - Robot-assisted hand training (Better indicated by higher values)												
1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	serious[4]	none	21	18	-	SMD 0.13 higher (0.5 lower to 0.67 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by FMA-UE change scores at post-intervention - Robot-assisted hand training (Better indicated by higher values)												
1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	serious[4]	none	21	18	-	SMD 0.16 lower (0.8 lower to 0.47 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by MI-UE change scores at post-intervention - Robot-assisted hand training (Better indicated by higher values)												
1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	very serious[2]	none	21	18	-	SMD 0.03 lower (0.66 lower to 0.6 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (hand function) as measured by a validated scale; change scores at post-intervention - Robotics (Better indicated by lower values)												
2*	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	serious[4]	none	35	34	-	SMD 0.05 lower (0.52 lower to 0.43 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by ARAT at 1 month follow-up - Robot-assisted hand training (Better indicated by higher values)												

1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	very serious[2]	none	21	18	-	SMD 0.03 lower (0.6 lower to 0.66 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by FMA-UE at 1 month follow-up - Robot-assisted hand training (Better indicated by higher values)												
1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	very serious[2]	none	21	18	-	SMD 0.05 higher (0.58 lower to 0.68 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by MI-UE at 1 month follow-up - Robot-assisted hand training (Better indicated by higher values)												
1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	very serious[2]	none	21	18	-	SMD 0.06 higher (0.57 lower to 0.69 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (hand function) as measured by 9HPT (pegs/s) at 1 month follow-up - Robot-assisted hand training (Better indicated by higher values)												
1 (Gandolfi 2018)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	serious[4]	none	21	18	-	SMD 0.24 lower (0.87 lower to 0.4 higher)	VERY LOW	CRITICAL

ARAT: action research arm test; CI: confidence interval; FMA-UE: Fugl-Meyer assessment for upper extremity; MI-UE: motricity index - upper extremity; RMI: Rivermead mobility index; s:seconds; SMD: standardised mean difference; 9HPT: 9 hole peg test
** See corresponding forest plot*
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)
3 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
4 95% CI crosses 1 MID (for SMD +/-0.5)

Table 7: Evidence profile for comparison between robotics and control in adults with Parkinson's disease

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Robotics	Control	Relative (95% CI)	Absolute		
Limb/joint/muscle function (motor functioning) as measured by UPDRS III scores at post intervention - Upper limb robotic therapy (Better indicated by lower values)												
1 (Raciti 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	9	-	Upper limb robotic therapy (median [IQR]): 21 (16 to 26) Conventional physical therapy (median [IQR]): 32 (23.25 to 40) p=0.5[3]	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by FMA-UE scores at post-intervention - Upper limb robotic therapy (Better indicated by higher values)												
1 (Raciti 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	9	-	Upper limb robotic therapy (median [IQR]): 53 (51 to 55) Conventional physical therapy (median [IQR]): 56 (52.5 to 59.5) p=0.009[4]	VERY LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by MI-UE scores at post-intervention - Upper limb robotic therapy (Better indicated by higher values)												
1 (Raciti 2022)	randomised trials	very serious[5]	no serious inconsistency	no serious indirectness	very serious[2]	none	12	9	-	Upper limb robotic therapy (median [IQR]): 89 (83 to 94)	VERY LOW	CRITICAL

										Conventional physical therapy (median [IQR]): 82 (79.25 to 88.5) p= 0.0001[6]		
Limb/joint/muscle function (hand function) as measured by 9HPT (s) change scores at post-intervention - Upper limb robotic therapy (Better indicated by lower values)												
1 (Raciti 2022)	randomised trials	very serious[5]	no serious inconsistency	no serious indirectness	serious[7]	none	12	9	-	SMD 0.46 lower (1.34 lower to 0.41 higher)	VERY LOW	CRITICAL
Functioning as measured by FIM scores at post-intervention - Upper limb robotic therapy (Better indicated by higher values)												
1 (Raciti 2022)	randomised trials	very serious[5]	no serious inconsistency	no serious indirectness	very serious[2]	none	12	9	-	Upper limb robotic therapy (median [IQR]): 110 (105 to 115) Conventional physical therapy (median [IQR]): 101 (100 to 106) p=0.6[3]	VERY LOW	CRITICAL

CI: confidence interval; FIM: functional independence measure; FMA-UE: Fugl-Meyer assessment for upper extremity; IQR: interquartile range; MI-UE: motricity index - upper extremity; s: seconds; SMD: standardised mean difference; UPDRS III: unified Parkinson's disease rating scale part 3; 9HPT: 9 hole peg test
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 Very serious imprecision due to sample size <200
3 No statistically significant difference between groups, according to author analysis
4 Differences between groups judged to be statistically significant according to author analysis, favouring control. Clinical significance could not be determined
5 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
6 Differences between groups judged to be statistically significant according to author analysis, favouring robotics. Clinical significance could not be determined
7 95% CI crosses 1 MID (for SMD +/-0.5)

Table 8: Evidence profile for comparison between robotics and placebo in adults with multiple sclerosis

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Robotics**	**Placebo**	**Relative (95% CI)**	**Absolute**		
Limb/joint/muscle function (upper limb function) as measured by ARAT change scores at post-intervention - Robot-based haptic training (Better indicated by higher values)												
1 (Solaro 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	19	17	-	SMD 0.31 higher (0.34 lower to 0.97 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (hand function) as measured by 9HPT (s) change scores at post-intervention - Robot-based haptic training (Better indicated by lower values)												
1 (Solaro 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	19	17	-	SMD 0.33 lower (0.99 lower to 0.33 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (hand function) as measured by 9HPT improvers (defined as participants with decreased scores after treatment) at post-intervention - Robot-based haptic training												
1 (Solaro 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	15/19 (78.9%)	10/17 (58.8%)	RR 1.34 (0.85 to 2.13)	200 more per 1000 (from 88 fewer to 665 more)	VERY LOW	CRITICAL
Limb/joint/muscle function (hand function) as measured by 9HPT responders (defined as participants with at least 20% decrease in score) at post-intervention - Robot-based haptic training												
1 (Solaro 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	6/19 (31.6%)	3/17 (17.6%)	RR 1.79 (0.53 to 6.07)	139 more per 1000 (from 83 fewer to 895 more)	VERY LOW	CRITICAL
Limb/joint/muscle function (hand function) as measured by 9HPT worsening (defined as participants with increased scores after treatment) at post-intervention - Robot-based haptic training												
1 (Solaro 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	4/19 (21.1%)	7/17 (41.2%)	RR 0.51 (0.18 to 1.45)	202 fewer per 1000 (from 338 fewer to 185 more)	VERY LOW	CRITICAL

ARAT: action research arm test; CI: confidence interval; RR: risk ratio; s: seconds; SMD: standardised mean difference; 9HPT: 9 hole peg test

1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for RR 0.8 and 1.25, for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for RR 0.8 and 1.25)

Rehabilitation interventions to address stability: Vestibular exercise, including optokinetic training

Table 9: Evidence profile for comparison between vestibular exercise and control in adults with acquired brain injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vestibular exercise	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by a validated scale; change scores at post-intervention - Vestibular exercise (Better indicated by higher values)												
2*	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	43	36	-	SMD 0.49 higher (0.03 to 0.94 higher)	LOW	CRITICAL
Gait and balance as measured by CB&M change scores at post-intervention - Vestibular rehabilitation plus standard neurorehabilitation (Better indicated by higher values)												
1 (Tramontano 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	14	13	-	SMD 0.24 higher (0.52 lower to 1 higher)	VERY LOW	CRITICAL
Gait and balance as measured by DGI change scores at 1 month follow-up - Vestibular rehabilitation plus standard neurorehabilitation (Better indicated by higher values)												
1 (Tramontano 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	13	-	SMD 0.27 higher (0.5 lower to 1.04 higher)	LOW	CRITICAL
Gait and balance as measured by CB&M change scores at 1 month follow-up - Vestibular rehabilitation plus standard neurorehabilitation (Better indicated by higher values)												
1 (Tramontano 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	13	13	-	SMD 0.18 lower (0.95	VERY LOW	CRITICAL

										lower to 0.59 higher)		
Gait and balance as measured by a validated scale; change scores at 2 months follow-up - Vestibular exercise (Better indicated by higher values)												
2*	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	37	37	-	SMD 0.21 higher (0.25 lower to 0.66 higher)	LOW	CRITICAL
Gait and balance as measured by CB&M change scores at 2 months follow-up - Vestibular rehabilitation plus standard neurorehabilitation (Better indicated by higher values)												
1 (Tramontano 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	12	11	-	SMD 0.27 lower (1.1 lower to 0.55 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at post-intervention - Vestibular exercise (Better indicated by higher values)												
2*	randomised trials	serious[1]	very serious[4]	no serious indirectness	very serious[3]	none	45	39	-	SMD 0.73 higher (1.2 lower to 2.66 higher)	VERY LOW	CRITICAL
Balance as measured by BBS change scores at 1 month follow-up - Vestibular rehabilitation plus standard neurorehabilitation (Better indicated by higher values)												
1 (Tramontano 2022)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	13	-	SMD 0.46 lower (1.24 lower to 0.32 higher)	LOW	CRITICAL
Balance as measured by a validated scale; change scores at 2 months follow-up - Vestibular exercise (Better indicated by higher values)												
2*	randomised trials	serious[1]	very serious[4]	no serious indirectness	very serious[3]	none	38	39	-	SMD 0.71 higher (1.17 lower to 2.59 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CB&M: community balance and mobility scale; CI: confidence interval; DGI: dynamic gait index scoring form; SMD: standardised mean difference
** See corresponding forest plot*
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)
4 Very serious heterogeneity (I^2 >80%)

Table 10: Evidence profile for comparison between vestibular exercise and control in adults with multiple sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Vestibular exercise	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by TBG change scores at post-intervention - Vestibular rehabilitation (Better indicated by higher values)												
1 (Tramontano 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	10	-	SMD 0.82 higher (0.05 lower to 1.68 higher)	VERY LOW	CRITICAL
Gait as measured by T25FWT (s) change scores at post-intervention - Vestibular rehabilitation (Better indicated by lower values)												
1 (Tramontano 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	10	-	SMD 0.71 lower (1.56 lower to 0.15 higher)	VERY LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Vestibular rehabilitation (Better indicated by higher values)												
1 (Tramontano 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	10	-	SMD 0.89 higher (0.02 to 1.76 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 2MWT change scores at post-intervention - Vestibular rehabilitation (Better indicated by higher values)												
1 (Tramontano 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	13	10	-	SMD 0.28 higher (0.55 lower to 1.11 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; s: seconds; SMD: standardised mean difference; TBG: Tinetti balance and gait; T25FWT: timed 25 foot walk test; 2MWT: 2 minute walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 11: Evidence profile for comparison between vestibular exercise and control in adults with spinocerebellar ataxia 6

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Vestibular exercise**	**Control**	**Relative (95% CI)**	**Absolute**		
Balance as measured by BBS change scores at post-intervention - Home-based optokinetic training (Better indicated by higher values)												
1 (Bunn 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	6	5	-	SMD 0.03 lower (1.22 lower to 1.16 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; SMD: standardised mean difference
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)

Rehabilitation interventions to address stability: Balance exercises

Table 12: Evidence profile for comparison between balance exercises and control in adults with multiple sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Balance exercises**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by lower values)												
7*	randomised trials	very serious[1]	serious[2]	no serious indirectness	serious[3]	none	238	198	-	SMD 0.31 lower (0.63 lower to 0.01 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at post-intervention - Balance specific physiotherapy (Better indicated by lower values)												
1 (Pavlikova 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	50	41	-	Balance specific physiotherapy (Sensory-motor integration training) (median [IQR]): -0.1 (4.8**)	VERY LOW	CRITICAL

										Balance specific physiotherapy (Motor programme activating therapy) (median [IQR]): -1 (3.4**) Non-balance specific physiotherapy (Conventional dynamic strengthening exercises) (median [IQR]): -0.2 (3**) Non-balance specific physiotherapy (Vojta reflex locomotion) (median [IQR]): -0.7 (2.6**) p=0.74[5]		
Gait and balance as measured by DGI change scores at post-intervention - Exercises to improve balance and mobility (Better indicated by higher values)												
1 (Cattaneo 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	69	36	-	SMD 0.31 higher (0.10 lower to 0.71 higher)	VERY LOW	CRITICAL
Gait and balance as measured by FGA change scores at post intervention, Balance exercise programme (CoDuSe), (Better indicated by higher values)												
1 (Forsberg 2016)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	35	38	-	SMD 0.61 higher (0.14 to 1.08 higher)	VERY LOW	CRITICAL
Gait and balance as measured by FSST change scores at post intervention, Balance exercise programme (CoDuSe) (Better indicated by lower values)												

1 (Forsberg 2016)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	35	38	-	SMD 0.38 lower (0.84 lower to 0.09 higher)	VERY LOW	CRITICAL
Gait and balance as measured by DGI change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) (Better indicated by higher values)												
1 (Nilsagard 2013)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	41	39	-	SMD 0.36 higher (0.08 lower to 0.8 higher)	VERY LOW	CRITICAL
Gait and balance as measured by FSST change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) (Better indicated by lower values)												
1 (Nilsagard 2013)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	41	39	-	SMD 0.08 higher (0.36 lower to 0.52 higher)	VERY LOW	CRITICAL
Gait and balance as measured by Mini-BESTest change scores at post-intervention - Tailored home-based balance exercises (Homebalance) (Better indicated by higher values)												
1 (Novotna 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	23	16	-	SMD 0.08 higher (0.56 lower to 0.72 higher)	VERY LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at follow-up (8-23 weeks) - Balance exercises (Better indicated by lower values)												
2*	randomised trials	very serious[1]	very serious[7]	no serious indirectness	very serious[6]	none	95	63	-	SMD 0.02 lower (0.8 lower to 0.77 higher)	VERY LOW	CRITICAL
Gait and balance as measured by DGI change scores at 2 months follow-up - Exercises to improve balance and mobility (Better indicated by higher values)												
1 (Cattaneo 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	58	26	-	SMD 0.13 higher (0.33 lower to 0.59 higher)	VERY LOW	CRITICAL
Gait and balance as measured by RVGA change scores at 11 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	36	-	SMD 0.18 lower (0.63 lower to 0.28 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by lower values)												

6*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	171	165	-	SMD 0.48 lower (0.7 to 0.27 lower)	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) versus no intervention (Better indicated by lower values)												
1 (Robinson 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	20	16	-	SMD 0.67 lower (1.35 lower to 0.00 higher)	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) versus traditional balance training (Better indicated by lower values)												
1 (Robinson 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	20	15	-	SMD 0.73 lower (1.42 to 0.04 lower)	VERY LOW	CRITICAL
Gait as measured by 10MWT - fast (s) change scores at post-intervention - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	40	-	SMD 0.59 lower (1.04 to 0.13 lower)	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores at post-intervention - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	40	-	SMD 0.33 lower (0.77 lower to 0.12 higher)	VERY LOW	CRITICAL
Gait as measured by T25FWT (ft/s) change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) (Better indicated by higher values)												
1 (Nilsagard 2013)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	41	39	-	SMD 0.28 lower (0.72 lower to 0.16 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT - preferred (s) change scores at 11 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	36	-	SMD 0.22 lower (0.68 lower to 0.23 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT - preferred (s) change scores at 23 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												

1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	37	37	-	SMD 0.30 lower (0.76 lower to 0.15 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT - fast (s) change scores at 11 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	36	-	SMD 0.51 lower (0.97 to 0.05 lower)	VERY LOW	CRITICAL
Gait as measured by 10MWT - fast (s) change scores at 23 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	37	37	-	SMD 0.48 lower (0.94 to 0.02 lower)	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores at 11 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	36	-	SMD 0.24 lower (0.69 lower to 0.22 higher)	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores at 23 weeks follow-up - Core stability and balance programme (Better indicated by lower values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	37	37	-	SMD 0.03 lower (0.49 lower to 0.42 higher)	LOW	CRITICAL
Balance as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by higher values)												
8*	randomised trials	very serious[1]	serious[2]	no serious indirectness	serious[3]	none	307	232	-	SMD 0.63 higher (0.27 to 1 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at follow-up (1-2 months) - Balance exercises (Better indicated by higher values)												
2*	randomised trials	very serious[1]	very serious[7]	no serious indirectness	very serious[6]	none	97	67	-	SMD 0.37 higher (0.56 lower to 1.3 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by a validated scale; change scores at post-intervention (Better indicated by higher values)												
4*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	129	129	-	SMD 0.26 higher (0.09 lower to 0.62 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 2MWT change scores at 11 weeks follow-up - Core stability and balance programme (Better indicated by higher values)												

1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	39	36	-	SMD 0.63 higher (0.16 to 1.09 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 2MWT change scores at 23 weeks follow-up - Core stability and balance programme (Better indicated by higher values)												
1 (Arntzen 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	37	37	-	SMD 0.66 higher (0.2 to 1.13 higher)	VERY LOW	CRITICAL
Functioning measured by WHODAS2.0 change scores at post-intervention - Traditional balance training versus no intervention (Better indicated by lower values)												
1 (Robinson 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	16	15	-	SMD 1.95 lower (2.83 to 1.08 lower)	LOW	CRITICAL
Functioning as measured by WHODAS2.0 change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) versus no intervention (Better indicated by lower values)												
1 (Robinson 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	15	-	SMD 2.53 lower (3.45 to 1.61 lower)	LOW	CRITICAL
Functioning as measured by WHODAS2.0 change scores at post-intervention - Exergame-based balance exercises (Nintendo Wii) versus traditional balance training (Better indicated by lower values)												
1 (Robinson 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	20	16	-	SMD 0.14 lower (0.8 lower to 0.52 higher)	VERY LOW	CRITICAL

CI: confidence interval; CoDuSe: core stability, dual task training, and sensory strategies; DGI: dynamic gait index scoring form; FGA: functional gait assessment; FSST: 4-square step test; ft/s: feet per second; IQR: interquartile range; Mini-BESTest: mini balance evaluation systems test; MSWS-12: multiple sclerosis walking scale-12; RVGA: Rivermead visual gait assessment; s: seconds; SMD: standardised mean difference; T25FWT: timed 25 foot walk test TUG: timed up and go test; WHODAS2.0: World Health Organisation disability assessment schedule; 10MWT: 10 metre walk test; 2MWT: 2 minute walk test

** See corresponding forest plot*

*** Authors report IQR as 1 value*

1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2

2 Serious heterogeneity (I^2 >50%)

3 95% CI crosses 1 MID (for SMD +/-0.5)

4 Very serious imprecision due to sample size <200

5 No statistically significant difference between groups, according to author analysis

6 95% CI crosses 2 MIDs (for SMD +/-0.5)

7 Very serious heterogeneity (I^2 >80%)

Table 13: Evidence profile for comparison between balance exercises and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Balance exercises	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by higher values)												
6*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	serious[3]	none	157	146	-	SMD 0.63 higher (0.03 to 1.22 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at post-intervention - Resistance training balance exercises (Better indicated by lower values)												
1 (Schlenstedt 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	17	15	-	SMD 0.7 lower (1.42 lower to 0.02 higher)	VERY LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at follow-up (4-42 weeks) - Balance exercises (Better indicated by higher values)												
4*	randomised trials	very serious[1]	serious[4]	no serious indirectness	serious[3]	none	108	98	-	SMD 0.12 higher (0.33 lower to 0.57 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at 4 weeks follow-up - Resistance training balance exercises (Better indicated by lower values)												
1 (Schlenstedt 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[5]	none	14	11	-	SMD 0.19 lower (0.98 lower to 0.61 higher)	VERY LOW	CRITICAL
Gait and balance as measured by Mini-BESTest change scores at 16 weeks follow-up - Highly challenging balance training (HiBalance) (Better indicated by lower values)												
1 (Wallén 2018)	randomised trials	serious[6]	no serious inconsistency	no serious indirectness	serious[3]	none	41	39	-	SMD 0.25 higher (0.19 lower to 0.69 higher)	LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by higher values)												
2*	randomised trials	very serious[1]	serious[3]	no serious indirectness	very serious[5]	none	53	48	-	SMD 0.03 higher (0.78	VERY LOW	CRITICAL

										lower to 0.85 higher)		
Gait as measured by a validated scale; change scores at follow-up (4-6 weeks) - Balance exercises (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	53	47	-	SMD 0.19 lower (0.59 lower to 0.2 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	52	48	-	SMD 0.05 lower (0.45 lower to 0.34 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Interactive balance training with augmented visual feedback (Better indicated by higher values)												
1 (van den Heuvel 2014)	randomised trials	serious[6]	no serious inconsistency	no serious indirectness	very serious[7]	none	17	14	-	Interactive balance training with augmented visual feedback (median [IQR]): 1 (-0.25 to 2) Usual care (median [IQR]): -1 (-2 to 2) p=0.108[8]	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at follow-up (4-6 weeks) - Balance exercises (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	52	47	-	SMD 0.01 lower (0.41 lower to 0.38 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at 6 weeks follow-up - Interactive balance training with augmented visual feedback (Better indicated by higher values)												

1 (van den Heuvel 2014)	randomised trials	serious[6]	no serious inconsistency	no serious indirectness	very serious[7]	none	17	13	-	Interactive balance training with augmented visual feedback (median [IQR]): 0 (-1 to 1) Usual care (median [IQR]): 0 (-1.25 to 1.25) p=0.864[8]	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by a validated scale; change scores at post-intervention - Balance exercises (Better indicated by lower values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	35	33	-	SMD 0.02 higher (0.46 lower to 0.49 higher)	LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by a validated scale; change scores at follow-up (1-3 months) - Balance exercises (Better indicated by lower values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	32	29	-	SMD 0.05 lower (0.55 lower to 0.46 higher)	VERY LOW	CRITICAL
Functioning as measured by UPDRS change scores at post-intervention - Interactive balance training with augmented visual feedback (Better indicated by lower values)												
1 (van den Heuvel 2014)	randomised trials	serious[6]	no serious inconsistency	no serious indirectness	very serious[7]	none	15	11	-	Interactive balance training with augmented visual feedback (median [IQR]): 2 (-4 to 4.75) Usual care (median [IQR]):	VERY LOW	CRITICAL

										5 (-0.5 to 10.75) p=0.132[8]		
Functioning as measured by UPDRS change scores at 6 weeks follow-up - Interactive balance training with augmented visual feedback (Better indicated by lower values)												
1 (van den Heuvel 2014)	randomised trials	serious[6]	no serious inconsistency	no serious indirectness	very serious[7]	none	17	11	-	Interactive balance training with augmented visual feedback (median [IQR]): -3 (-9 to 4.25) Usual care (median [IQR]): -1 (-4 to 6) p=0.259[8]	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; MiniBESTest: mini balance evaluation systems test; SMD: standardised mean difference; TUG: timed up and go test; UPDRS: unified Parkinson's disease rating scale
** See corresponding forest plot*
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 Very serious heterogeneity (I2 >80%)
3 95% CI crosses 1 MID (for SMD +/-0.5)
4 Serious heterogeneity (I2 >50%)
5 95% CI crosses 2 MIDs (for SMD +/-0.5)
6 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
7 Very serious imprecision due to sample size <200
8 No statistically significant difference between groups, according to author analysis

Rehabilitation interventions to address stability: Perturbation training

Table 14: Evidence profile for comparison between perturbation training and control in adults with Parkinson's disease

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Perturbation training	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by TUG change scores at post-intervention - Perturbation treadmill training (Better indicated by lower values)												
1 (Steib 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	18	20	-	SMD 0.77 lower (1.43 to 0.11 lower)	VERY LOW	CRITICAL
Gait and balance as measured by Mini-BESTest change scores at post-intervention - Perturbation treadmill training (Better indicated by higher values)												
1 (Steib 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	18	20	-	SMD 0.45 higher (0.2 lower to 1.09 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 2MWT change scores at post-intervention - Perturbation treadmill training (Better indicated by higher values)												
1 (Steib 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	18	20	-	SMD 0.49 higher (0.16 lower to 1.13 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III change scores at post-intervention - Perturbation treadmill training (Better indicated by lower values)												
1 (Gasner 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	18	20	-	SMD 0.35 lower (0.99 lower to 0.29 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at 3 months follow-up - Perturbation treadmill training (Better indicated by lower values)												
1 (Steib 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	16	19	-	SMD 0.36 lower (1.03 lower to 0.31 higher)	VERY LOW	CRITICAL
Gait and balance as measured by Mini-BESTest change scores at 3 months follow-up – Perturbation treadmill training (Better indicated by higher values)												
1 (Steib 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	16	19	-	SMD 0.29 higher (0.38	VERY LOW	CRITICAL

										lower to 0.95 higher)		
Exercise capacity as measured by 2MWT change scores at 3 months follow-up - Perturbation treadmill training (Better indicated by higher values)												
1 (Steib 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	16	19	-	SMD 0.34 higher (0.33 lower to 1.01 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III change scores at 3 months follow-up - Perturbation treadmill training (Better indicated by lower values)												
1 (Gasner 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	16	19	-	SMD 0.35 lower (1.02 lower to 0.32 higher)	VERY LOW	CRITICAL

CI: confidence interval; Mini-BESTest: mini balance evaluation systems test; SMD: standardised mean difference; TUG: timed up and go test; UPDRS III: unified Parkinson's disease rating scale part 3; 2MWT: 2 minute walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)

Rehabilitation interventions to address mobility: Gait training

Table 15: Evidence profile for comparison between gait training and control in adults with acquired spinal cord injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Gait training**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - Robotic-assisted gait training (HANK) (Better indicated by lower values)												
1 (Gil-Agudo 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	11	10	-	SMD 0.81 lower (1.71 lower to 0.09 higher)	LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by higher values)												
3*	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	54	53	-	SMD 0.31 higher (0.07 lower to 0.69 higher)	LOW	CRITICAL

Gait as measured 10MWT change scores at post-intervention – Body-weight supported gait training (Better indicated by higher values)												
1 (Piira 2019b)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	7	7	-	SMD 0.37 (0.69 lower to 1.43 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention – Robot-assisted gait training (Better indicated by higher values)												
2*	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	serious[2]	none	47	46	-	SMD 0.3 (0.11 lower to 0.71 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at post-intervention - Robot-assisted locomotor training (Lokomat) (Better indicated by higher values)												
1 (Piira 2019a)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	7	9	-	Robot-assisted locomotor training (mean [range]): 0 (-1 to 0.1) Usual care (mean [range]): 0.1 (-0.1 to 0.6) p=0.61[6]	VERY LOW	CRITICAL
Gait as measured by WISCII change scores at post-intervention - Robotic-assisted gait training (Lokomat) plus standard physical treatment (Better indicated by higher values)												
1 (Esclarín-Ruz 2014)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	serious[2]	none	41	42	-	SMD 0.32 higher (0.11 lower to 0.76 higher)	VERY LOW	CRITICAL
Gait as measured by WISCII change scores at post-intervention - Robot-assisted gait training (HANK) (Better indicated by higher values)												
1 (Gil-Agudo 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	11	10	-	SMD 1.25 higher (0.3 to 2.21 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Robot-assisted locomotor training (Lokomat) (Better indicated by higher values)												
1 (Piira 2019a)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	7	12	-	Robot-assisted locomotor training (mean	VERY LOW	CRITICAL

										[range]): 4.3 (0 to 10) Usual care (mean [range]): 3.2 (-1 to 9) p=0.48[6]		
Balance as measured by MFRT (cm) change scores at post-intervention - Robot-assisted locomotor training (Lokomat) (Better indicated by higher values)												
1 (Piira 2019a)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	7	12	-	Robot-assisted locomotor training (mean [range]): -11 (-19 to 0) Usual care (mean [range]): -2.4 (-14 to 8) p=0.03[7]	VERY LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Bodyweight supported locomotor training (Better indicated by higher values)												
1 (Piira 2019b)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	9	9	-	SMD 0.34 lower (1.28 lower to 0.59 higher)	VERY LOW	CRITICAL
Balance as measured by MFRT (cm) change scores at post-intervention - Bodyweight supported locomotor training (Better indicated by higher values)												
1 (Piira 2019b)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	9	9	-	SMD 0.53 higher (0.42 lower to 1.47 higher)	LOW	CRITICAL
Exercise capacity as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by higher values)												
3*	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	51	47	-	SMD 0.38 higher (0.02 lower to 0.79 higher)	LOW	CRITICAL

Exercise capacity as measured by 6MWT change scores at post-intervention - Robot-assisted locomotor training (Lokomat) (Better indicated by higher values)												
1 (Piira 2019a)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	7	9	-	Robot-assisted locomotor training (mean [range]): 6.6 (-14 to 34) Usual care (mean [range]): 23.1 (-45 to 43) p=0.84[6]	VERY LOW	CRITICAL
Limb/joint/muscle function (lower limb function) as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by higher values)												
3*	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	61	61	-	SMD 0.39 higher (0.03 to 0.75 higher)	LOW	CRITICAL
Limb/joint/muscle function (lower limb function) as measured by LEMS change scores at post-intervention - Robot-assisted locomotor training (Lokomat) (Better indicated by higher values)												
1 (Piira 2019a)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	7	12	-	Robot-assisted locomotor training (mean [range]): 5.4 (-1 to 19) Usual care (mean [range]): 0.2 (-11 to 7) p=0.17[6]	VERY LOW	CRITICAL
Functioning as measured by SCIM3 change scores at post-intervention - Robot-assisted gait training (HANK) (Better indicated by higher values)												
1 (Gil-Agudo 2023)	randomised trials	very serious[4]	no serious inconsistency	no serious indirectness	very serious[3]	none	11	10	-	SMD 0.07 lower (0.93 lower to 0.79 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; cm; centimetres; m/s: metres per second; LEMS: lower extremity motor score; MFRT: modified functional reach test; SCIM3: spinal cord independence measure 3rd revision; SMD: standardised mean difference; TUG: timed up and go test; WISCII: walking index for spinal cord injury; 10MWT: 10 metre walk test; 6MWT: 6 minute walk test
** See corresponding forest plot*
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/- 0.5)
4 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
5 Very serious imprecision due to sample size <200
6 No statistically significant difference between groups, according to author analysis
7 Differences between groups judged to be statistically significant according to author analysis, favouring gait training. Clinical significance could not be determined

Table 16: Evidence profile for comparison between gait training and same intervention (different intensity) in adults with acquired spinal cord injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Gait training**	**Same intervention (different intensity)**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by SCI-FAP change scores at post-intervention - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by lower values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	7	-	SMD 0.4 lower (1.42 lower to 0.63 higher)	VERY LOW	CRITICAL
Gait and balance as measured by SCI-FAP change scores at 1 month follow-up - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by lower values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	7	-	SMD 0.39 lower (1.41 lower to 0.64 higher)	VERY LOW	CRITICAL
Gait and balance as measured by SCI-FAP change scores at 6 months follow-up - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by lower values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	7	-	SMD 0.37 lower (1.4 lower to 0.65 higher)	VERY LOW	CRITICAL

Gait as measured by 10MWT (m/s) change scores at post-intervention - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by higher values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	7	5	-	SMD 0 higher (1.15 lower to 1.15 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at 1 month follow-up - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by higher values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	7	5	-	SMD 0.16 lower (1.31 lower to 0.99 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at 6 months follow-up - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by higher values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	7	5	-	SMD 0.12 lower (1.27 lower to 1.03 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by higher values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	5	-	SMD 0.03 higher (1.09 lower to 1.15 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at 1 month follow-up - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by higher values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	5	-	SMD 0.41 lower (1.54 lower to 0.73 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at 6 months follow-up - Robot-resisted treadmill training (Lokomat) versus Robot-assisted treadmill training (Lokomat) (Better indicated by higher values)												
1 (Lam 2015)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	5	-	SMD 0.04 lower (1.16 lower to 1.07 higher)	VERY LOW	CRITICAL

Limb/joint/muscle function (spasticity) as measured by MAS scores at post-intervention - High-intensity (50 mins) robotic-assisted gait training sessions versus low-intensity (25 mins) robotic-assisted gait training sessions (Better indicated by lower values)												
1 (Wirz 2017)	randomised trials	very serious[3]	no serious inconsistency	no serious indirectness	very serious[4]	none	9	9	-	High-intensity (50 mins) robotic-assisted gait training sessions (median [range]): 0.75 (0 to 4) Low-intensity (25 mins) robotic-assisted gait training sessions (median [range]): 1.75 (0 to 3) p=0.309[5]	VERY LOW	CRITICAL

CI: confidence interval; m/s: metres per second; MAS: modified Ashworth scale; SCI-FAP: spinal cord injury functional ambulation profile; SMD: standardised mean difference; TUG: timed up and go test; 10MWT: 10 metre walk test; 6MWT: 6 minute walk test
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)
3 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
4 Very serious imprecision due to sample size <200
5 No statistically significant difference between groups, according to author analysis

Table 17: Evidence profile for comparison between gait training and control in adults with progressive supranuclear palsy

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Gait training	Control	Relative (95% CI)	Absolute		

Balance as measured by BBS change scores at post-intervention - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation (Better indicated by higher values)												
1 (Clerici 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	12	12	-	Robotic-assisted gait training plus multidisciplinary intensive rehabilitation (median [IQR]): 9.5 (6.5 to 19) 'Treadmill plus' training plus multidisciplinary intensive rehabilitation (median [IQR]): 10.5 (8 to 20.5) p=0.4[3]	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation (Better indicated by higher values)												
1 (Clerici 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	12	12	-	Robotic-assisted gait training plus multidisciplinary intensive rehabilitation (median [IQR]): 32.5 (19.5 to 99.5) 'Treadmill plus' training plus multidisciplinary intensive rehabilitation (median [IQR]): 55.5 (-3 to 67.5) p=0.62[3]	VERY LOW	CRITICAL
Functioning as measured by PSPRS change scores at post-intervention - Robotic-assisted gait training (Lokomat) plus multidisciplinary intensive rehabilitation (Better indicated by lower values)												

1 (Clerici 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	12	12	-	Robotic-assisted gait training plus multidisciplinary intensive rehabilitation (median [IQR]): -5 (-5.5 to -3.5) 'Treadmill plus' training plus multidisciplinary intensive rehabilitation (median [IQR]): -8 (-9.5 to -5) p=0.047[4]	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; IQR: interquartile range; PSPRS: progressive supranuclear palsy rating scale; 6MWT: 6 minute walk test
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 Very serious imprecision due to sample size <200
3 No statistically significant difference between groups, according to author analysis
4 Differences between groups judged to be statistically significant according to author analysis, favouring control. Clinical significance could not be determined

Table 18: Evidence profile for comparison between gait training and control in adults with multiple sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Gait training**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by lower values)												
6*	randomised trials	very serious[1]	serious[2]	no serious indirectness	no serious imprecision	none	131	124	-	SMD 0.08 lower (0.45 lower to 0.3 higher)	LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at post-intervention - Robot-assisted gait training (Better indicated by lower values)												

5*	randomised trials	very serious[1]	serious[2]	no serious indirectness	serious[3]	none	108	103	-	SMD 0.09 lower (0.55 lower to 0.38 higher)	VERY LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at post-intervention - Step training (Better indicated by lower values)												
1 (Hoang 2016)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	23	21	-	SMD 0.12 lower (0.71 lower to 0.48 higher)	VERY LOW	CRITICAL
Gait and balance as measured by FAC change scores at post-intervention - Robot-assisted gait training plus standard rehabilitation programme (Better indicated by higher values)												
1 (Pompa 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	21	22	-	SMD 0.72 higher (0.11 to 1.34 higher)	VERY LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at follow-up (6 weeks to 3 months) - Robot-assisted gait training (Better indicated by lower values)												
3*	randomised trials	very serious[1]	serious[2]	no serious indirectness	serious[3]	none	69	67	-	SMD 0.18 higher (0.38 lower to 0.73 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by higher values)												
4*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	102	94	-	SMD 0.23 higher (0.05 lower to 0.51 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Robot-assisted gait training (Better indicated by higher values)												
3*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	79	73	-	SMD 0.15 higher (0.17 lower to 0.47 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention – Step training (Better indicated by higher values)												
1 (Hoang 2016)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	23	21	-	SMD 0.53 lower (0.08	VERY LOW	CRITICAL

										lower to 1.13 higher)		
Gait as measured by MSWS-12 change scores at post-intervention - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises (Better indicated by lower values)												
1 (Straudi 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	36	36	-	SMD 0.12 higher (0.34 lower to 0.59 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at follow-up (6 weeks to 3 months) - Robot-assisted gait training (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	61	59	-	SMD 0.12 higher (0.23 lower to 0.48 higher)	LOW	CRITICAL
Gait as measured by MSWS-12 change scores at 3 months follow-up - Robot-assisted gait training (Lokomat) plus stretching and strengthening exercises (Better indicated by lower values)												
1 (Straudi 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	36	36	-	SMD 0.26 higher (0.21 lower to 0.72 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at post-intervention - Robot-assisted gait training (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	61	59	-	SMD 0.22 higher (0.14 lower to 0.58 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at follow-up (6 weeks to 3 months) - Robot-assisted gait training (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	61	59	-	SMD 0.12 higher (0.24 lower to 0.48 higher)	LOW	CRITICAL
Exercise capacity as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by higher values)												
5*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	113	110	-	SMD 0.3 higher (0.04	VERY LOW	CRITICAL

										to 0.57 higher)		
Exercise capacity as measured by a validated scale; change scores at post-intervention - Robot-assisted gait training (Better indicated by higher values)												
4*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	90	89	-	SMD 0.41 higher (0.11 to 0.71 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by a validated scale; change scores at post-intervention - Step training (Better indicated by higher values)												
1 (Hoang 2016)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	23	21	-	SMD 0.12 lower (0.71 lower to 0.47 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by a validated scale; change scores (6 weeks to 3 months) - Robot-assisted gait training (Better indicated by higher values)												
3*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	69	67	-	SMD 0.21 higher (0.13 lower to 0.55 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (lower limb function) as measured by SPPB change scores at post-intervention - Robot-assisted gait training (Ekso) plus standard rehabilitation (Better indicated by higher values)												
1 (Berriozabalgoitia 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	18	14	-	SMD 0.66 higher (0.06 lower to 1.38 higher)	VERY LOW	CRITICAL
Functioning as measured by MSFC change scores at post-intervention - Virtual reality-based step training (Better indicated by lower values)												
1 (Hoang 2016)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	23	21	-	SMD 0.77 lower (0.77 lower to 0.41 higher)	VERY LOW	CRITICAL

CI: confidence interval; FAC: functional ambulatory category; MSFC: multiple sclerosis functional composite score; MSWS-12: multiple sclerosis walking scale-12; SMD: standardised mean difference; SPPB: short physical performance battery
** See corresponding forest plot*
1 Very serious risk of bias in the evidence contributing to the outcome
2 Serious heterogeneity (I2 >50%)
3 95% CI crosses 1 MID (for SMD +/-0.5)

Table 19: Evidence profile for comparison between gait training and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Gait training	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by lower values)												
4*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	serious[3]	none	107	104	-	SMD 1.62 lower (3.48 lower to 0.24 higher)	VERY LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at post-intervention - Nordic walking training (Better indicated by lower values)												
1 (Wroblewska 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	20	-	SMD 6.31 lower (7.89 to 4.73 lower)	LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at post-intervention - Robot-asisted gait training (Better indicated by lower values)												
1 (Capecci 2019)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	48	48	-	SMD 0.35 higher (0.05 lower to 0.75 higher)	LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at post-intervention - Step training (Better indicated by lower values)												
1 (Song 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	28	25	-	SMD 0.65 higher (0.1 to 1.21 higher)	VERY LOW	CRITICAL
Gait and balance as measured by a validated scale; change scores at post-intervention - Treadmill training (Better indicated by lower values)												
1 (Bello 2013)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	11	11	-	SMD 1.89 lower (2.93 to 0.85 lower)	LOW	CRITICAL
Gait and balance as measured by TBG scores at post-intervention - Virtual reality-based treadmill training (C-Mill) (Better indicated by higher values)												
1 (Pullia 2023)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	10	10	-	Virtual reality-based treadmill training (C-	VERY LOW	CRITICAL

										Mill) (median [IQR]): 27 (23.5 to 28) Conventional gait training (median [IQR]): 20.5 (8.75 to 25.25) p<0.008[6]		
Gait and balance as measured by TUG change scores at post-intervention - Nordic walking training (Better indicated by lower values)												
1 (Szefler-Derela 2020)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	20	20	-	Nordic walking training (median [IQR]): -0.96 (-2.75 to -0.18) Standard rehabilitation (median [IQR]): -1.18 (-3.16 to -0.1) p=0.561[8]	VERY LOW	CRITICAL
Gait and balance as measured by DGI change scores at post-intervention - Nordic walking training (Better indicated by higher values)												
1 (Szefler-Derela 2020)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	20	20	-	Nordic walking training (median [IQR]): 8 (not reported) Standard rehabilitation (median	VERY LOW	CRITICAL

										[IQR]): 5.5 (not reported) p=0.064[8]		
Gait and balance as measured by FGA change scores at post-intervention - Exergame-based step training (Better indicated by higher values)												
1 (Song 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	28	25	-	SMD 0.24 higher (0.3 lower to 0.78 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Gait training (Better indicated by higher values)												
4*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	serious[3]	none	93	101	-	SMD 0.71 higher (0.38 lower to 1.81 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Bodyweight supported gait training (Better indicated by higher values)												
1 (Berra 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[7]	none	14	22	-	SMD 0 higher (0.67 lower to 0.67 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Robot-assisted gait training (Better indicated by higher values)												
2*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	very serious[7]	none	68	68	-	SMD 1 higher (1.49 lower to 3.49 higher)	VERY LOW	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Treadmill training (Better indicated by higher values)												
1 (Bello 2013)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	11	11	-	SMD 0.95 higher (0.06 to 1.84 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (s) scores at post-intervention - Virtual reality-based treadmill training (C-Mill) (Better indicated by lower values)												
1 (Pullia 2023)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	10	10	-	Virtual reality-based treadmill training (C-Mill) (median [IQR]): 5.27 (4.06 to 5.85)	VERY LOW	CRITICAL

										Conventional gait training (median [IQR]): 6.19 (2.6 to 8.8) p>0.05[8]		
Gait as measured by 10MWT (m/s) change scores at post-intervention - Robot-assisted gait training versus treadmill training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 1.15 higher (0.47 to 1.82 higher)	LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at post-intervention - Treadmill training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 1.05 higher (0.39 to 1.72 higher)	LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at 3 months follow-up - Robot-assisted gait training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 1.01 higher (0.35 to 1.67 higher)	LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at 3 months follow-up - Robot-assisted gait training versus treadmill training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	20	-	SMD 2.24 higher (1.43 to 3.05 higher)	MODERATE	CRITICAL
Gait as measured by 10MWT (m/s) change scores at 3 months follow-up - Treadmill training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 1.13 higher (0.46 to 1.8 higher)	LOW	CRITICAL

Balance as measured by BBS change scores at post-intervention - Robot-assisted gait training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	20	-	SMD 1.29 higher (0.6 to 1.98 higher)	MODERATE	CRITICAL
Balance as measured by BBS change scores at post-intervention - Robot-assisted gait training versus treadmill training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.53 higher (0.1 lower to 1.16 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Treadmill training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.75 higher (0.11 to 1.4 higher)	LOW	CRITICAL
Balance as measured by BBS scores at post-intervention - Virtual reality-based treadmill training (C-Mill) (Better indicated by higher values)												
1 (Pullia 2023)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	10	10	-	Virtual reality-based treadmill training (C-Mill) (median [IQR]): 52.5 (50.25 to 55.25) Conventional gait training (median [IQR]): 40 (13.25 to 47.25) p<0.006[6]	VERY LOW	CRITICAL

Balance as measured by BBS change scores at 3 months follow-up - Robot-assisted gait training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 1.01 higher (0.35 to 1.68 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at 3 months follow-up - Robot-assisted gait training versus treadmill training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.19 higher (0.43 lower to 0.81 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at 3 months follow-up - Treadmill training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.73 higher (0.09 to 1.37 higher)	LOW	CRITICAL
Exercise capacity as measured by a validated scale; change scores at post-intervention - Robot-assisted gait training (Better indicated by higher values)												
2*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	very serious[7]	none	68	68	-	SMD 0.79 higher (1.59 lower to 3.17 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Robot-assisted gait training versus treadmill training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[7]	none	20	20	-	SMD 0.1 higher (0.52 lower to 0.72 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Treadmill training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	20	-	SMD 1.61 higher (0.89 to 2.34 higher)	MODERATE	CRITICAL

Exercise capacity as measured by 6MWT scores at post-intervention - Virtual reality-based treadmill training (C-Mill) (Better indicated by higher values)												
1 (Pullia 2023)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	10	10	-	Virtual reality-based treadmill training (C-Mill) (median [IQR]): 360 (345 to 381) Conventional gait training (median [IQR]): 155 (0 to 294) p<0.006[6]	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at 3 months follow-up - Robot-assisted gait training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	20	-	SMD 2.06 higher (1.28 to 2.84 higher)	MODERATE	CRITICAL
Exercise capacity as measured by 6MWT change scores at 3 months follow-up - Robot-assisted gait training versus treadmill training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[7]	none	20	20	-	SMD 0.04 lower (0.66 lower to 0.58 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at 3 months follow-up - Treadmill training versus conventional gait training (Better indicated by higher values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20	20	-	SMD 1.73 higher (0.99 to 2.47 higher)	MODERATE	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by validated change scores at post-intervention - Gait training (Better indicated by lower values)												

3*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	serious[3]	none	73	81	-	SMD 0.89 higher (0.5 lower to 2.28 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by validated change scores at post-intervention - Bodyweight supported gait training (Better indicated by lower values)												
1 (Berra 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	14	22	-	SMD 0.31 lower (0.98 lower to 0.37 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by validated change scores at post-intervention - Robot-assisted gait training (Better indicated by lower values)												
1 (Capecci 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	48	48	-	SMD 0.16 higher (0.24 lower to 0.56 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by validated change scores at post-intervention - Treadmill training (Better indicated by lower values)												
1 (Bello 2013)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	11	11	-	SMD 3.37 higher (1.99 to 4.75 higher)	LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III scores at post-intervention - Virtual reality-based treadmill training (C-Mill) (Better indicated by lower values)												
1 (Pullia 2023)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	10	10	-	Virtual reality-based treadmill training (C-Mill) (median [IQR]): 25.5 (14.75 to 44.25) Conventional gait training (median	VERY LOW	CRITICAL

										[IQR]): 29 (22.75 to 42) p>0.05[8]		
Limb/joint/muscle function (motor functioning) as measured by UPDRS III change scores at post-intervention - Nordic walking training (Better indicated by lower values)												
1 (Szefler-Derela 2020)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	20	20	-	Nordic walking training (median [IQR]): -8.5 (not reported) Standard rehabilitation (median [IQR]): -6 (not reported) p=0.047[6]	VERY LOW	CRITICAL
Functioning as measured by validated change scores at post-intervention - Gait training (Better indicated by higher values)												
2*	randomised trials	very serious[1]	very serious[2]	no serious indirectness	very serious[7]	none	34	42	-	SMD 0.39 higher (0.94 lower to 1.73 higher)	VERY LOW	CRITICAL
Functioning as measured by validated change scores at post-intervention - Bodyweight supported gait training (Better indicated by higher values)												
1 (Berra 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]		14	22	-	SMD 0.29 lower (0.96 lower to 0.39 higher)	VERY LOW	CRITICAL
Functioning as measured by validated change scores at post-intervention - Robot-assisted training (Better indicated by higher values)												
1 (Picellli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]		20	20	-	SMD 1.08 higher (0.41 to 1.74 higher)	LOW	CRITICAL
Functioning as measured by UPDRS change scores at post-intervention - Robot-assisted gait training versus treadmill training (Better indicated by lower values)												

1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.34 lower (0.96 lower to 0.29 higher)	LOW	CRITICAL
Functioning as measured by UPDRS change scores at post-intervention - Treadmill training versus conventional gait training (Better indicated by lower values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.64 lower (1.27 lower to 0 higher)	LOW	CRITICAL
Functioning as measured by FIM scores at post-intervention - Virtual reality-based treadmill training (C-Mill) (Better indicated by higher values)												
1 (Pullia 2023)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	very serious[5]	none	10	10	-	Virtual reality-based treadmill training (C-Mill) (median [IQR]): 120.5 (117.5 to 123.7) Conventional gait training (median [IQR]): 104.5 (82 to 113) P<0.009[6]	VERY LOW	CRITICAL
Functioning as measured by UPDRS change scores at 3 months follow-up - Robot-assisted gait training versus conventional gait training (Better indicated by lower values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 1.11 lower (1.78 to 0.44 lower)	LOW	CRITICAL
Functioning as measured by UPDRS change scores at 3 months follow-up - Robot-assisted gait training versus treadmill training (Better indicated by lower values)												

1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.35 lower (0.98 lower to 0.27 higher)	LOW	CRITICAL
Functioning as measured by UPDRS change scores at 3 months follow-up - Treadmill training versus conventional gait training (Better indicated by lower values)												
1 (Picelli 2013)	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[3]	none	20	20	-	SMD 0.63 lower (1.26 lower to 0.01 higher)	LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; DGI: dynamic gait index scoring form; FGA: functional gait assessment; FIM: functional independence measure; m/s: metres per second; s: seconds; SMD: standardised mean difference; TBG: Tinetti balance and gait; TUG: timed up and go test; UPDRS (III): unified Parkinson's disease rating scale (part 3); 10MWT: 10 metre walk test; 6MWT: 6 minute walk test

** See corresponding forest plot*

1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2

2 Very serious heterogeneity (I2 >80%)

3 95% CI crosses 1 MID (for SMD +/-0.5)

4 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2

5 Very serious imprecision due to sample size <200

6 Differences between groups judged to be statistically significant according to author analysis, favouring gait training. Clinical significance could not be determined

7 95% CI crosses 2 MIDs (for SMD +/-0.5)

8 No statistically significant difference between groups, according to author analysis

Table 20: Evidence profile for comparison between gait training and same intervention (different frequency) in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Gait training**	**Same intervention (different frequency)**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.1 higher (0.96 to	MODERATE	CRITICAL

										3.23 higher)		
Gait and balance as measured by TUG change scores at post-intervention - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.08 higher (0.95 to 3.22 higher)	MODERATE	CRITICAL
Gait and balance as measured by TUG change scores at post-intervention - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 0.65 lower (1.56 lower to 0.25 higher)	LOW	CRITICAL
Gait and balance as measured by TUG change scores at 2 months follow-up - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.52 higher (1.29 to 3.76 higher)	MODERATE	CRITICAL
Gait and balance as measured by TUG change scores at 2 months follow-up - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.83 higher (1.52 to 4.15 higher)	MODERATE	CRITICAL
Gait and balance as measured by TUG change scores at 2 months follow-up - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 0.45 lower (1.34 lower to	LOW	CRITICAL

										0.44 higher)		
Gait and balance as measured by TUG change scores at 4 months follow-up - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.47 higher (1.24 to 3.69 higher)	MODERATE	CRITICAL
Gait and balance as measured by TUG change scores at 4 months follow-up - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.22 higher (1.05 to 3.38 higher)	MODERATE	CRITICAL
Gait and balance as measured by TUG change scores at 4 months follow-up - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 0.93 lower (1.86 lower to 0.01 higher)	LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at post-intervention - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 3.76 higher (2.19 to 5.33 higher)	MODERATE	CRITICAL
Gait as measured by 10MWT (s) change scores at post-intervention - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 3.95 higher (2.33 to	MODERATE	CRITICAL

										5.57 higher)		
Gait as measured by 10MWT (s) change scores at post-intervention - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 0.97 higher (0.04 to 1.91 higher)	LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at 2 months follow-up - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 3.68 higher (2.13 to 5.22 higher)	MODERATE	CRITICAL
Gait as measured by 10MWT (s) change scores at 2 months follow-up - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 3.15 higher (1.75 to 4.54 higher)	MODERATE	CRITICAL
Gait as measured by 10MWT (s) change scores at 2 months follow-up - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	10	10	-	SMD 0 higher (0.88 lower to 0.88 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at 4 months follow-up - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 3.3 higher (1.86 to	MODERATE	CRITICAL

										4.74 higher)		
Gait as measured by 10MWT (s) change scores at 4 months follow-up - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.79 higher (1.49 to 4.1 higher)	MODERATE	CRITICAL
Gait as measured by 10MWT (s) change scores at 4 months follow-up - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by lower values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	10	10	-	SMD 0.34 higher (0.54 lower to 1.23 higher)	VERY LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.13 lower (3.28 to 0.99 lower)	MODERATE	CRITICAL
Balance as measured by BBS change scores at post-intervention - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 0.71 lower (1.62 lower to 0.2 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 1.52 higher (0.5 to 2.54 higher)	MODERATE	CRITICAL
Balance as measured by BBS change scores at 2 months follow-up - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by higher values)												

1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.5 lower (3.73 to 1.27 lower)	MODERATE	CRITICAL
Balance as measured by BBS change scores at 2 months follow-up - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 0.63 lower (1.54 lower to 0.27 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at 2 months follow-up - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.03 higher (0.91 to 3.16 higher)	MODERATE	CRITICAL
Balance as measured by BBS change scores at 4 months follow-up - High-frequency treadmill training versus intermediate-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 3.36 lower (4.81 to 1.9 lower)	MODERATE	CRITICAL
Balance as measured by BBS change scores at 4 months follow-up - High-frequency treadmill training versus low-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	10	10	-	SMD 2.07 lower (3.2 to 0.94 lower)	MODERATE	CRITICAL
Balance as measured by BBS change scores at 4 months follow-up - Intermediate-frequency treadmill training versus low-frequency treadmill training (Better indicated by higher values)												
1 (Pelosin 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	10	10	-	SMD 1.43 higher (0.42 to	LOW	CRITICAL

										2.43 higher)		

BBS: Berg balance scale; CI: confidence interval; s: seconds; SMD: standardised mean difference; TUG: timed up and go test; 10MWT: 10 metre walk test
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)

Rehabilitation interventions to address mobility: Lower limb wearable, electrical stimulation and lower-body robotics

Table 21: Evidence profile for comparison between lower limb wearables plus electrical stimulation and control in adults with acquired brain injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Lower limb wearables plus electrical stimulation**	**Control**	**Relative (95% CI)**	**Absolute**		
Limb/joint/muscle function (spasticity) as measured by TS change scores at post-intervention - Functional electrical stimulation plus ankle splinting plus tilt table standing (Better indicated by lower values)												
1 (Leung 2014)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	17	18	-	SMD 2.75 lower (3.71 to 1.8 lower)	LOW	CRITICAL
Limb/joint/muscle function (spasticity) as measured by TS change scores at 1 month follow-up - Functional electrical stimulation plus ankle splinting plus tilt table standing (Better indicated by lower values)												
1 (Leung 2014)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	17	15	-	SMD 0 higher (0.69 lower to 0.69 higher)	VERY LOW	CRITICAL

CI: confidence interval; SMD: standardised mean difference; TS: Tardieu scale
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/- 0.5)
3 95% CI crosses 2 MIDs (for SMD +/- 0.5)

Table 22: Evidence profile for comparison between lower limb wearables and placebo in adults with Parkinson's disease

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Lower limb wearables**	**Placebo**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - Custom-made shoe insole plus standard rehabilitation (Better indicated by lower values)												
1 (Pollet 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	21	21	-	SMD 0.12 higher (0.49 lower to 0.72 higher)	LOW	CRITICAL
Gait and balance as measured by TUG change scores at 4 weeks follow-up - Custom-made shoe insole plus standard rehabilitation (Better indicated by lower values)												
1 (Pollet 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	21	21	-	SMD 0.41 lower (1.02 lower to 0.2 higher)	LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at post-intervention - Custom-made shoe insole plus standard rehabilitation (Better indicated by higher values)												
1 (Pollet 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	21	21	-	SMD 0.1 higher (0.51 lower to 0.7 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores at 4 weeks follow-up - Custom-made shoe insole plus standard rehabilitation (Better indicated by higher values)												
1 (Pollet 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	21	21	-	SMD 0.61 higher (0.01 lower to 1.23 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Custom-made shoe insole plus standard rehabilitation (Better indicated by higher values)												
1 (Pollet 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	21	21	-	SMD 0.31 lower (0.92 lower to 0.3 higher)	VERY LOW	CRITICAL

Balance as measured by BBS change scores at 4 weeks follow-up - Custom-made shoe insole plus standard rehabilitation (Better indicated by higher values)												
1 (Pollet 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	21	21	-	SMD 0.37 higher (0.24 lower to 0.98 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; m/s: metres per second; SMD: standardised mean difference; TUG: timed up and go test; 10MWT: 10 metre walk test
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/- 0.5)
3 95% CI crosses 2 MIDs (for SMD +/- 0.5)

Table 23: Evidence profile for comparison between electrical stimulation and control in adults with multiple sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Electrical stimulation**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - Neuromuscular electrical stimulation plus progressive resistance training (Better indicated by lower values)												
1 (Coote 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	10	-	Neuromuscular electrical stimulation plus progressive resistance training (median [SIQR]): -1.6 (3.6) Progressive resistance training (median [SIQR]): -0.6 (8.6) p=0.230[3]	VERY LOW	CRITICAL
Gait and balance as measured by RVGA scores (with device) at post-intervention - Functional electrical stimulation (Better indicated by lower values)												

1 (Taylor 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	9	11	-	Functional electrical stimulation (median [IQR]): 12 (8 to 19.5) Core stability physiotherapy and home-based exercise programme (median [IQR]): 16 (15 to 22.5) p-value > 0.05[3]	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores (device usage not reported) at post-intervention - Functional electrical stimulation (Better indicated by lower values)												
1 (Renfrew 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[4]	none	31	22	-	SMD 0.52 higher (0.04 lower to 1.07 higher)	VERY LOW	CRITICAL
Gait as measured by T25FWT (ft/s) change scores (without device) at post-intervention - Functional electrical stimulation (Better indicated by higher values)												
1 (Renfrew 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[4]	none	31	22	-	SMD 0.39 lower (0.94 lower to 0.17 higher)	VERY LOW	CRITICAL
Gait as measured by T25FWT (ft/s) change scores (with device) at post-intervention - Functional electrical stimulation (Better indicated by higher values)												
1 (Renfrew 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[4]	none	31	22	-	SMD 0.49 lower (1.05 lower to 0.06 higher)	VERY LOW	CRITICAL
Gait as measured by MSWS-12 change scores at post-intervention - Neuromuscular electrical stimulation plus progressive resistance training (Better indicated by lower values)												
1 (Coote 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	10	-	Neuromuscular electrical stimulation plus	VERY LOW	CRITICAL

										progressive resistance training (median [SIQR]): -6.5 (15.8) Progressive resistance training (median [SIQR]): -5 (14.5) p=0.956[3]		
Gait as measured by 10MWT (m/s) change scores (with device) at post-intervention - Functional electrical stimulation (Better indicated by higher values)												
1 (Taylor 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	9	11	-	Functional electrical stimulation (median [IQR]): 0.79 (0.54 to 1.32) Core stability physiotherapy and home-based exercise programme (median [IQR]): 0.81 (0.44 to 0.94) p-value > 0.05[3]	VERY LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Neuromuscular electrical stimulation plus progressive resistance training (Better indicated by higher values)												
1 (Coote 2015)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	10	-	Neuromuscular electrical stimulation plus progressive resistance training (median [SIQR]): 3.5 (6)	VERY LOW	CRITICAL

										Progressive resistance training (median [SIQR]): 5 (4.5) p=0.845[3]		

BBS: Berg balance scale; CI: confidence interval; IQR: interquartile range; ft/s: feet per second; m/s: metres per second; MSWS-12: multiple sclerosis walking scale-12; RVGA: Rivermead visual gait assessment; SIQR: semi-interquartile range; SMD: standardised mean difference; TUG: timed up and go test; T25FWT: timed 25 foot walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2.0
2 Very serious imprecision due to sample size <200
3 No statistically significant difference between groups, according to author analysis
4 95% CI crosses 1 MID (for SMD +/- 0.5)

Table 24: Evidence profile for comparison between electrical stimulation and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Electrical stimulation**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores (without device) at post-intervention - Functional electrical stimulation plus standard care (Better indicated by lower values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	26	25	-	MD 1.58 lower (9.71 lower to 6.56 higher)[3]	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores (without device) at 4 weeks follow-up - Functional electrical stimulation plus standard care (Better indicated by lower values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	26	25	-	MD 2.37 higher (10.07 lower to 14.82 higher)[3]	VERY LOW	CRITICAL
Gait and balance as measured by Mini-BESTest change scores (without device) at post-intervention - Functional electrical stimulation plus standard care (Better indicated by higher values)												

1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	26	25	-	MD 0.83 higher (0.89 lower to 2.56 higher)[3]	LOW	CRITICAL
Gait and balance as measured by Mini-BESTest change scores (without device) at 4 weeks follow-up - Functional electrical stimulation plus standard care (Better indicated by higher values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	26	25	-	MD 0.52 higher (9.3 lower to 1.97 higher)[3]	VERY LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores (without device) at post-intervention - Functional electrical stimulation plus standard care (Better indicated by higher values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	26	25	-	MD 0.14 higher (0.03 higher to 0.26 higher)[3]	VERY LOW	CRITICAL
Gait as measured by 10MWT (m/s) change scores (without device) at 4 weeks follow-up - Functional electrical stimulation plus standard care (Better indicated by higher values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	26	25	-	MD 0.1 higher (0.05 lower to 0.25 higher)[3]	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by MDS-UPDRS III change scores (without device) at post-intervention - Functional electrical stimulation plus standard care (Better indicated by lower values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	26	25	-	MD 3.65 lower (8.97 lower to 1.67 higher)[3]	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by MDS-UPDRS III change scores (without device) at 4 weeks follow-up - Functional electrical stimulation plus standard care (Better indicated by lower values)												
1 (Taylor 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	26	25	-	MD 0.91 lower (6.21 lower to 4.4 higher)[3]	LOW	CRITICAL

CI: confidence interval; m/s: metres per second; MD: mean difference; MDS-UPDRS III: Movement Disorder Society sponsored revision of unified Parkinson's disease rating scale part 3; Mini-BESTest: mini balance evaluation systems test; TUG: timed up and go test; 10MWT: 10 metre walk test

1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for TUG +/-8.95; for Mini-BESTest +/-2.75; for 10MWT +/-0.165; for MDS-UPDRS III +/-6.25)
3 Mean difference (95% CI) adjusted for baseline and site, as per author analysis
4 95% CI crosses 2 MIDs (for TUG +/-8.95)

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Sensorimotor exercises

Table 25: Evidence profile for comparison between sensorimotor exercises and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Sensorimotor exercises**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - Sensorimotor and visuomotor agility training (Better indicated by lower values)												
1 (Tollár 2018)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	35	20	-	SMD 2.18 lower (2.87 to 1.49 lower)	LOW	CRITICAL

CI: confidence interval; SMD: standardised mean difference; TUG: timed up and go test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Hydrotherapy

Table 26: Evidence profile for comparison between hydrotherapy and control in adults with acquired brain injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Hydrotherapy**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TBG change scores at post-intervention - Aquatic training plus multidisciplinary neurorehabilitation (Better indicated by higher values)												

1 (Curcio 2020)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	10	-	SMD 0.14 higher (0.73 lower to 1.02 higher)	VERY LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Aquatic training plus multidisciplinary neurorehabilitation (Better indicated by higher values)												
1 (Curcio 2020)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	10	-	SMD 0.05 lower (0.92 lower to 0.83 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (spasticity) as measured by MAS change scores at post-intervention - Aquatic training plus multidisciplinary neurorehabilitation (Better indicated by lower values)												
1 (Curcio 2020)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	10	-	SMD 0.24 lower (1.12 lower to 0.64 higher)	VERY LOW	CRITICAL
Functioning as measured by DRS change scores at post-intervention - Aquatic training plus multidisciplinary neurorehabilitation (Better indicated by lower values)												
1 (Curcio 2020)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	10	-	SMD 0.06 lower (0.94 lower to 0.82 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; DRS: disability rating scale; MAS: modified Ashworth scale; SMD: standardised mean difference; TBG: Tinetti balance and gait
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 27: Evidence profile for comparison between hydrotherapy and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Hydrotherapy**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment (Better indicated by lower values)												

1 (Palamara 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	17	17	-	SMD 0.35 lower (1.03 lower to 0.33 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment (Better indicated by higher values)												
1 (Palamara 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	17	17	-	SMD 0.12 higher (0.55 lower to 0.8 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III change scores at post-intervention - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment (Better indicated by lower values)												
1 (Palamara 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	17	17	-	SMD 0.22 higher (0.45 lower to 0.9 higher)	LOW	CRITICAL
Gait and balance as measured by TUG change scores at 6 months follow-up - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment (Better indicated by lower values)												
1 (Palamara 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	17	17	-	SMD 0.71 lower (1.4 to 0.01 lower)	LOW	CRITICAL
Balance as measured by BBS change scores at 6 months follow-up - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment (Better indicated by higher values)												
1 (Palamara 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	17	17	-	SMD 0.92 higher (0.21 to 1.63 higher)	LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III change scores at 6 months follow-up - Aquatic therapy plus multidisciplinary intensive rehabilitation treatment (Better indicated by lower values)												
1 (Palamara 2017)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	17	17	-	SMD 0.24 higher (0.43 lower to 0.92 higher)	LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; SMD: standardised mean difference; TUG: timed up and go test; UPDRS III: unified Parkinson's disease rating scale part 3

1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 28: Evidence profile for comparison between hydrotherapy and control in adults with general peripheral neuropathies

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hydrotherapy	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by DGI change scores at post-intervention - Hydrotherapy plus inpatient multidisciplinary rehabilitation programme (Better indicated by higher values)												
1 (Zivi 2018)	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	serious[1]	none	21	19	-	SMD 0.7 higher (0.05 to 1.34 higher)	MODERATE	CRITICAL
Balance as measured by BBS change scores at post-intervention - Hydrotherapy plus inpatient multidisciplinary rehabilitation programme (Better indicated by higher values)												
1 (Zivi 2018)	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	very serious[2]	none	21	19	-	SMD 0.05 lower (0.67 lower to 0.57 higher)	LOW	CRITICAL
Functioning as measured by FIM change scores at post-intervention - Hydrotherapy plus inpatient multidisciplinary rehabilitation programme (Better indicated by higher values)												
1 (Zivi 2018)	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	very serious[2]	none	21	19	-	SMD 0.03 lower (0.65 lower to 0.59 higher)	LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; DGI: dynamic gait index; FIM: functional independence measure; SMD: standardised mean difference
1 95% CI crosses 1 MID (for SMD +/-0.5)
2 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 29: Evidence profile for comparison between hydrotherapy and control in children and young people with Duchenne's muscular dystrophy

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Hydrotherapy	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by NSAA change scores at post-intervention - Aquatic therapy and land-based training (Better indicated by higher values)												
1 (Hind 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	2	-	SMD 0.3 higher (1.26 lower to 1.86 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Hydrotherapy plus inpatient rehabilitation programme (Better indicated by higher values)												
1 (Hind 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	8	1	-	SMD 1.3 higher (0.93 lower to 3.53 higher)	VERY LOW	CRITICAL

CI: confidence interval; NSAA: north star ambulatory assessment; SMD: standardised mean difference; 6MWT: 6 minute walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Exergaming and AR/VR

Table 30: Evidence profile for comparison between exergaming and AR/VR and control in adults with acquired spinal cord injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exergaming and AR/VR	Control	Relative (95% CI)	Absolute		
Balance as measured by MFRT (cm) change scores at post-intervention - Virtual reality navigation therapy plus standard rehabilitation programme (Better indicated by higher values)												

1 (Manzanares 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	6	5	-	SMD 0.21 higher (0.98 lower to 1.4 higher)	VERY LOW	CRITICAL
Functioning as measured by SCIM3 change scores at post-intervention - Virtual reality navigation therapy plus standard rehabilitation programme (Better indicated by higher values)												
1 (Manzanares 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	6	5	-	SMD 0.48 higher (0.73 lower to 1.7 higher)	VERY LOW	CRITICAL

AR: augmented reality; CI: confidence interval; cm: centimetres; MFRT: modified functional reach test; SCIM3: spinal cord independence measure 3rd revision; SMD: standardised mean difference; VR: virtual reality
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 31: Evidence profile for comparison between exergaming and AR/VR and control in adults with multiple sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Exergaming and AR/VR**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by a validated scale; change scores at post-intervention - Exergaming and VR/AR (Better indicated by higher values)												
2*	randomised trials	very serious[1]	serious[2]	no serious indirectness	very serious[3]	none	20	17	-	SMD 0.67 higher (0.68 lower to 2.01 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at post-intervention - Virtual reality-based motor rehabilitation plus traditional physiotherapy (Better indicated by lower values)												
1 (Lozano-Quilis 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	6	5	-	SMD 0.22 lower (1.42 lower to 0.97 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at post-intervention - Virtual reality-based motor rehabilitation plus traditional physiotherapy (Better indicated by lower values)												

1 (Lozano-Quilis 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	6	5	-	SMD 0.12 lower (1.31 lower to 1.07 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at post-intervention - Exergaming and VR/AR (Better indicated by higher values)												
2*	randomised trials	very serious[1]	serious[2]	no serious indirectness	serious[5]	none	20	17	-	SMD 1.25 higher (0.21 lower to 2.7 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Exergame-based rehabilitation programme (Better indicated by higher values)												
1 (Tollár 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[5]	none	14	12	-	SMD 0.97 higher (0.15 to 1.8 higher)	VERY LOW	CRITICAL

AR: augmented reality; CI: confidence interval; s: seconds; SMD: standardised mean difference; TUG: timed up and go test; VR: virtual reality; 6MWT: 6 minute walk test; 10MWT: 10 metre walk test
** See corresponding forest plot*
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 Serious heterogeneity (I2 >50%)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)
4 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
5 95% CI crosses 1 MID (for SMD +/-0.5)

Table 32: Evidence profile for comparison between exergaming and AR/VR and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Exergaming and AR/VR**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by a validated scale change scores at post-intervention - Exergaming and VR/AR (Better indicated by higher values)												
3*	randomised trials	very serious[1]	serious[2]	no serious indirectness	very serious[3]	none	66	64	-	SMD 0.12 higher (0.6 lower to 0.84 higher)	VERY LOW	CRITICAL

Gait and balance as measured by BESTest change scores at post-intervention - Exergame-based rehabilitation programme (Better indicated by higher values)												
1 (Tollár 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[4]	none	25	24	-	SMD 0.49 higher (0.08 lower to 1.06 higher)	VERY LOW	CRITICAL
Gait and balance as measured by DGI change scores at post-intervention - Exergame-based rehabilitation programme (Better indicated by higher values)												
1 (Tollár 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[4]	none	25	24	-	SMD 0.76 higher (0.17 to 1.34 higher)	VERY LOW	CRITICAL
Balance as measured by a validated scale; change scores at post-intervention - Exergaming and VR/AR (Better indicated by higher values)												
2*	randomised trials	very serious[1]	very serious[5]	no serious indirectness	serious[4]	none	50	50	-	SMD 1.19 higher (0.17 lower to 2.55 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Exergame-based rehabilitation programme (Better indicated by higher values)												
1 (Tollár 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	25	24	-	SMD 1.9 higher (1.22 to 2.59 higher)	LOW	CRITICAL
Limb/joint/muscle function (upper limb function) as measured by DASH change scores at post-intervention - Virtual reality-based rehabilitation programme (Better indicated by lower values)												
1 (Pazzaglia 2020)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[4]	none	25	26	-	SMD 0.23 lower (0.78 lower to 0.32 higher)	VERY LOW	CRITICAL

AR: augmented reality; BESTest: balance evaluation systems test; CI: confidence interval; DASH: disabilities of the arm, shoulder and hand; DGI: dynamic gait index; SMD: standardised mean difference; VR: virtual reality; 6MWT: 6 minute walk test
** See corresponding forest plot*
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 Serious heterogeneity (I2 >50%)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)

4 95% CI crosses 1 MID (for SMD +/-0.5)
5 Very serious heterogeneity (I2 >80%)

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Wearable garments, technology and exoskeletons

Table 33: Evidence profile for comparison between exoskeletons and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exoskeletons	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by B-BESTest change scores at post-intervention - Exercise programme with exoskeleton versus exercise programme without exoskeleton (Better indicated by higher values)												
1 (Gryfe 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	14	-	SMD 0.45 lower (1.21 lower to 0.32 higher)	VERY LOW	CRITICAL
Gait and balance as measured by B-BESTest change scores at post-intervention - Exercise programme with exoskeleton versus waitlist control (Better indicated by higher values)												
1 (Gryfe 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	13	13	-	SMD 0.13 higher (0.64 lower to 0.9 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Exercise programme with exoskeleton versus exercise programme without exoskeleton (Better indicated by higher values)												
1 (Gryfe 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	13	14	-	SMD 1.84 higher (0.91 to 2.76 higher)	LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Exercise programme with exoskeleton versus waitlist control (Better indicated by higher values)												
1 (Gryfe 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	13	13	-	SMD 1.2 higher (0.35	VERY LOW	CRITICAL

										to 2.04 higher)		
Limb/joint/muscle function (motor functioning) as measured by UPDRS III (worst side only) change scores at post-intervention - Exercise programme with exoskeleton versus Exercise programme without exoskeleton (Better indicated by lower values)												
1 (Gryfe 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	13	14	-	SMD 0.14 higher (0.61 lower to 0.9 higher)	VERY LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III (worst side only) change scores at post-intervention - Exercise programme with exoskeleton versus Waitlist control (Better indicated by lower values)												
1 (Gryfe 2022)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[3]	none	13	13	-	SMD 0.04 lower (0.81 lower to 0.73 higher)	VERY LOW	CRITICAL

B-BESTest: brief balance evaluation systems test; CI: confidence interval; SMD: standardised mean difference; UPDRS III: unified Parkinson's disease rating scale part 3; 6MWT: 6 minute walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)
3 95% CI crosses 2 MIDs (for SMD +/-0.5)

Rehabilitation interventions to address upper limb functioning, stability and mobility together: Individualised (tailored) exercise programmes

Table 34: Evidence profile for comparison between individualised (tailored) exercise programme and control in adults with acquired spinal cord injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Individualised (tailored) exercise programme**	**Control**	**Relative (95% CI)**	**Absolute**		
Exercise capacity as measured by 6MWT or 6MPT* change scores at post-intervention - Web-based individualised physiotherapy programme (Better indicated by higher values)												

1 (Coulter 2017)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	14	6	-	SMD 0.46 higher (0.52 lower to 1.45 higher)	VERY LOW	CRITICAL

CI: confidence interval; SMD: standardised mean difference; 6MPT: 6 minute push test; 6MWT: 6 minute walk test
** Participants completed whichever test was suited to their primary mode of mobility, and scores have been combined for analysis*
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)

Table 35: Evidence profile for comparison between individualised (tailored) exercise programme and control in adults with amyotrophic lateral sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Individualised (tailored) exercise programme**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by TUG change scores at post-intervention - Tailored exercise programme (Better indicated by lower values)												
1 (Ferri 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	7	4	-	SMD 5.2 lower (8.18 to 2.22 lower)	LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Tailored exercise programme (Better indicated by higher values)												
1 (Ferri 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	7	4	-	SMD 1.59 higher (0.11 to 3.07 higher)	VERY LOW	CRITICAL
Functioning as measured by ALSFRS-R change scores at post-intervention - Tailored exercise programme (Better indicated by higher values)												
1 (Ferri 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	7	4	-	SMD 4.33 higher (1.76 to 6.89 higher)	LOW	CRITICAL
Functioning as measured by ALS-SS change scores at post-intervention - Tailored exercise programme (Better indicated by higher values)												

1 (Ferri 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	7	4	-	SMD 3.04 higher (1.04 to 5.05 higher)	LOW	CRITICAL

ALSFRS-R: amyotrophic lateral sclerosis functional rating scale (revised); ALS-SS: amyotrophic lateral sclerosis survival score; CI: confidence interval; SMD: standardised mean difference; TUG: timed up and go test; 6MWT: 6 minute walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)

Table 36: Evidence profile for comparison between individualised (tailored) exercise programme and control in adults with multiple sclerosis

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Individualised (tailored) exercise programme**	**Control**	**Relative (95% CI)**	**Absolute**		
Gait and balance as measured by a validated scale; change scores at post-intervention - Individualised exercise programme (Better indicated by lower values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	51	45	-	SMD 0.03 lower (0.44 lower to 0.38 higher)	LOW .	CRITICAL
Gait as measured by a validated scale; change scores at post-intervention - Individualised exercise programme (Better indicated by higher values)												
2*	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	45	36	-	SMD 0.02 lower (0.47 lower to 0.42 higher)	LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Web-based individualised physiotherapy programme (Better indicated by higher values)												
1 (Paul 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	37	39	-	SMD 0.16 lower (0.61 lower to 0.29 higher)	VERY LOW	CRITICAL

Exercise capacity as measured by 2MWT change scores at post-intervention - Web-based individualised physiotherapy programme (Better indicated by higher values)												
1 (Paul 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	37	39	-	SMD 0.14 lower (0.59 lower to 0.31 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at 3 months follow-up - Web-based individualised physiotherapy programme (Better indicated by lower values)												
1 (Paul 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	34	36	-	SMD 0.04 lower (0.51 lower to 0.43 higher)	VERY LOW	CRITICAL
Gait as measured by T25FWT (ft/s) change scores at 3 months follow-up - Web-based individualised physiotherapy programme (Better indicated by higher values)												
1 (Paul 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	27	32	-	SMD 0.23 lower (0.74 lower to 0.29 higher)	VERY LOW	CRITICAL
Balance as measured by BBS change scores at 3 months follow-up - Web-based individualised physiotherapy programme (Better indicated by higher values)												
1 (Paul 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	36	36	-	SMD 0.49 lower (0.96 to 0.02 lower)	VERY LOW	CRITICAL
Exercise capacity as measured by 2MWT change scores at 3 months follow-up - Web-based individualised physiotherapy programme (Better indicated by higher values)												
1 (Paul 2019)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	35	36	-	SMD 0.41 lower (0.88 lower to 0.06 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; ft/s: feet per second; SMD: standardised mean difference; TUG: timed up and go test; T25FWT: timed 25 foot walk test; 2MWT: 2 minute walk test

** See corresponding forest plot*

1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2

2 95% CI crosses 1 MID (for SMD +/-0.5)

Table 37: Evidence profile for comparison between individualised (tailored) exercise programme and control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Individualised (tailored) exercise programme	Control	Relative (95% CI)	Absolute		
Exercise capacity as measured by 5XSST change scores at post-intervention - Personalised intensive physiotherapy programme (Better indicated by lower values)												
1 (Schaible 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	15	12	-	SMD 1.41 lower (2.28 to 0.55 lower)	LOW	CRITICAL
Limb/joint/muscle function (motor functioning) as measured by UPDRS III change scores at post-intervention - Personalised intensive physiotherapy programme (Better indicated by lower values)												
1 (Schaible 2021)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	15	12	-	SMD 0.97 lower (1.78 to 0.16 lower)	VERY LOW	CRITICAL

CI: confidence interval; SMD: standardised mean difference; UPDRS III: unified Parkinson's disease rating scale part 3; 5XSST: 5 times sit to stand test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 1 MID (for SMD +/-0.5)

Table 38: Evidence profile for comparison between individualised (tailored) exercise programme and same intervention (different setting) control in adults with Parkinson's disease

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Individualised (tailored) exercise programme	Same intervention (different setting)	Relative (95% CI)	Absolute		

Gait and balance as measured by Mini-BESTest change scores at post-intervention - Home-based and centre-based individualised exercise programme (Better indicated by higher values)												
1 (Flynn 2021)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	19	20	-	SMD 0.07 lower (0.69 lower to 0.56 higher)	LOW	CRITICAL
Gait as measured by 10MWT (m/s, preferred pace) change scores at post-intervention - Home-based and centre-based individualised exercise programme (Better indicated by higher values)												
1 (Flynn 2021)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	19	20	-	SMD 0.06 lower (0.69 lower to 0.57 higher)	LOW .	CRITICAL
Gait as measured by 10MWT (m/s, fast pace) change scores at post-intervention - Home-based and centre-based individualised exercise programme (Better indicated by higher values)												
1 (Flynn 2021)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	19	20	-	SMD 0.21 lower (0.84 lower to 0.42 higher)	LOW	CRITICAL

CI: confidence interval; m/s: metres per second; Mini-BESTest: mini balance evaluation systems test; SMD: standardised mean difference; 10MWT: 10 metre walk test
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)
3 95% CI crosses 1 MID (for SMD +/-0.5)

Mixed rehabilitation interventions

Table 39: Evidence profile for comparison between mixed interventions (balance exercises plus gait training) and control in adults with Parkinson's disease

Quality assessment	No of patients	Effect	Quality	Importance

No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Balance exercises plus gait training	Control	Relative (95% CI)	Absolute		
Gait and balance as measured by TBG change scores at post-intervention - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) (Better indicated by higher values)												
1 (Ciatto 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	15	-	MD 1.32 higher (2.36 lower to 5 higher)	VERY LOW	CRITICAL
Balance as measured by BBS change scores at post-intervention - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) (Better indicated by higher values)												
1 (Ciatto 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	15	-	MD 3.60 higher (0.69 lower to 7.89 higher)	VERY LOW	CRITICAL
Functioning as measured by FIM change scores at post-intervention - Bodyweight supported gait training plus bodyweight supported balance exercises (Rysen system) (Better indicated by higher values)												
1 (Ciatto 2023)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	15	15	-	MD 12.36 higher (5.77 to 18.95 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; FIM: functional independence measure; MD: mean difference; TBG: Tinetti balance and gait
1 Serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 Very serious imprecision due to sample size <200 (standard deviation for control group not presented at any time point so unable to calculate default MID)

Table 40: Evidence profile for comparison between mixed interventions (gait training plus electrical stimulation) and control in adults with acquired spinal cord injury

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Gait training plus electrical stimulation	Control	Relative (95% CI)	Absolute		

Gait and balance as measured by TUG change scores at post-intervention - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by lower values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	6	-	SMD 0.07 higher (0.94 lower to 1.08 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at post-intervention - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by lower values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	14	7	-	SMD 0.35 higher (0.56 lower to 1.27 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at post-intervention - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by higher values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	9	7	-	SMD 0.27 lower (1.26 lower to 0.73 higher)	VERY LOW	CRITICAL
Gait and balance as measured by TUG change scores at 2 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by lower values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	6	-	SMD 0.36 higher (0.66 lower to 1.38 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at 2 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by lower values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	14	7	-	SMD 0.28 higher (0.63 lower to 1.19 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at 2 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by higher values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	9	7	-	SMD 0.24 lower (1.24	VERY LOW	CRITICAL

										lower to 0.75 higher)		
Gait and balance as measured by TUG change scores at 8 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by lower values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	10	6	-	SMD 0.05 lower (1.06 lower to 0.96 higher)	VERY LOW	CRITICAL
Gait as measured by 10MWT (s) change scores at 8 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by lower values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	14	7	-	SMD 0.31 higher (0.6 lower to 1.23 higher)	VERY LOW	CRITICAL
Exercise capacity as measured by 6MWT change scores at 8 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by higher values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	9	7	-	SMD 0.03 lower (1.02 lower to 0.96 higher)	VERY LOW	CRITICAL
Functioning as measured by SCIM3 change scores at 8 months follow-up - Functional electrical stimulation plus bodyweight supported treadmill training (Loko70) (Better indicated by higher values)												
1 (Kapadia 2014)	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	15	11	-	SMD 0.41 higher (0.37 lower to 1.2 higher)	VERY LOW	CRITICAL

BBS: Berg balance scale; CI: confidence interval; s: seconds; SMD: standardised mean difference; SCIM3: spinal cord independence measure 3rd revision; TUG: timed up and go test; 10MWT: 10 metre walk test; 6MWT: 6 minute walk test
1 Very serious risk of bias in the evidence contributing to the outcomes as per Cochrane RoB2
2 95% CI crosses 2 MIDs (for SMD +/-0.5)
3 95% CI crosses 1 MID (for SMD +/-0.5)

Appendix G Economic evidence study selection

Study selection for: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

No economic evidence was identified which was applicable to this review question.

Appendix H Economic evidence tables

Economic evidence tables for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

No evidence was identified which was applicable to this review question.

Appendix I Economic model

Economic model for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

No economic analysis was conducted for this review question.

Appendix J Excluded studies

Excluded studies for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

Excluded effectiveness studies

Table 41: Excluded studies and reasons for their exclusion

Study	Reason for exclusion
Abadi Marand, Laleh, Noorizadeh Dehkordi, Shohreh, Roohi-Azizi, Mahtab et al. (2023) Effect of Dynamic Neuromuscular Stabilization on Balance, Trunk Function, Falling, and Spasticity in People With Multiple Sclerosis: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 104(1): 90-101	- Country Study conducted in Iran.
Abasiyanik, Zuhal and Kahraman, Turhan (2022) Effect of dual-task training on cognitive functions in persons with multiple sclerosis: A systematic review and meta-analysis. Multiple sclerosis and related disorders 62: 103801	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of cognitive processing speed, executive functioning, working memory, and frontal lobe function. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Abd El Kafy, EM and El-Shemy, SA (2013) Modulation of lower extremity rotational deformities using TheraTogs™ and strapping system in children with spastic diplegia. Egyptian journal of neurology, psychiatry and neurosurgery 50(4): 397-402	- Country Study conducted in Egypt.
Abdelaal, Ashraf and El-Shamy, Shamekh (2022) Effects of Antigravity Treadmill Training on Gait and Balance in Patients with Diabetic Polyneuropathy: A Randomized Controlled Trial. F1000Research 11: 52	- Country Study conducted in Saudi Arabia.
Abdelbasset, Walid Kamal, Alrawaili, Saud M, Nambi, Gopal et al. (2020) Therapeutic effects of proprioceptive exercise on functional capacity, anxiety, and depression in patients with diabetic neuropathy: a 2-month prospective study. Clinical rheumatology 39(10): 3091-3097	- Country Study conducted in Saudi Arabia.
Abdullahi, A., Wong, T.W.L., Van Criekinge, T. et al. (2023) Combination of noninvasive brain stimulation and constraint-induced movement therapy in patients with stroke: a systematic review and meta-	- Population Systematic review including participants out of protocol (adult stroke survivors). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.

Study	Reason for exclusion
analysis. Expert Review of Neurotherapeutics 23(2): 187-203	
Abou, Libak, Alluri, Aditya, Fliflet, Alexander et al. (2021) Effectiveness of Physical Therapy Interventions in Reducing Fear of Falling Among Individuals With Neurologic Diseases: A Systematic Review and Meta-analysis. Archives of physical medicine and rehabilitation 102(1): 132-154	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of fear of falling. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Abou, Libak, Malala, Vonjiniaina Domohina, Yarnot, Rebecca et al. (2020) Effects of Virtual Reality Therapy on Gait and Balance Among Individuals With Spinal Cord Injury: A Systematic Review and Meta-analysis. Neurorehabilitation and neural repair 34(5): 375-388	- Study design (adults) Systematic review with 3/10 randomised controlled trials and 7/10 non-comparative studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Abraham, M.E., Shalom, M., Gendreau, J. et al. (2023) Utilizing Neuromodulation in the Treatment of Spinal Cord Injury: An Assessment of Clinical Trials from the National ClinicalTrials.gov Database. World Neurosurgery 177: e361-e367	- Country Systematic review with 2/33 of the included studies conducted in Canada, 2/33 in Switzerland, 1/33 in Canada and the US, 1/33 in Spain, 24/33 in the US, 2/33 in Hong Kong, and 1/33 in China. Canadian, Swiss, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Afrasiabifar, Ardashir; Karami, Fatemeh; Najafi Doulatabad, Shahla (2018) Comparing the effect of Cawthorne-Cooksey and Frenkel exercises on balance in patients with multiple sclerosis: a randomized controlled trial. Clinical rehabilitation 32(1): 57-65	- Country Study conducted in Iran.
Afshari, Khashayar, Ozturk, Erin D, Yates, Brandon et al. (2022) Effect of hybrid FES exercise on body composition during the sub-acute phase of spinal cord injury. PloS one 17(1): e0262864	- Country Study conducted in the US.
Aguirre-Guemez, Ana Valeria, Perez-Sanpablo, Aberto Isaac, Quinzanos-Fresnedo, Jimena et al. (2019) Walking speed is not the best outcome to evaluate the effect of robotic assisted gait training in people with motor incomplete Spinal Cord Injury: A Systematic Review with meta-analysis. The journal of spinal cord medicine 42(2): 142-154	- Country Systematic review with 2/15 of the included studies conducted in Spain, 2/15 in Switzerland, 1/15 in Canada, 7/15 in the US, 1/15 in China, 1/15 in Mexico, and 1/15 in South Korea. Spanish, Swiss, and Canadian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ahmad, Irshad, Verma, Shalini, Noohu, Majumi M et al. (2020) Sensorimotor and gait training improves proprioception, nerve function, and muscular activation in	- Country Study conducted in India.

Study	Reason for exclusion
patients with diabetic peripheral neuropathy: a randomized control trial. Journal of musculoskeletal & neuronal interactions 20(2): 234-248	
Ahmad, Irshad, Verma, Shalini, Noohu, Majumi Mohamad et al. (2021) Effect of sensorimotor training on spatiotemporal parameters of gait among middle and older age adults with diabetic peripheral neuropathy. Somatosensory & motor research 38(3): 230-240	- Country Study conducted in India.
Ahmed Hassanin, Mohamed, Aly, Maya G, Atef, Hady et al. (2023) Task-oriented training for upper limb functions in patients with multiple sclerosis: Systematic review and meta-analysis. Multiple sclerosis and related disorders 73: 104625	- Country Systematic review with 2/5 of the included studies conducted in Italy, 1/5 in Belgium, 1/5 in Turkey, and 1/5 in the US. Italian and Belgian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ahmed, I., Mustafaoglu, R., Benkhalifa, N. et al. (2023) Does noninvasive brain stimulation combined with other therapies improve upper extremity motor impairment, functional performance, and participation in activities of daily living after stroke? A systematic review and meta-analysis of randomized controlled trial. Topics in Stroke Rehabilitation 30(3): 213-234	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Aida, Jared; Chau, Brian; Dunn, Justin (2018) Immersive virtual reality in traumatic brain injury rehabilitation: A literature review. NeuroRehabilitation 42(4): 441-448	- Publication date Systematic review with 6/11 studies published 2013 onwards, and 5/11 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Aidar, Felipe J, Gama de Matos, Dihogo, de Souza, Raphael F et al. (2018) Influence of aquatic exercises in physical condition in patients with multiple sclerosis. The Journal of sports medicine and physical fitness 58(5): 684-689	- Country Study conducted in Brazil.
Akbari, Narges Jahantigh and Naimi, Sedigheh Sadat (2022) The effect of exercise therapy on balance in patients with diabetic peripheral neuropathy: a systematic review. Journal of diabetes and metabolic disorders 21(2): 1861-1871	- Country Systematic review with 1/12 of the included studies conducted in Spain, 3/12 in Iran, 3/12 in the US, 1/12 in Brazil, 1/12 in India, 1/12 in Pakistan, 1/12 in Singapore, and 1/12 in South Korea. Spanish study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Akbari, Narges Jahantigh, Tahan, Nahid, Naimi, Sedigheh Sadat et al. (2024) Comparing the effects of cerebellar and prefrontal anodal transcranial direct current stimulation	- Country Study conducted in Iran.

Study	Reason for exclusion
concurrent with postural training on balance and fatigue in patients with multiple sclerosis: a double-blind, randomized, sham-controlled trial. Experimental brain research	
Alagumoorthi, G., Jebakani, D.B., Kumaresan, A. et al. (2022) Does Wii Based Intervention Cause Meaningful Improvement in Functional Balance in Idiopathic Parkinson's disease - A Systematic Review. European Journal of Molecular and Clinical Medicine 9(8): 450-470	- Study design (adults) Systematic review with 4/15 randomised controlled trials, 6/15 non-comparative studies, and 5/15 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alagumoorthi, G, D, Beulah Jebakani, Thirunavukarasu, Suresh et al. (2022) Effectiveness of Wii sports- based strategy training in reducing risk of falling, falls and improving quality of life in adults with idiopathic Parkinson's disease- a randomized comparative trial. Clinical rehabilitation 36(8): 1097-1109	- Country Study conducted in India.
Alajam, Ramzi; Alqahtani, Abdulfattah S; Liu, Wen (2019) Effect of Body Weight-Supported Treadmill Training on Cardiovascular and Pulmonary Function in People With Spinal Cord Injury: A Systematic Review. Topics in spinal cord injury rehabilitation 25(4): 355-369	- Study design (adults) Systematic review with 2/9 randomised controlled trials and 7/9 non-comparative studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alashram, A.R. (2024) Task-oriented training for gait rehabilitation in people with multiple sclerosis: A systematic review. Journal of Bodywork and Movement Therapies 39: 87-96	- Study design (adults) Systematic review with 5/9 randomised controlled trials, 3/9 non-comparative studies, and 1/9 non-randomised controlled trial. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alashram, Anas R; Annino, Giuseppe; Mercuri, Nicola Biagio (2022) Changes in spasticity following functional electrical stimulation cycling in patients with spinal cord injury: A systematic review. The journal of spinal cord medicine 45(1): 10-23	- Country Systematic review with 1/9 randomised controlled trials, 7/9 non-comparative studies, and 1/9 non-randomised studies. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Alashram, Anas R; Annino, Giuseppe; Padua, Elvira (2021) Robot-assisted gait training in individuals with spinal cord injury: A systematic review for the clinical effectiveness of Lokomat. Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia 91: 260-269	- Country Systematic review with 5/16 of the included studies conducted in Spain, 1/16 in Canada, 1/16 in Norway, 1/16 in The Netherlands, 4/16 in the US, 1/16 in China, 1/16 in Israel, 1/16 in South Korea, and 1/16 in an unclear country. Spanish, Canadian, Norwegian, and Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alashram, Anas R, Annino, Giuseppe, Raju, Manikandan et al. (2020) Effects of physical therapy	- Country Systematic review with 2/8 of the included studies conducted in Canada, 1/8 in Italy, 1/8 in Norway, and 4/8 in

Study	Reason for exclusion
interventions on balance ability in people with traumatic brain injury: A systematic review. NeuroRehabilitation 46(4): 455-466	the US. Canadian, Italian, and Norwegian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alashram, Anas R, Annino, Giuseppe, Romagnoli, Cristian et al. (2023) Proprioceptive Focal Stimulation (Equistasi R) for gait and postural balance rehabilitation in patients with Parkinson's disease: A systematic review. Proceedings of the Institution of Mechanical Engineers. Part H, Journal of engineering in medicine 237(2): 179-189	- Outcomes Systematic review with no meta-analysis and individual presentation of results. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alashram, Anas R; Padua, Elvira; Annino, Giuseppe (2022) Virtual reality for balance and mobility rehabilitation following traumatic brain injury: A systematic review of randomized controlled trials. Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia 105: 115-121	- Country Systematic review with 1/5 of the included studies conducted in Canada, 1/5 in Italy, and 3/5 in the US. Canadian and Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alashram, Anas R, Padua, Elvira, Hammash, Ahmad K et al. (2020) Effectiveness of virtual reality on balance ability in individuals with incomplete spinal cord injury: A systematic review. Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia 72: 322-327	- Country Systematic review with 2/5 of the included studies conducted in Switzerland, 1/5 in the Netherlands, 1/5 in South Korea, and 1/5 in the US. Swiss and Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alberts, Jay L, Kaya, Ryan D, Penko, Amanda L et al. (2023) A Randomized Clinical Trial to Evaluate a Digital Therapeutic to Enhance Gait Function in Individuals With Parkinson's Disease. Neurorehabilitation and neural repair 37(9): 603-616	- Country Study conducted in the US.
Albrecht, Franziska, Pereira, Joana B, Mijalkov, Mite et al. (2021) Effects of a Highly Challenging Balance Training Program on Motor Function and Brain Structure in Parkinson's Disease. Journal of Parkinson's disease 11(4): 2057-2071	- Comparator Speech training programme for stability, and not no intervention, waitlist, standard rehabilitation care alone, or ‘usual care’.
Aldaihan, M.M. (2023) The Impact of Aquatic Therapy on Balance and Mobility in Individuals with Spinal Cord Injury-A Systematic Review and Meta-Analysis. Journal of Pioneering Medical Sciences 12(2): 27-35	- Country Systematic review with 3/6 of the included studies conducted in Italy, 2/6 in Brazil, and 1/6 in the US. Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alemdarotlu, I, Karaduman, A, Yilmaz, O et al. (2014) Effects of upper extremity dynamic exercise on	- Other protocol criteria Turkish language article.

Study	Reason for exclusion
respiratory function and quality of life in Duchenne Muscular Dystrophy. Fizyoterapi rehabilitasyon 25(2): 78-85	
Alhaffo, A.A.A.; Jubara, M.; Idan, G.F. (2023) Effect of Epidural Pulsed Radiofrequency with Neuro-Stimulation in Management of Thoracic Spinal Cord Injury. Journal of Population Therapeutics and Clinical Pharmacology 30(3): e273-e283	- Country Study conducted in Iraq.
Ali, Ahmed S, Darwish, Moshera H, Shalaby, Nevin M et al. (2021) Efficacy of core stability versus task oriented trainings on balance in ataxic persons with multiple sclerosis. A single blinded randomized controlled trial. Multiple sclerosis and related disorders 50: 102866	- Country Study conducted in Egypt.
Aljabri, Ammar, Halawani, Alhussain, Ashqar, Alaa et al. (2024) The Efficacy of Vestibular Rehabilitation Therapy for Mild Traumatic Brain Injury: A Systematic Review and Meta-analysis. The Journal of head trauma rehabilitation 39(2): e59-e69	- Country Systematic review with 2/8 of the included studies conducted in Canada, 1/8 in Norway, 4/8 in the US, and 1/8 in Iran. Canadian and Norwegian were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Allen, Natalie E, Song, Jooeun, Paul, Serene S et al. (2017) An interactive videogame for arm and hand exercise in people with Parkinson's disease: A randomized controlled trial. Parkinsonism & related disorders 41: 66-72	- Intervention Interactive videogame to address upper limb functioning only and not upper limb functioning, stability, and mobility together.
Almuklass, Awad M, Davis, Leah, Hamilton, Landon D et al. (2018) Pulse Width Does Not Influence the Gains Achieved With Neuromuscular Electrical Stimulation in People With Multiple Sclerosis: Double-Blind, Randomized Trial. Neurorehabilitation and neural repair 32(1): 84-93	- Country Study conducted in the US.
Alnajjar, Fady, Zaier, Riadh, Khalid, Sumayya et al. (2021) Trends and Technologies in Rehabilitation of Foot Drop: A Systematic Review. Expert review of medical devices 18(1): 31-46	- Population Systematic review including participants who are in protocol (2/24 people with foot drop), unclear (1/24 people with hemiplegia), and out of protocol (6/24 adults with stroke, 6/24 healthy adults, 1/24 adults with stroke and healthy adults, and 1/24 no participants). Studies including participants with foot drop and hemiplegia were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alrashidi, Abdullah A, Nightingale, Tom E, Currie, Katharine D et al. (2021) Exercise Improves Cardiorespiratory Fitness, but Not	- Intervention Standardised aerobic training programme, and not individualised exercise programme.

Study	Reason for exclusion
Arterial Health, after Spinal Cord Injury: The CHOICES Trial. Journal of neurotrauma 38(21): 3020-3029	
Alvarez-Bueno, Celia, Deeks, Jonathan J, Cavero-Redondo, Ivan et al. (2023) Effect of Exercise on Motor Symptoms in Patients With Parkinson's Disease: A Network Meta-analysis. Journal of geriatric physical therapy (2001) 46(2): e87-e105	- Country Systematic review with 14/56 of the included studies conducted in Italy, 5/56 in Canada, 3/56 in Spain, 2/56 in Australia, 2/56 in Germany, 2/56 in the UK, 1/56 in Ireland, 1/56 in the Netherlands, 13/56 in the US, 3/56 in China, 3/56 in South Korea, 2/56 in Brazil, 2/56 in Turkey, 1/56 in India, 1/56 in Japan, and 1/56 in Taiwan. Italian, Canadian, Spanish, Australian, German, Dutch, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alves Da Rocha, P; McClelland, J; Morris, M E (2015) Complementary physical therapies for movement disorders in Parkinson's disease: a systematic review. European journal of physical and rehabilitation medicine 51(6): 693-704	- Publication date Systematic review with 11/35 studies published 2013 onwards, and 24/35 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Alves, Melissa L. M, Mesquita, Beatriz S, Morais, Wenderson S et al. (2018) Nintendo WiiTM versus Xbox KinectTM for assisting people with Parkinson's disease. Perceptual and Motor Skills 125(3): 546-565	- Country Study conducted in Brazil.
Alves, Wilson M, Alves, Thiago G, Ferreira, Renilson M et al. (2019) Strength training improves the respiratory muscle strength and quality of life of elderly with Parkinson disease. The Journal of sports medicine and physical fitness 59(10): 1756-1762	- Country Study conducted in Brazil.
Alwardat, Mohammad and Etoom, Mohammad (2019) Effectiveness of robot-assisted gait training on freezing of gait in people with Parkinson disease: evidence from a literature review. Journal of exercise rehabilitation 15(2): 187-192	- Study design (adults) Systematic review with 3/4 case studies and 1/4 non-comparative studies. No studies checked against protocol criteria as did not include any randomised controlled trials or systematic reviews.
Alwardat, Mohammad, Etoom, Mohammad, Al Dajah, Salameh et al. (2018) Effectiveness of robot-assisted gait training on motor impairments in people with Parkinson's disease: a systematic review and meta-analysis. International journal of rehabilitation research. Internationale Zeitschrift fur Rehabilitationsforschung. Revue internationale de recherches de readaptation 41(4): 287-296	- Publication date Systematic review with 4/7 studies published 2013 onwards, and 3/7 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Amatachaya, Sugalya, Srisim, Kitiyawadee, Arrayawichanon, Preeda et al. (2019) Dual-Task Obstacle	- Country Study conducted in Thailand.

Study	Reason for exclusion
Crossing Training Could Immediately Improve Ability to Control a Complex Motor Task and Cognitive Activity in Chronic Ambulatory Individuals With Spinal Cord Injury. Topics in spinal cord injury rehabilitation 25(3): 260-270	
Amato Nesbit, Suzanne, Sharma, Ritu, Waldfogel, Julie M et al. (2019) Non-pharmacologic treatments for symptoms of diabetic peripheral neuropathy: a systematic review. Current medical research and opinion 35(1): 15-25	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of pain, numbness, paresthesia, composite neuropathic symptoms, quality of life, and adverse effects. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Amatya, B, Khan, F, La Mantia, L et al. (2013) Non pharmacological interventions for spasticity in multiple sclerosis. Cochrane Database of Systematic Reviews	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Amedoro, Alessio, Berardi, Anna, Conte, Antonella et al. (2020) The effect of aquatic physical therapy on patients with multiple sclerosis: A systematic review and meta-analysis. Multiple sclerosis and related disorders 41: 102022	- Country Systematic review with 1/11 of the included studies conducted in Spain, 1/11 in Switzerland, 7/11 in Iran, 1/11 in Brazil, and 1/11 in Turkey. Spanish and Swiss studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Amirthalingam, Jashvini, Paidi, Gokul, Alshowaikh, Khadija et al. (2021) Virtual Reality Intervention to Help Improve Motor Function in Patients Undergoing Rehabilitation for Cerebral Palsy, Parkinson's Disease, or Stroke: A Systematic Review of Randomized Controlled Trials. Cureus 13(7): e16763	- Population Systematic review including participants in protocol (2/13 people with Parkinson's disease) and out of protocol (10/13 adults with stroke and 1/13 people with cerebral palsy). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
An, Yeongsang and Park, Chanhee (2022) The effects of virtual soccer game on balance, gait function, and kick speed in chronic incomplete spinal cord injury: a randomized controlled trial. Spinal cord 60(6): 504-509	- Country Study conducted in South Korea.
Ancona, E, Quarenghi, A, Simonini, M et al. (2019) Effect of verticalization with Erigo® in the acute rehabilitation of severe acquired brain injury. Neurological sciences 40(10): 2073-2080	- Population Participants' condition does not meet the guideline definition of chronic (3 months since diagnosis or injury). Mean time since injury reported as 86 days for intervention group and 77 days for control group.
Anderson, Kim D, Korupolu, Radha, Musselman, Kristin E et al. (2022) Multi-center, single-blind randomized controlled trial comparing functional electrical stimulation therapy to conventional therapy in incomplete tetraplegia. Frontiers in rehabilitation sciences 3: 995244	- Country Study conducted in the US.

Study	Reason for exclusion
Andreopoulou, Georgia, Busselli, Giulia, Street, Tamsyn et al. (2024) Is functional electrical stimulation effective in improving walking in adults with lower limb impairment due to an upper motor neuron lesion? An umbrella review. Artificial organs 48(3): 210-231	- Population Systematic review of systematic reviews including participants in protocol (5/24 people with spinal cord injury and 2/24 people with multiple sclerosis), unclear (1/24 people with mixed neurological disorders), and out of protocol (16/24 adults with stroke). Systematic reviews including participants with spinal cord injury, multiple sclerosis, and mixed neurological disorders were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Andreopoulou, Georgia; Mercer, Thomas H; van der Linden, Marietta L (2018) Walking measures to evaluate assistive technology for foot drop in multiple sclerosis: A systematic review of psychometric properties. Gait & posture 61: 55-66	- Publication date Systematic review with 15/41 studies published 2013 onwards, and 26/41 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Andreu-Caravaca, Luis, Ramos-Campo, Domingo J, Chung, Linda H et al. (2022) Can strength training modify voluntary activation, contractile properties and spasticity in Multiple Sclerosis?: A randomized controlled trial. Physiology & behavior 255: 113932	- Intervention Standardised strength training programme, and not individualised exercise programme.
Andreu-Caravaca, Luis, Ramos-Campo, Domingo J, Manonelles, Pedro et al. (2022) The Impact of Resistance Training Program on Static Balance in Multiple Sclerosis Population: A Randomized Controlled Trial Study. Journal of clinical medicine 11(9)	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data not validated scales).
Andrew, D, Haavik, H, Dancey, E et al. (2015) Somatosensory evoked potentials show plastic changes following a novel motor training task with the thumb. Clinical neurophysiology : official journal of the International Federation of Clinical Neurophysiology 126(3): 575-80	- Population People with no known neurological disorders.
Androwis, Ghaith J, Sandroff, Brian M, Niewrzol, Peter et al. (2021) A pilot randomized controlled trial of robotic exoskeleton-assisted exercise rehabilitation in multiple sclerosis. Multiple sclerosis and related disorders 51: 102936	- Country Study conducted in the US.
Arazpour, M, Samadian, M, Ebrahimzadeh, K et al. (2016) The influence of orthosis options on walking parameters in spinal cord-injured patients: a literature review. Spinal cord 54(6): 412-22	- Publication date Systematic review with 5/29 studies published 2013 onwards, and 24/29 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Arcolin, Ilaria, Pisano, Fabrizio, Delconte, Carmen et al. (2016) Intensive cycle ergometer training improves gait speed and endurance in patients with Parkinson's disease: A comparison with treadmill training. Restorative neurology and neuroscience 34(1): 125-38	- Intervention Standardised intensive cycle ergometer training and not an individualised exercise programme.
Armat, Mohammad Reza, Mortazavi, Hamed, Akbari, Hadi et al. (2024) The Effect of Resistance Exercises Using an Elastic Band on Balance and Fear of Falling in Older Adults With Diabetic Peripheral Neuropathy: A 16-week Randomized Controlled Trial. Archives of physical medicine and rehabilitation	- Country Study conducted in Iran.
Arntzen, Ellen Christin, Braaten, Tonje, Fikke, Hanne Kristin et al. (2023) Feasibility of a new intervention addressing group-based balance and high-intensity training, physical activity, and employment in individuals with multiple sclerosis: a pilot randomized controlled trial. Frontiers in rehabilitation sciences 4: 1258737	- Intervention Mixed intervention including components in protocol (balance exercises) and out of protocol (standardised high-intensity training, standardised physical activity, and employment intervention).
Arroyo-Fernandez, Ruben, Menchero-Sanchez, Raquel, Pozuelo-Carrascosa, Diana P et al. (2024) Effectiveness of Body Weight-Supported Gait Training on Gait and Balance for Motor-Incomplete Spinal Cord Injuries: A Systematic Review with Meta-Analysis. Journal of clinical medicine 13(4)	- Country Systematic review with 2/14 of the included studies conducted in Norway, 1/14 in Canada, 1/14 in Spain, 6/14 in the US, 1/14 in Brazil, 1/14 in China, 1/14 in South Korea, and 1/14 in Turkey. Norwegian, Canadian, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ashburn, Ann, Pickering, Ruth, McIntosh, Emma et al. (2019) Exercise- and strategy-based physiotherapy-delivered intervention for preventing repeat falls in people with Parkinson's: the PDSAFE RCT. Health technology assessment (Winchester, England) 23(36): 1-150	- Intervention Falls prevention programme, which is not included in any of the 4 protocol intervention groups.
Atan, Tugba, Ozyemisci Taskiran, Ozden, Bora Tokcaer, Ayse et al. (2019) Effects of different percentages of body weight-supported treadmill training in Parkinson's disease: a double-blind randomized controlled trial. Turkish journal of medical sciences 49(4): 999-1007	- Country Study conducted in Turkey.
Atterbury, Elizabeth Maria and Welman, Karen Estelle (2017) Balance training in individuals with Parkinson's disease: Therapist-	- Country Study conducted in South Africa.

Study	Reason for exclusion
supervised vs. home-based exercise programme. Gait & posture 55: 138-144	
Aulisio, Madeline C; Han, Dong Y; Glueck, Amanda C (2020) Virtual reality gaming as a neurorehabilitation tool for brain injuries in adults: A systematic review. Brain injury 34(10): 1322-1330	- Publication date Systematic review with 7/12 studies published 2013 onwards, and 5/12 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ayan, C., Varela, S., Vila, M.H. et al. (2016) Treadmill training combined with water and land-based exercise programs: Effects on Parkinson's disease patients. NeuroRehabilitation 39(2): 295-299	- Comparator Combination of hydrotherapy and land-based exercises, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Baeza-Barragan, Maria Rosa, Labajos Manzanares, Maria Teresa, Ruiz Vergara, Carmen et al. (2020) The Use of Virtual Reality Technologies in the Treatment of Duchenne Muscular Dystrophy: Systematic Review. JMIR mHealth and uHealth 8(12): e21576	- Country Systematic review with 1/7 of the included studies conducted in the Netherlands and 6/7 in Brazil. Dutch study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Bai, Xi, Guo, Zhiwei, He, Lin et al. (2019) Different Therapeutic Effects of Transcranial Direct Current Stimulation on Upper and Lower Limb Recovery of Stroke Patients with Motor Dysfunction: A Meta-Analysis. Neural plasticity 2019: 1372138	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Bansi, J, Bloch, W, Gamper, U et al. (2013) Training in MS: influence of two different endurance training protocols (aquatic versus overland) on cytokine and neurotrophin concentrations during three week randomized controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 19(5): 613-21	- Intervention Aquatic cycle ergometer training to improve immune responses, fatigue and cardiorespiratory abilities, and not to address upper limb functioning, stability, and mobility together.
Baque, Emmah, Sakzewski, Leanne, Barber, Lee et al. (2016) Systematic review of physiotherapy interventions to improve gross motor capacity and performance in children and adolescents with an acquired brain injury. Brain injury 30(8): 948-59	- Publication date Systematic review with 2/6 studies published 2013 onwards, and 4/6 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Barbosa, P.Y.I., Falconi, A., D'Alencar, M. et al. (2023) Effects of kinesthetic cues supported by physiotherapist during a motor training intervention with virtual reality-based games on functioning in people with Parkinson's disease: A prospective, single-blinded, parallel-group, randomized clinical trial. medRxiv	- Country Study conducted in Brazil.

Study	Reason for exclusion
Barbuto, Scott; Kuo, Sheng-Han; Stein, Joel (2020) Investigating the Clinical Significance and Research Discrepancies of Balance Training in Degenerative Cerebellar Disease: A Systematic Review. American journal of physical medicine & rehabilitation 99(11): 989-998	- Study design (adults) Systematic review with 6/14 randomised controlled trials, 5/14 non-randomised studies, 2/14 case studies, and 1/14 retrospective cohort studies. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Barbuto, Scott, Kuo, Sheng-Han, Winterbottom, Lauren et al. (2023) Home Aerobic Training for Cerebellar Degenerative Diseases: a Randomized Controlled Trial. Cerebellum (London, England) 22(2): 272-281	- Country Study conducted in the US.
Baroni, Andrea, Magro, Giacomo, Martinuzzi, Carlotta et al. (2022) Combined effects of cerebellar tDCS and task-oriented circuit training in people with multiple sclerosis: A pilot randomized control trial. Restorative neurology and neuroscience 40(2): 85-95	- Intervention Electrical neuromodulation (transcranial direct current stimulation) to address mobility and stability only, and not to address upper limb functioning, stability, and mobility together.
Barry, Gillian; Galna, Brook; Rochester, Lynn (2014) The role of exergaming in Parkinson's disease rehabilitation: a systematic review of the evidence. Journal of neuroengineering and rehabilitation 11: 33	- Publication date Systematic review with 2/7 studies published 2013 onwards, and 5/7 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Baur, K., Schattin, A., De Bruin, E.D. et al. (2018) Trends in robot-assisted and virtual reality-assisted neuromuscular therapy: A systematic review of health-related multiplayer games. Journal of NeuroEngineering and Rehabilitation 15(1): 107	- Study design (adults) Systematic review with 3/13 randomised controlled trials, 7/13 non-comparative studies, and 1/13 non-randomised controlled trial. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Bayraktar, Handan E N, Yalcin, Elif, Sipal, Meric S et al. (2024) The effect of electromyography triggered electrical stimulation to abdominal muscles on sitting balance, respiratory functions, and abdominal muscle thickness in complete spinal cord injury: a randomized controlled trial. International journal of rehabilitation research. Internationale Zeitschrift fur Rehabilitationsforschung. Revue internationale de recherches de readaptation	- Country Study conducted in Turkey.
Beck, Eric N; Intzandt, Brittany N; Almeida, Quincy J (2018) Can Dual Task Walking Improve in Parkinson's Disease After External Focus of Attention Exercise? A Single Blind	- Intervention External focus of attention before dual-task walking, not dual-task training.

Study	Reason for exclusion
Randomized Controlled Trial. Neurorehabilitation and neural repair 32(1): 18-33	
Behrouz Jazi, AH; Rasti, J; Etemadifar, M (2023) Balance rehabilitation for patients with Multiple Sclerosis using a Kinect®-based virtual training program. Journal of clinical neuroscience 116: 104-111	- Country Study conducted in Iran.
Bekhet, Amira Hassan, Bochkezanian, Vanesa, Saab, Ibtissam M et al. (2019) The Effects of Electrical Stimulation Parameters in Managing Spasticity After Spinal Cord Injury: A Systematic Review. American journal of physical medicine & rehabilitation 98(6): 484-499	- Publication date Systematic review with 8/23 studies published 2013 onwards, and 15/23 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Bekkers, Esther M J, Mirelman, Anat, Alcock, Lisa et al. (2020) Do Patients With Parkinson's Disease With Freezing of Gait Respond Differently Than Those Without to Treadmill Training Augmented by Virtual Reality?. Neurorehabilitation and neural repair 34(5): 440-449	- Intervention Virtual reality to address stability and mobility only, and not upper limb functioning, stability, and mobility together.
Benussi, Alberto, Koch, Giacomo, Cotelli, Maria et al. (2015) Cerebellar transcranial direct current stimulation in patients with ataxia: A double-blind, randomized, sham-controlled study. Movement disorders : official journal of the Movement Disorder Society 30(12): 1701-5	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Beretta, Victor Spiandor, Conceicao, Nubia Ribeiro, Nobrega-Sousa, Priscila et al. (2020) Transcranial direct current stimulation combined with physical or cognitive training in people with Parkinson's disease: a systematic review. Journal of neuroengineering and rehabilitation 17(1): 74	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Beretta, Victor Spiandor, Santos, Paulo Cezar Rocha, Orcioli-Silva, Diego et al. (2022) Transcranial direct current stimulation for balance rehabilitation in neurological disorders: A systematic review and meta-analysis. Ageing research reviews 81: 101736	- Population Systematic review including participants in protocol (10/37 people with Parkinson's disease, 3/37 people with cerebellar ataxia, 1/37 people with leukoaraiosis, 1/37 people with multiple sclerosis and 1/37 people with spinal cord injury), unclear (1/37 people with vestibular dysfunction), and out of protocol (19/37 adults with stroke and 1/37 people with mal de debarquement syndrome). Studies including participants with Parkinson's disease, cerebellar ataxia, leukoaraiosis, multiple sclerosis, spinal cord injury, and vestibular dysfunction were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.

Study	Reason for exclusion
Bertoni, R., Mestanza Mattos, F.G., Porta, M. et al. (2022) Effects of immersive virtual reality on upper limb function in subjects with multiple sclerosis: A cross-over study. Multiple Sclerosis and Related Disorders 65: 104004	- Intervention Virtual reality intervention to address upper limb functioning only and not upper limb functioning, stability, and mobility together.
Bevilacqua, Roberta, Maranesi, Elvira, Riccardi, Giovanni Renato et al. (2019) Non-Immersive Virtual Reality for Rehabilitation of the Older People: A Systematic Review into Efficacy and Effectiveness. Journal of clinical medicine 8(11)	- Population Systematic review including participants in protocol (1/8 people with amyotrophic lateral sclerosis and 1/8 people with Parkinson's disease), and out of protocol (3/8 adults with stroke, 1/18 people with Alzheimer's disease, 1/8 people on haemodialysis, 1/8 older adults at risk of falls). Studies including participants with amyotrophic lateral sclerosis and Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Biebl, J.T., Azqueta-Gavaldon, M., Wania, C. et al. (2022) Resistance Training Combined with Balance or Gait Training for Patients with Parkinson's Disease: A Randomized Controlled Pilot Study. Parkinson's Disease 2022: 9574516	- Comparator Gait resistance training, and not no intervention, waitlist, standard rehabilitation care alone, or ‘usual care’.
Biktimirov, A., Bryukhovetskiy, I., Sharma, A. et al. (2023) Neuromodulation and quality of life for patient with spasticity after spinal cord injury. Int. Rev. Neurobiol. 172: 79-99	- Publication type Book chapter.
Bilek, Furkan, Cetisli-Korkmaz, Nilufer, Ercan, Zubeyde et al. (2022) Aerobic exercise increases irisin serum levels and improves depression and fatigue in patients with relapsing remitting multiple sclerosis: A randomized controlled trial. Multiple sclerosis and related disorders 61: 103742	- Country Study conducted in Turkey.
Bin, Luo, Wang, Xiaoping, Jiatong, Hu et al. (2023) The effect of robot-assisted gait training for patients with spinal cord injury: a systematic review and meta-analysis. Frontiers in neuroscience 17: 1252651	- Country Systematic review with 2/11 of the included studies conducted in Spain, 1/11 Canada, 1/11 in Switzerland, 5/11 in the US, 1/11 in China, and 1/11 in South Korea. Spanish, Canadian, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Binshalan, Tarub; Nair, Krishnan Padmakumari Sivaraman; McNeill, Alisdair (2022) The Effectiveness of Physiotherapy Interventions for Mobility in Severe Multiple Sclerosis: A Systematic Review and Meta-Analysis. Multiple sclerosis international 2022: 2357785	- Publication date Systematic review with 13/25 studies published 2013 onwards, and 12/25 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Bishnoi, Alka, Lee, Rachel, Hu, Yang et al. (2022) Effect of Treadmill	- Population

Study	Reason for exclusion
Training Interventions on Spatiotemporal Gait Parameters in Older Adults with Neurological Disorders: Systematic Review and Meta-Analysis of Randomized Controlled Trials. International journal of environmental research and public health 19(5)	Systematic review including participants in protocol (13/32 people with Parkinson's disease) and out of protocol (19/32 adults with stroke). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Bochkezanian, V., Newton, R.U., Trajano, G.S. et al. (2018) Effect of tendon vibration during wide-pulse neuromuscular electrical stimulation (NMES) on muscle force production in people with spinal cord injury (SCI). BMC Neurology 18(1): 17	- Study design (adults) No comparator group, so not a randomised controlled trial.
Boes, Morgan K, Bollaert, Rachel E, Kesler, Richard M et al. (2018) Six-Minute Walk Test Performance in Persons With Multiple Sclerosis While Using Passive or Powered Ankle-Foot Orthoses. Archives of physical medicine and rehabilitation 99(3): 484-490	- Country Study conducted in the US.
Bonnechere, Bruno, Jansen, Bart, Omelina, Lubos et al. (2016) The use of commercial video games in rehabilitation: a systematic review. International journal of rehabilitation research. Internationale Zeitschrift fur Rehabilitationsforschung. Revue internationale de recherches de readaptation 39(4): 277-290	- Publication date Systematic review with 75/126 studies published 2013 onwards, and 51/126 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Bonni, Sonia, Ponzo, Viviana, Tramontano, Marco et al. (2019) Neurophysiological and clinical effects of blindfolded balance training (BBT) in Parkinson's disease patients: a preliminary study. European journal of physical and rehabilitation medicine 55(2): 176-182	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data not validated scales) and neurophysiological functional connectivity.
Bonzano, Laura, Pedulla, Ludovico, Tacchino, Andrea et al. (2019) Upper limb motor training based on task-oriented exercises induces functional brain reorganization in patients with multiple sclerosis. Neuroscience 410: 150-159	- Intervention Active task-oriented muscle training to address upper limb functioning, not repetitive task training.
Bowman, Thomas, Gervasoni, Elisa, Amico, Angelo P et al. (2021) What is the impact of robotic rehabilitation on balance and gait outcomes in people with multiple sclerosis? A systematic review of randomized control trials. European journal of physical and rehabilitation medicine 57(2): 246-253	- Publication date Systematic review with 8/12 studies published 2013 onwards, and 4/12 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Bowman, Thomas, Gervasoni, Elisa, Arienti, Chiara et al. (2021) Wearable Devices for Biofeedback Rehabilitation: A Systematic Review and Meta-Analysis to Design Application Rules and Estimate the Effectiveness on Balance and Gait Outcomes in Neurological Diseases. Sensors (Basel, Switzerland) 21(10)	- Population Systematic review including participants in protocol (5/19 people with Parkinson's disease), unclear (1/19 people with Parkinson's disease and adults with stroke), and out of protocol (12/19 adults with stroke and 1/19 people with mild cognitive impairment). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Braendvik, Siri Merete, Koret, Teija, Helbostad, Jorunn L et al. (2016) Treadmill Training or Progressive Strength Training to Improve Walking in People with Multiple Sclerosis? A Randomized Parallel Group Trial. Physiotherapy research international : the journal for researchers and clinicians in physical therapy 21(4): 228-236	- Comparator Strength training and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Brandin-De la Cruz, N., Secorro, N., Calvo, S. et al. (2020) Immersive virtual reality and antigravity treadmill training for gait rehabilitation in Parkinson's disease: a pilot and feasibility study. Revista de Neurologia 71(12): 447-454	- Study design (adults) No comparator group, so not a randomised controlled trial.
Brayall, P., Donlon, E., Doyle, L. et al. (2018) Physical Therapy-Based Interventions Improve Balance, Function, Symptoms, and Quality of Life in Patients with Chemotherapy-Induced Peripheral Neuropathy: A Systematic Review. Rehabilitation Oncology 36(3): 161-166	- Study design (adults) Systematic review with 2/5 randomised controlled trials and 3/5 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Braz de Oliveira, Marcos Paulo, Rigo Lima, Carla, da Silva, Silvia Lanziotti Azevedo et al. (2024) Effect of aquatic exercise programs according to the International Classification of Functionality, Disability and Health domains in individuals with Parkinson's disease: a systematic review and meta-analysis with GRADE quality assessment. Disability and rehabilitation 46(3): 429-442	- Intervention Systematic review investigating hydrotherapy to address stability and mobility only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Brincks, John, Dalgas, Ulrik, Franzen, Erika et al. (2023) Unwrapping the "black box" of balance training in people with multiple sclerosis - A descriptive systematic review of intervention components, progression, and intensity. Multiple sclerosis and related disorders 69: 104412	- Country Systematic review with 12/40 of the included studies conducted in Italy, 3/40 in Sweden, 2/40 in the UK, 1/40 in Australia, 1/40 in Czech Republic, 1/40 in Denmark, 1/40 in Germany, 1/40 in Spain, 6/40 in the US, 4/40 in Turkey, 3/40 in Iran, 2/40 in Egypt, 1/40 in Brazil, 1/40 in Israel, and 1/40 in Jordan. Italian, Swedish, UK, Australian, Czech, Danish, German, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Broeder, Sanne, Heremans, Elke, Pinto Pereira, Marcelo et al. (2019) Does transcranial direct current stimulation during writing alleviate upper limb freezing in people with Parkinson's disease? A pilot study. Human movement science 65	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Broeder, Sanne, Vandendoorent, Britt, Hermans, Pauline et al. (2023) Transcranial direct current stimulation enhances motor learning in Parkinson's disease: a randomized controlled trial. Journal of neurology 270(7): 3442-3450	- Outcomes No relevant outcomes reported. Reports measures of writing and cortical excitability.
Brown, Elena V Donoso, Bleakley, Scott, Vojcsik, Gregory et al. (2020) The effect of a novel thoracolumbar brace on spinal alignment in Parkinson's disease: a pilot study. Journal of physical therapy science 32(1): 72-78	- Country Study conducted in the US.
Bueno, Maria Eduarda Brandao, Silva, Tais Caroline Oliveira da, de Souza, Rogerio Jose et al. (2023) Acute effects of transcranial direct current stimulation combined with physical therapy on the balance and gait in individuals with Parkinson's disease: A randomized controlled trial. Clinical neurology and neurosurgery 226: 107604	- Country Study conducted in Brazil.
Buhagiar, F., Fitzgerald, M., Bell, J. et al. (2020) Neuromodulation for Mild Traumatic Brain Injury Rehabilitation: A Systematic Review. Frontiers in Human Neuroscience 14: 598208	- Study design (adults) Systematic review with 6/14 randomised controlled trials, 4/14 non-controlled studies, 2/14 case reports, and 2/14 case series. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Burns, Anthony S, Marino, Ralph J, Kalsi-Ryan, Sukhvinder et al. (2017) Type and Timing of Rehabilitation Following Acute and Subacute Spinal Cord Injury: A Systematic Review. Global spine journal 7(3suppl): 175s-194s	- Publication date Systematic review with 4/19 studies published 2013 onwards, and 15/19 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Bye, E A, Harvey, L A, Gambhir, A et al. (2017) Strength training for partially paralysed muscles in people with recent spinal cord injury: a within-participant randomised controlled trial. Spinal cord 55(5): 460-465	- Intervention Standardised strength training programme, and not individualised exercise programme.
Byrnes, Keira Leigh and Whillier, Stephney (2019) Effects of Nonpharmaceutical Treatments on Symptom Management in Adults With Mild or Moderate Multiple Sclerosis: A	- Publication date Systematic review with 23/40 studies published 2013 onwardsand 17/40 published pre-2013. Studies published 2013 onwards were checked against protocol criteria - 2

Study	Reason for exclusion
Meta-analysis. Journal of manipulative and physiological therapeutics 42(7): 514-531	were identified as potentially relevant and retrieved for further screening.
Byrnes-Blanco, Laura, Reed, Kyle, Dubey, Rajiv et al. (2023) A systematic literature review of ankle-foot orthosis and functional electrical stimulation foot-drop treatments for persons with multiple sclerosis. Prosthetics and orthotics international 47(4): 358-367	- Study design (adults) Systematic review with 2/17 randomised controlled trials, 6/17 non-comparative studies, 3/17 case series, 3/17 non-randomised controlled trials, 2/17 qualitative studies, and 1/17 cross-sectional study. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cabanas-Valdes, R, Llurda-Almuzara, L, Lopez-de-Celis, C et al. (2022) Does physical activity improve motor function and gait in huntington disease? A systematic review and meta-analysis. Revista de neurologia 74(12): 392-402	- Intervention Systematic review with studies investigating standardised physical activity programmes. No studies checked against protocol criteria as did not include studies investigating individualised exercise programmes.
Calabro, R.S., Naro, A., Russo, M. et al. (2017) Is two better than one? Muscle vibration plus robotic rehabilitation to improve upper limb spasticity and function: A pilot randomized controlled trial. PLoS ONE 12(10): e0185936	- Population Adult stroke survivors. Not relevant according to protocol population criteria.
Calabro, Rocco S, Cassio, Anna, Mazzoli, Davide et al. (2021) What does evidence tell us about the use of gait robotic devices in patients with multiple sclerosis? A comprehensive systematic review on functional outcomes and clinical recommendations. European journal of physical and rehabilitation medicine 57(5): 841-849	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Calabro, Rocco Salvatore, Bonanno, Mirjam, Torregrossa, William et al. (2023) Benefits of Telerehabilitation for Patients With Severe Acquired Brain Injury: Promising Results From a Multicenter Randomized Controlled Trial Using Nonimmersive Virtual Reality. Journal of medical Internet research 25: e45458	- Population Mixed population including participants in protocol (12/40 people with traumatic brain injury) and out of protocol (28/40 adults with stroke [reported as vascular aetiology]). Results not presented separately for target population.
Calabro, Rocco Salvatore, Russo, Margherita, Naro, Antonino et al. (2017) Robotic gait training in multiple sclerosis rehabilitation: Can virtual reality make the difference? Findings from a randomized controlled trial. Journal of the neurological sciences 377: 25-30	- Intervention Virtual reality to address mobility only and not upper limb functioning, stability, and mobility together.
Calafiore, Dario, Invernizzi, Marco, Ammendolia, Antonio et al. (2021) Efficacy of Virtual Reality and Exergaming in Improving Balance in	- Country Systematic review with 2/7 of the included studies conducted in Spain, 1/7 in Italy, 1/7 in Hungary, 1/7 in Jordan, 1/7 in Iran, and 1/7 in Israel. Spanish, Italian, and

Study	Reason for exclusion
Patients With Multiple Sclerosis: A Systematic Review and Meta-Analysis. Frontiers in neurology 12: 773459	Hungarian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Calderone, Andrea, Carta, Diamante, Cardile, Davide et al. (2023) Use of Virtual Reality in Patients with Acquired Brain Injury: A Systematic Review. Journal of clinical medicine 12(24)	- Study design (adults) Systematic review with 6/13 randomised controlled trials and 7/13 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Callesen, Jacob, Cattaneo, Davide, Brincks, John et al. (2020) How do resistance training and balance and motor control training affect gait performance and fatigue impact in people with multiple sclerosis? A randomized controlled multi-center study. Multiple sclerosis (Houndmills, Basingstoke, England) 26(11): 1420-1432	- Intervention Resistance training plus balance and motor control training intervention to address gait and fatigue, and not: 1. Balance exercises to address stability. 2. Gait training to address mobility. 3. Dual task training to address upper limb functioning, stability and mobility together. 4. Sensorimotor exercises to address upper limb functioning, stability and mobility together.
Cammisuli, Sharon, Cavazzi, Enrico, Baldissarro, Eleonora et al. (2016) Rehabilitation of balance disturbances due to chemotherapy-induced peripheral neuropathy: a pilot study. European journal of physical and rehabilitation medicine 52(4): 479-88	- Study design (adults) Non-randomised controlled trial.
Campbell, Evan, Coulter, Elaine H, Mattison, Paul G et al. (2016) Physiotherapy Rehabilitation for People With Progressive Multiple Sclerosis: A Systematic Review. Archives of physical medicine and rehabilitation 97(1): 141-51e3	- Publication date Systematic review with 4/13 studies published 2013 onwards, and 9/13 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Canning, Colleen G, Sherrington, Catherine, Lord, Stephen R et al. (2015) Exercise for falls prevention in Parkinson disease: a randomized controlled trial. Neurology 84(3): 304-12	- Intervention Falls prevention intervention, which is not included in any of the 4 protocol intervention groups.
Cano Porras, Desiderio, Siemonsma, Petra, Inzelberg, Rivka et al. (2018) Advantages of virtual reality in the rehabilitation of balance and gait: Systematic review. Neurology 90(22): 1017-1025	- Population Systematic review including participants in protocol (18/97 people with Parkinson's disease, 11/97 people with multiple sclerosis, and 6/97 people with traumatic brain injury), and out of protocol (46/97 adults with stroke and 16/97 people with cerebral palsy). Studies including participants with Parkinson's disease, multiple sclerosis and traumatic brain injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cano-de-la-Cuerda, Roberto, Blazquez-Fernandez, Aitor, Marcos-Anton, Selena et al. (2024) Economic Cost of Rehabilitation with Robotic and Virtual Reality Systems in People with Neurological Disorders: A	- Population Systematic review including participants in protocol (1/15 people with multiple sclerosis and 1/15 people with spinal cord injury) and out of protocol (12/15 adults with stroke and 1/15 people with cerebral palsy). Studies including participants with multiple sclerosis and spinal cord injury

Study	Reason for exclusion
Systematic Review. Journal of clinical medicine 13(6)	were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Capato, Tamine T C, de Vries, Nienke M, IntHout, Joanna et al. (2020) Multimodal Balance Training Supported by Rhythmical Auditory Stimuli in Parkinson's Disease: A Randomized Clinical Trial. Journal of Parkinson's disease 10(1): 333-346	- Country Study conducted in Brazil.
Capato, Tamine T C, de Vries, Nienke M, IntHout, Joanna et al. (2020) Multimodal Balance Training Supported by Rhythmic Auditory Stimuli in Parkinson Disease: Effects in Freezers and Nonfreezers. Physical therapy 100(11): 2023-2034	- Country Study conducted in Brazil.
Capato, Tamine T C, Nonnekes, Jorik, de Vries, Nienke M et al. (2020) Effects of multimodal balance training supported by rhythmical auditory stimuli in people with advanced stages of Parkinson's disease: a pilot randomized clinical trial. Journal of the neurological sciences 418: 117086	- Country Study conducted in Brazil.
Capodaglio, Edda Maria; Cavalagli, Angela; Panigazzi, Monica (2022) Exergame for the functional rehabilitation of adults over 55 with neurological diseases. Giornale italiano di medicina del lavoro ed ergonomia 44(1): 59-76	- Paper unavailable
Carling, Anna, Forsberg, Anette, Gunnarsson, Martin et al. (2017) CoDuSe group exercise programme improves balance and reduces falls in people with multiple sclerosis: A multi-centre, randomized, controlled pilot study. Multiple sclerosis (Houndmills, Basingstoke, England) 23(10): 1394-1404	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Carlson, H.L., Ciechanski, P., Harris, A.D. et al. (2018) Changes in spectroscopic biomarkers after transcranial direct current stimulation in children with perinatal stroke. Brain Stimulation 11(1): 94-103	- Outcomes Outcome of interest (functioning) only reported for complete experimental sample rather than separately for intervention and control groups, so unable to perform comparative analysis.
Carmignano, Simona Maria, Fundaro, Cira, Bonaiuti, Donatella et al. (2022) Robot-assisted gait training in patients with Parkinson's disease: Implications for clinical practice. A systematic review. NeuroRehabilitation 51(4): 649-663	- Study design (adults) Systematic review with 9/20 randomised controlled trials, 2/20 systematic reviews, 4/20 case series, 4/20 non-comparative studies, and 1/20 non-randomised controlled trial. Randomised controlled trials and systematic reviews were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Carpinella, Ilaria, Cattaneo, Davide, Bonora, Gianluca et al. (2017) Wearable Sensor-Based Biofeedback Training for Balance and Gait in Parkinson Disease: A Pilot Randomized Controlled Trial. Archives of physical medicine and rehabilitation 98(4): 622-630e3	- Intervention Whole-body wearable biofeedback training for balance and gait, and not upper limb functioning, stability, and mobility together.
Carroll, Louise M, Morris, Meg E, O'Connor, William T et al. (2020) Is Aquatic Therapy Optimally Prescribed for Parkinson's Disease? A Systematic Review and Meta-Analysis. Journal of Parkinson's disease 10(1): 59-76	- Intervention Systematic review investigating hydrotherapy to address any of gait, balance, upper limb functioning, falls, transfers, or pain, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Carroll, Louise M, Volpe, Daniele, Morris, Meg E et al. (2017) Aquatic Exercise Therapy for People With Parkinson Disease: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 98(4): 631-638	- Intervention Hydrotherapy to address mobility only, and not to address upper limb functioning, stability and mobility together.
Carswell, Caitlin and Rea, Paul M (2021) What the Tech? The Management of Neurological Dysfunction Through the Use of Digital Technology. Advances in experimental medicine and biology 1317: 131-145	- Publication type Book chapter.
Carvalho, Alessandro, Barbirato, Dannyel, Araujo, Narahyana et al. (2015) Comparison of strength training, aerobic training, and additional physical therapy as supplementary treatments for Parkinson's disease: pilot study. Clinical interventions in aging 10: 183-91	- Country Study conducted in Brazil.
Cassani, Raymundo, Novak, Guilherme S, Falk, Tiago H et al. (2020) Virtual reality and non-invasive brain stimulation for rehabilitation applications: a systematic review. Journal of neuroengineering and rehabilitation 17(1): 147	- Population Systematic review including participants in protocol (1/16 people with multiple sclerosis) and out of protocol (7/16 adults with stroke, 3/16 people with cerebral palsy, 3/16 people with phobias and post-traumatic stress disorder, and 2/16 people with neuropathic pain). Study including participants with multiple sclerosis was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Castellano-Aguilera, Ana, Bivia-Roig, Gemma, Cuenca-Martinez, Ferran et al. (2022) Effectiveness of Virtual Reality on Balance and Risk of Falls in People with Multiple Sclerosis: A Systematic Review and Meta-Analysis. International journal of	- Intervention Systematic review investigating virtual reality to address balance and falls risk, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
environmental research and public health 19(21)	
Castelli, Enrico, Beretta, Elena, De Tanti, Antonio et al. (2022) Robot-assisted rehabilitation for children with neurological disabilities: Results of the Italian consensus conference CICERONE. NeuroRehabilitation 51(4): 665-679	- Study design (CYP) Systematic review with 12/60 randomised controlled trials, 8/60 cohort studies, 4/60 systematic reviews, 30/60 case-control or case series, 5/60 expert opinions or descriptive studies, and 1/60 observational study. Randomised controlled trials, systematic reviews, and cohort studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Casuso-Holgado, Maria Jesus, Martin-Valero, Rocio, Carazo, Ana F et al. (2018) Effectiveness of virtual reality training for balance and gait rehabilitation in people with multiple sclerosis: a systematic review and meta-analysis. Clinical rehabilitation 32(9): 1220-1234	- Intervention Systematic review investigating virtual reality to address stability and mobility only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Cetin, Baris; Kilinc, Muhammed; Cakmakli, Gul Yalcin (2024) The effects of exergames on upper extremity performance, trunk mobility, gait, balance, and cognition in Parkinson's disease: a randomized controlled study. Acta neurologica Belgica	- Country Study conducted in Turkey.
Chandrashekhar, Raghuveer, Wang, Hongwu, Dionne, Carol et al. (2021) Wearable Focal Muscle Vibration on Pain, Balance, Mobility, and Sensation in Individuals with Diabetic Peripheral Neuropathy: A Pilot Study. International journal of environmental research and public health 18(5)	- Country Study conducted in the US.
Chang, Hongbin; Song, Yang; Cen, Xuanzhen (2022) Effectiveness of Augmented Reality for Lower Limb Rehabilitation: A Systematic Review. Applied bionics and biomechanics 2022: 4047845	- Population Systematic review including participants in protocol (3/16 people with Parkinson's disease) and out of protocol (6/16 adults with stroke and 7/16 older adults). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Chang, Shuo-Hsiu, Afzal, Taimoor, Berliner, Jeffrey et al. (2018) Exoskeleton-assisted gait training to improve gait in individuals with spinal cord injury: a pilot randomized study. Pilot and feasibility studies 4: 62	- Country Study conducted in the US.
Chang, Won Hyuk, Kim, Min Soo, Park, Eunhee et al. (2017) Effect of Dual-Mode and Dual-Site Noninvasive Brain Stimulation on Freezing of Gait in Patients With Parkinson Disease. Archives of physical medicine and rehabilitation 98(7): 1283-1290	- Country Study conducted in South Korea.

Study	Reason for exclusion
Chau, Brian; Humbert, Sarah; Shou, Aaron (2021) Systemic Literature Review of the Use of Virtual Reality for Rehabilitation in Parkinson Disease. Federal practitioner : for the health care professionals of the VA, DoD, and PHS 38(suppl1): 20-s27	- Study design (adults) Systematic review with 15/28 randomised controlled trials, 7/28 non-randomised controlled trials, 5/28 non-controlled studies, and 1/28 retrospective cohort. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Chen, J., Jin, Z., Yao, J. et al. (2020) Influence of the intelligent standing mobile robot on lower extremity physiology of complete spinal cord injury patients. Medicine in Novel Technology and Devices 7: 100045	- Country Study conducted in China.
Chen, J.; Xie, Z.; Or, C. (2021) Effectiveness of immersive virtual reality-supported interventions for patients with disorders or impairments: a systematic review and meta-analysis. Health and Technology 11(4): 811-833	- Population Systematic review including participants out of protocol (40/52 people with anxiety, 3/52 adults with stroke, 3/52 people with psychotic disorders, 2/52 people with amblyopia, 2/52 people with mild cognitive impairment, and 2/52 people with unilateral vestibular hypofunction). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Chen, J.L., Schipani, A., Schuch, C.P. et al. (2021) Does Cathodal vs. Sham Transcranial Direct Current Stimulation Over Contralesional Motor Cortex Enhance Upper Limb Motor Recovery Post-stroke? A Systematic Review and Meta-analysis. Frontiers in Neurology 12: 626021	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Chen, Janini, Chien, Hsin Fen, Francato, Debora Cristina Valente et al. (2021) Effects of resistance training on postural control in Parkinson's disease: a randomized controlled trial. Arquivos de neuro-psiquiatria	- Country Study conducted in Brazil.
Chen, Jian-Min, Li, Xiao-Lu, Pan, Qin-He et al. (2023) Effects of non-invasive brain stimulation on motor function after spinal cord injury: a systematic review and meta-analysis. Journal of neuroengineering and rehabilitation 20(1): 3	- Country Systematic review with 4/14 of the included studies conducted in Spain, 2/14 in Austria, 1/14 in Denmark, 1/14 in Finland, 1/14 in the UK, and 5/14 in the US. Spanish, Austrian, Danish, Finnish, and the UK were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Chen, Yi, Gao, Qiang, He, Cheng-Qi et al. (2020) Effect of Virtual Reality on Balance in Individuals With Parkinson Disease: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Physical therapy 100(6): 933-945	- Country Systematic review with 1/14 of the included studies conducted in Australia, 1/14 in Hungary, 1/14 in Italy, 1/14 in The Netherlands, 5/12 in Taiwan, 2/14 in Brazil, 2/14 in Hong Kong, and 1/14 in South Korea. Australian, Hungarian, Italian, and Dutch were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Chen, Yu-An, Wu, Ruey-Meei, Sheu, Chen-Hsing et al. (2023) Attentional focus effect on dual-task walking in	- Country Study conducted in Taiwan.

Study	Reason for exclusion
Parkinson's disease with and without freezing of gait. GeroScience 45(1): 177-195	
Chen, Z., Wang, C., Fan, W. et al. (2020) Robot-Assisted Arm Training versus Therapist-Mediated Training after Stroke: A systematic review and meta-analysis. Journal of Healthcare Engineering 2020: 8810867	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Cheng, F.-Y., Yang, Y.-R., Wu, Y.-R. et al. (2017) Effects of curved-walking training on curved-walking performance and freezing of gait in individuals with Parkinson's disease: A randomized controlled trial. Parkinsonism and Related Disorders 43: 20-26	- Country Study conducted in Taiwan.
Cheng, Fang-Yu, Yang, Yea-Ru, Chen, Li-Mei et al. (2016) Positive Effects of Specific Exercise and Novel Turning-based Treadmill Training on Turning Performance in Individuals with Parkinson's disease: A Randomized Controlled Trial. Scientific reports 6: 33242	- Country Study conducted in Taiwan.
Cheung, Eddy Y Y, Ng, Thomas K W, Yu, Kevin K K et al. (2017) Robot-Assisted Training for People With Spinal Cord Injury: A Meta-Analysis. Archives of physical medicine and rehabilitation 98(11): 2320-2331e12	- Publication date Systematic review with 6/11 studies published 2013 onwards, and 5/11 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cheung, Eddy Yu Yeung, Yu, Kevin Ka Ki, Kwan, Rachel Lai Chu et al. (2019) Effect of EMG-biofeedback robotic-assisted body weight supported treadmill training on walking ability and cardiopulmonary function on people with subacute spinal cord injuries - a randomized controlled trial. BMC neurology 19(1): 140	- Country Study conducted in Hong Kong.
Chhatbar, Pratik Y, Ramakrishnan, Viswanathan, Kautz, Steven et al. (2016) Transcranial direct current stimulation post-stroke upper extremity motor recovery studies exhibit a dose-response relationship. Brain Stimulation 9(1): 16-26	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Childs, Daniel S, Le-Rademacher, Jennifer G, McMurray, Ryan et al. (2021) Randomized Trial of Scrambler Therapy for Chemotherapy-Induced Peripheral Neuropathy: Crossover Analysis. Journal of pain and symptom management 61(6): 1247-1253	- Country Study conducted in the US.

Study	Reason for exclusion
Chivers Seymour, Kim, Pickering, Ruth, Rochester, Lynn et al. (2019) Multicentre, randomised controlled trial of PDSAFE, a physiotherapist-delivered fall prevention programme for people with Parkinson's. Journal of neurology, neurosurgery, and psychiatry 90(7): 774-782	- Intervention Falls prevention programme, not a protocol intervention for mobility, stability or upper limb functioning.
Choi, Ja Young, Yi, Sook-Hee, Ao, Lijuan et al. (2021) Virtual reality rehabilitation in children with brain injury: a randomized controlled trial. Developmental medicine and child neurology 63(4): 480-487	- Country Study conducted in South Korea.
Choi, Ja Young, Yi, Sook-Hee, Shim, Dain et al. (2023) Home-based virtual reality-enhanced upper limb training system in children with brain injury: a randomized controlled trial. Frontiers in pediatrics 11: 1131573	- Country Study conducted in South Korea.
Chou, Raymond C; Taylor, J Andrew; Solinsky, Ryan (2020) Effects of hybrid-functional electrical stimulation (FES) rowing whole-body exercise on neurologic improvement in subacute spinal cord injury: secondary outcomes analysis of a randomized controlled trial. Spinal cord 58(8): 914-920	- Country Study conducted in the US.
Chow, A.-M.D., Shin, J., Wang, H. et al. (2022) Influence of Transcranial Direct Current Stimulation Dosage and Associated Therapy on Motor Recovery Post-stroke: A Systematic Review and Meta-Analysis. Frontiers in Aging Neuroscience 14: 821915	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Chuang, Chieh-Sen, Chen, Yen-Wen, Zeng, Bing-Yan et al. (2022) Effects of modern technology (exergame and virtual reality) assisted rehabilitation vs conventional rehabilitation in patients with Parkinson's disease: a network meta-analysis of randomised controlled trials. Physiotherapy 117: 35-42	- Country Systematic review with 2/23 of the included studies conducted in Australia, 2/23 in Italy, 1/23 in the Netherlands, 1/23 in multi-high-income European countries and Israel, 6/23 in Taiwan, 5/23 in Brazil, 4/23 in China, and 2/23 in South Korea. Australian, Italian, Dutch, and multiple country studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cikajlo, Imre and Peterlin Potisk, Karmen (2019) Advantages of using 3D virtual reality based training in persons with Parkinson's disease: a parallel study. Journal of neuroengineering and rehabilitation 16(1): 119	- Intervention Exergaming and virtual reality intervention to address upper limb functioning only, and not upper limb functioning, stability, and mobility together.
Claesson, I.M., Stahle, A., Lokk, J. et al. (2018) Somatosensory Focused Balance Training without cues can improve balance and gait in early	- Outcomes Data only reported for complete experimental sample rather than separately for intervention and control groups , so unable to perform comparative analysis.

Study	Reason for exclusion
Parkinson's disease-a randomised pilot study. European Journal of Physiotherapy 20(2): 67-73	
Clerici, Ilaria, Maestri, Roberto, Bonetti, Francesca et al. (2019) Land Plus Aquatic Therapy Versus Land-Based Rehabilitation Alone for the Treatment of Freezing of Gait in Parkinson Disease: A Randomized Controlled Trial. Physical therapy 99(5): 591-600	- Comparator High-intensity, multidisciplinary, aerobic, motor-cognitive, intensive, goal-based inpatient rehabilitation, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Coelho, Daniel Boari, de Oliveira, Claudia Eunice Neves, Guimaraes, Marcos Vinicius Carvalho et al. (2022) A systematic review on the effectiveness of perturbation-based balance training in postural control and gait in Parkinson's disease. Physiotherapy 116: 58-71	- Publication date Systematic review with 5/11 studies published 2013 onwards, and 6/11 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Comemale, E. (2022) Guidelines of Physical Activity in Central Neurology: Which dosage for which effect ? A systematic review of the literature. Kinesitherapie 22(247): 18-33	- Other protocol criteria French language article.
Conceicao, Nubia Ribeiro, Gobbi, Lilian Teresa Bucken, Nobrega-Sousa, Priscila et al. (2021) Aerobic Exercise Combined With Transcranial Direct Current Stimulation Over the Prefrontal Cortex in Parkinson Disease: Effects on Cortical Activity, Gait, and Cognition. Neurorehabilitation and neural repair 35(8): 717-728	- Country Study conducted in Brazil.
Conde, Rodrigo Melo, Senem, Iara, Dos Santos, Marcia et al. (2023) Effectiveness of exercise therapy for individuals diagnosed with Charcot-Marie-Tooth disease: A systematic review of randomized clinical trials. Journal of the peripheral nervous system : JPNS 28(2): 169-178	- Publication date Systematic review with 4/8 studies published 2013 onwards, and 4/8 published pre-2013. Studies published 2013 onwards were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Contreras-Vidal, J.L., Bhagat, N.A., Brantley, J. et al. (2016) Powered exoskeletons for bipedal locomotion after spinal cord injury. Journal of Neural Engineering 13(3): 031001	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Copley, Jodie, Kuipers, Kathy, Fleming, Jenny et al. (2013) Individualised resting hand splints for adults with acquired brain injury: a randomized, single blinded, single case design. NeuroRehabilitation 32(4): 885-98	- Population Mix of participants in protocol (2/10 people with traumatic brain injury, 1/10 person with aneurysm, and 1/10 person with intra-ventricular haemorrhage) and out of protocol (6/10 adults with stroke). Results not presented separately for target population.

Study	Reason for exclusion
Corbianco, Silvia, Cavallini, Gabriella, Dini, Marco et al. (2021) Energy cost and psychological impact of robotic-assisted gait training in people with spinal cord injury: effect of two different types of devices. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology 42(8): 3357-3366	- Outcomes Outcome of interest (respiratory functioning [VO2max]) data presented graphically and cannot be extracted for analysis.
Corrini, Chiara, Gervasoni, Elisa, Perini, Gloria et al. (2023) Mobility and balance rehabilitation in multiple sclerosis: A systematic review and dose-response meta-analysis. Multiple sclerosis and related disorders 69: 104424	- Country Systematic review with 11/71 of the included studies conducted in Italy, 3/71 in Czech Republic, 3/71 in Germany, 3/71 in Sweden, 3/71 in the UK, 2/71 in Spain, 1/71 in Australia, 1/71 in Austria, 1/71 in Belgium, 1/71 in Denmark, 1/71 in Ireland, 1/71 in Norway, 13/71 in Turkey, 11/71 in the US, 10/71 in Iran, 2/71 in Brazil, 2/71 in Israel, 1/71 in Egypt, and 1/71 in Jordan. Spanish, Austrian, Danish, Finnish, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cortes, Mar, Medeiros, Ana Heloisa, Gandhi, Aasta et al. (2017) Improved grasp function with transcranial direct current stimulation in chronic spinal cord injury. NeuroRehabilitation 41(1): 51-59	- Country Study conducted in the US.
Cortes-Perez, Irene, Osuna-Perez, Maria Catalina, Montoro-Cardenas, Desiree et al. (2023) Virtual reality-based therapy improves balance and reduces fear of falling in patients with multiple sclerosis. a systematic review and meta-analysis of randomized controlled trials. Journal of neuroengineering and rehabilitation 20(1): 42	- Country Systematic review with 6/19 of the included studies conducted in Italy, 2/19 in Spain, 2/19 in the UK, 1/19 in Hungary, 1/19 in Sweden, 3/19 in Turkey, 2/19 in Iran, 1/19 in Israel, and 1/19 in Jordan. Italian, Spanish, Hungarian, Swedish, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cortes-Perez, Irene, Sanchez-Alcala, Marcelina, Nieto-Escamez, Francisco Antonio et al. (2021) Virtual Reality-Based Therapy Improves Fatigue, Impact, and Quality of Life in Patients with Multiple Sclerosis. A Systematic Review with a Meta-Analysis. Sensors (Basel, Switzerland) 21(21)	- Country Systematic review with 3/12 of the included studies conducted in Italy, 2/12 in the UK, 1/12 in France, 1/12 in Hungary, 1/12 in Spain, 3/12 in Turkey, and 1/12 in Jordan. Italian, UK, French, Hungarian, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cortes-Perez, Irene, Zagalaz-Anula, Noelia, Montoro-Cardenas, Desiree et al. (2021) Leap Motion Controller Video Game-Based Therapy for Upper Extremity Motor Recovery in Patients with Central Nervous System Diseases. A Systematic Review with Meta-Analysis. Sensors (Basel, Switzerland) 21(6)	- Country Systematic review with 2/5 of the included studies conducted in Spain, 2/5 in Turkey, and 1/5 in China. Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Corvillo, Iluminada, Varela, Enrique, Armijo, Francisco et al. (2017)	- Country

Study	Reason for exclusion
Efficacy of aquatic therapy for multiple sclerosis: a systematic review. European journal of physical and rehabilitation medicine 53(6): 944-952	Systematic review with 2/10 of the included studies conducted in Switzerland, 1/10 in Spain, 5/10 in Iran, 1/10 in Turkey, and 1/10 in the US. Swiss and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Costa-Ribeiro, Adriana, Maux, Ariadne, Bosford, Thamyris et al. (2017) Transcranial direct current stimulation associated with gait training in Parkinson's disease: A pilot randomized clinical trial. Developmental neurorehabilitation 20(3): 121-128	- Country Study conducted in Brazil.
Costa-Ribeiro, Adriana, Maux, Ariadne, Bosford, Thamyris et al. (2016) Dopamine-independent effects of combining transcranial direct current stimulation with cued gait training on cortical excitability and functional mobility in Parkinson's disease. Journal of rehabilitation medicine 48(9): 819-823	- Country Study conducted in Brazil.
Costello, Meredith C, Errante, Emily L, Smartz, Taylor et al. (2023) Clinical applications of electrical stimulation for peripheral nerve injury: a systematic review. Frontiers in neuroscience 17: 1162851	- Publication date Systematic review with 4/7 studies published 2013 onwards, and 3/7 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Craig, Jason, Hilderman, Courtney, Wilson, Geoffrey et al. (2016) Effectiveness of Stretch Interventions for Children With Neuromuscular Disabilities: Evidence-Based Recommendations. Pediatric physical therapy : the official publication of the Section on Pediatrics of the American Physical Therapy Association 28(3): 262-75	- Publication date Systematic review with 4/16 studies published 2013 onwards, and 12/16 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Crytzer, TM; Dicianno, BE; Fairman, AD (2013) Effectiveness of an upper extremity exercise device and text message reminders to exercise in adults with spina bifida: a pilot study. Assistive technology 25(4): 181-193	- Country Study conducted in the US.
Cuesta-Gomez, Alicia, Sanchez-Herrera-Baeza, Patricia, Ona-Simbana, Edwin Daniel et al. (2020) Effects of virtual reality associated with serious games for upper limb rehabilitation inpatients with multiple sclerosis: randomized controlled trial. Journal of neuroengineering and rehabilitation 17(1): 90	- Intervention Virtual reality with leap motion controller intervention to address upper limb functioning only, and not upper limb functioning, stability, and mobility together.
Cugusi, Lucia, Manca, Andrea, Bergamin, Marco et al. (2019) Aquatic	- Country

Study	Reason for exclusion
exercise improves motor impairments in people with Parkinson's disease, with similar or greater benefits than land-based exercise: a systematic review. Journal of physiotherapy 65(2): 65-74	Systematic review with 2/6 of the included studies conducted in Italy, 2/6 in Spain, 1/6 in Iran, and 1/6 in Turkey. Italian and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cugusi, Lucia; Prosperini, Luca; Mura, Gioia (2021) Exergaming for Quality of Life in Persons Living with Chronic Diseases: A Systematic Review and Meta-analysis. PM & R : the journal of injury, function, and rehabilitation 13(7): 756-780	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of health-related quality of life. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cugusi, Lucia, Solla, Paolo, Serpe, Roberto et al. (2015) Effects of a Nordic Walking program on motor and non-motor symptoms, functional performance and body composition in patients with Parkinson's disease. NeuroRehabilitation 37(2): 245-54	- Intervention Standardised Nordic walking exercise programme, and not: 1. Gait training. 2. Individualised exercise programme.
Cumplido-Trasmonte, C, Molina-Rueda, F, Puyuelo-Quintana, G et al. (2023) Satisfaction analysis of overground gait exoskeletons in people with neurological pathology. a systematic review. Journal of neuroengineering and rehabilitation 20(1): 47	- Population Systematic review including participants in protocol (11/23 people with spinal cord injury and 2/23 people with multiple sclerosis), unclear (1/23 people with stroke and multiple sclerosis and 1/23 people with stroke and spinal cord injury), and out of protocol (8/23 adults with stroke). Studies including participants with spinal cord injury and multiple sclerosis were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Cuthbert, Jeffrey P, Staniszewski, Kristi, Hays, Kaitlin et al. (2014) Virtual reality-based therapy for the treatment of balance deficits in patients receiving inpatient rehabilitation for traumatic brain injury. Brain injury 28(2): 181-8	- Country Study conducted in the US.
D'Cruz, Nicholas, Seuthe, Jana, Ginis, Pieter et al. (2020) Short-Term Effects of Single-Session Split-Belt Treadmill Training on Dual-Task Performance in Parkinson's Disease and Healthy Elderly. Frontiers in neurology 11: 560084	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data such as gait speed, stride length, and step width, not measured using validated scales), turning ability, and cognitive tasks.
da Silva, Adriano Zanardi; Iucksch, Dielise Debona; Israel, Vera Lucia (2023) Aquatic Dual-Task Training and Its Relation to Motor Functions, Activities of Daily Living, and Quality of Life of Individuals With Parkinson's Disease: A Randomized Clinical Trial. Health services insights 16: 11786329231180768	- Country Study conducted in Brazil.
Da Silva, Keyte Guedes, Nuvolini, Rosemeyre Alcarde, Bacha, Jessica Maria Ribeiro et al. (2023)	- Country Study conducted in Brazil.

Study	Reason for exclusion
Comparison of the Effects of an Exergame-Based Program with Conventional Physiotherapy Protocol Based on Core Areas of the European Guideline on Postural Control, Functional Mobility, and Quality of Life in Patients with Parkinson's Disease: Randomized Clinical Trial. Games for health journal 12(3): 228-241	
Dai, Shengyu, Yuan, Haoteng, Wang, Jiahui et al. (2023) Effects of aquatic exercise on the improvement of lower-extremity motor function and quality of life in patients with Parkinson's disease: A meta-analysis. Frontiers in physiology 14: 1066718	- Intervention Systematic review investigating hydrotherapy to address lower limb function and quality of life, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Dale, Marian L, Silva-Batista, Carla, de Almeida, Filipe Oliveira et al. (2023) Balance and gait in progressive supranuclear palsy: a narrative review of objective metrics and exercise interventions. Frontiers in neurology 14: 1212185	- Study design (adults) Systematic review including 16/34 cross-sectional studies, 6/34 case studies, 6/34 non-controlled studies, 4/34 observational studies, and 2/34 non-randomised studies. No studies checked against protocol criteria as did not include any randomised controlled trials or systematic reviews.
Dalmazane, Marion, Gallou-Guyot, Matthieu, Compagnat, Maxence et al. (2021) Effects on gait and balance of home-based active video game interventions in persons with multiple sclerosis: A systematic review. Multiple sclerosis and related disorders 51: 102928	- Study design (adults) Systematic review with 4/9 randomised controlled trials, 3/9 non-controlled studies, and 2/9 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Dascal, J., Reid, M., Ishak, W.W. et al. (2017) Virtual reality and medical inpatients: A systematic review of randomized, controlled trials. Innovations in Clinical Neuroscience 14(12): 14-21	- Publication date Systematic review with 1/11 studies published 2013 onwards, and 10/11 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Davies, B.L., Arpin, D.J., Liu, M. et al. (2016) Two Different Types of High-Frequency Physical Therapy Promote Improvements in the Balance and Mobility of Persons With Multiple Sclerosis. Archives of Physical Medicine and Rehabilitation 97(12): 2095-2101e3	- Country Study conducted in the US.
de Albuquerque, Lidio Lima, Pantovic, Milan, Clingo, Mitchell G et al. (2022) Long-Term Application of Cerebellar Transcranial Direct Current Stimulation Does Not Improve Motor Learning in Parkinson's Disease. Cerebellum (London, England) 21(3): 333-349	- Country Study conducted in the US.
De Angelis, Sara, Princi, Alessandro Antonio, Dal Farra, Fulvio et al. (2021) Vibrotactile-Based Rehabilitation on	- Population Systematic review including participants in protocol (5/18 people with Parkinson's disease and 1/18 people with

Study	Reason for exclusion
Balance and Gait in Patients with Neurological Diseases: A Systematic Review and Metanalysis. Brain sciences 11(4)	multiple sclerosis), unclear (4/18 people with Parkinson's disease and healthy participants, 1/18 people with balance disorders, and 1/18 people with Parkinson's disease, older adults at risk of falling, and healthy participants), and out of protocol (5/18 adults with stroke, and 1/18 adults with stroke and healthy participants). Studies including participants with Parkinson's disease and multiple sclerosis were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
de Araujo Morais, Leticia, Cipriano, Gerson Jr, Martins, Wagner Rodrigues et al. (2023) Inspiratory muscle training on quality of life in individuals with spinal cord injury: A systematic review and meta-analysis. Spinal cord 61(7): 359-367	- Study design (adults) Systematic review with 11/25 randomised controlled trials, 12/25 non-controlled studies, and 2/25 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened
de Araujo, Amanda Vitoria Lacerda, Neiva, Jaqueline Freitas de Oliveira, Monteiro, Carlos Bandeira de Mello et al. (2019) Efficacy of Virtual Reality Rehabilitation after Spinal Cord Injury: A Systematic Review. BioMed research international 2019: 7106951	- Study design (adults) Systematic review with 11/25 randomised controlled trials, 12/25 non-controlled studies, and 2/25 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
De Freitas, G.R.; Szpoganicz, C.; Ilha, J. (2018) Does neuromuscular electrical stimulation therapy increase voluntary muscle strength after spinal cord injury? A systematic review. Topics in Spinal Cord Injury Rehabilitation 24(1): 6-17	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
De Freitas, Tatiana Beline MS, PT, Leite, Paulo Henrique Wong BS, Dona, Flavia PhD, PT et al. (2020) The effects of dual task gait and balance training in Parkinson's disease: a systematic review. Physiotherapy theory and practice 36(10): 1088-1096	- Publication date Systematic review with 4/7 studies published 2013 onwards, and 3/7 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
De Icco, R., Putorti, A., Allena, M. et al. (2022) Non-Invasive Neuromodulation in the Rehabilitation of Pisa Syndrome in Parkinson's Disease: A Randomized Controlled Trial. Frontiers in Neurology 13: 849820	- Intervention Non-invasive neuromodulation intervention to address stability, and not: 1. To address upper limb function. 2. To address mobility. 3. To address upper limb functioning, stability, and mobility together.
De Keersmaecker, Emma, Lefeber, Nina, Geys, Marion et al. (2019) Virtual reality during gait training: does it improve gait function in persons with central nervous system movement disorders? A systematic review and meta-analysis. NeuroRehabilitation 44(1): 43-66	- Population Systematic review including participants who are in protocol (4/18 people with multiple sclerosis, 1/18 people with Parkinson's disease, and 1/18 people with traumatic brain injury) and out of protocol (12/18 adults with stroke). Studies including participants with multiple sclerosis, Parkinson's disease, and traumatic brain injury were checked against protocol criteria and were either not

Study	Reason for exclusion
	relevant or had been separately located by the literature search and screened.
De Luca, Rosaria, Latella, Desiree, Maggio, Maria Grazia et al. (2020) Do patients with PD benefit from music assisted therapy plus treadmill-based gait training? An exploratory study focused on behavioral outcomes. The International journal of neuroscience 130(9): 933-940	- Intervention Mixed intervention including components in protocol (treadmill-based gait training) and out of protocol (music assisted therapy).
de Melo, Gileno Edu Lameira, Kleiner, Ana Francisca Rozin, Lopes, Jamile Benite Palma et al. (2018) Effect of virtual reality training on walking distance and physical fitness in individuals with Parkinson's disease. NeuroRehabilitation 42(4): 473-480	- Country Study conducted in Brazil.
de Miguel-Fernandez, Jesus, Lobo-Prat, Joan, Prinsen, Erik et al. (2023) Control strategies used in lower limb exoskeletons for gait rehabilitation after brain injury: a systematic review and analysis of clinical effectiveness. Journal of neuroengineering and rehabilitation 20(1): 23	- Population Systematic review including participants out of protocol (57/73 adults with stoke and 16/73 people with cerebral palsy). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
De Miguel-Rubio, Amaranta, Gallego-Aguayo, Ignacio, De Miguel-Rubio, Maria Dolores et al. (2023) Effectiveness of the Combined Use of a Brain-Machine Interface System and Virtual Reality as a Therapeutic Approach in Patients with Spinal Cord Injury: A Systematic Review. Healthcare (Basel, Switzerland) 11(24)	- Country Systematic review with 1/11 of the included studies conducted in Australia, 1/11 in Canada, 1/11 in Italy, 1/11 in Portugal, 1/11 in Spain, 5/11 in the US, and 1/11 in Brazil. Australian, Canadian, Italian, Portuguese, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
De Miguel-Rubio, Amaranta, Munoz-Perez, Lorena, Alba-Rueda, Alvaro et al. (2022) A Therapeutic Approach Using the Combined Application of Virtual Reality with Robotics for the Treatment of Patients with Spinal Cord Injury: A Systematic Review. International journal of environmental research and public health 19(14)	- Publication date Systematic review with 4/6 studies published 2013 onwards, and 2/6 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
De Miguel-Rubio, Amaranta, Rubio, M Dolores, Salazar, Alejandro et al. (2020) Effectiveness of Virtual Reality on Functional Performance after Spinal Cord Injury: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Journal of clinical medicine 9(7)	- Intervention Systematic review with 1/7 studies investigating virtual reality to address upper limb functioning, stability and mobility together, 4/7 to address upper limb functioning only, and 2/7 to address stability and mobility only. Studies investigating virtual reality to address limb functioning, stability and mobility together were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
de Oliveira Lima, Renata Aparecida, Piemonte, Gabriela Andrade, Nogueira, Celia Regina et al. (2021)	- Country Systematic review with 1/8 of the included studies conducted in Switzerland, 2/8 in India, 2/8 in South Korea,

Study	Reason for exclusion
Efficacy of exercise on balance, fear of falling, and risk of falls in patients with diabetic peripheral neuropathy: a systematic review and meta-analysis. Archives of endocrinology and metabolism 65(2): 198-211	1/8 in Brazil, 1/8 in the US, and 1/8 in the US and Qatar. Swiss study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
de Paz, Ruben Hernandez, Serrano-Munoz, Diego, Perez-Nombela, Soraya et al. (2019) Combining transcranial direct-current stimulation with gait training in patients with neurological disorders: a systematic review. Journal of neuroengineering and rehabilitation 16(1): 114	- Population Systematic review including participants in protocol (2/8 people with Parkinson's disease and 2/8 people with spinal cord injury) and out of protocol (4/8 adults with stroke). Studies including participants with Parkinson's disease and spinal cord injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
de Sousa, Davide G, Harvey, Lisa A, Dorsch, Simone et al. (2016) Functional electrical stimulation cycling does not improve mobility in people with acquired brain injury and its effects on strength are unclear: a randomised trial. Journal of physiotherapy 62(4): 203-8	- Population Mixed population including participants in protocol (7/40 people with traumatic brain injury, 1/40 arteriovenous malformation, and 1/40 cerebral abscess) and out of protocol (31/40 adults with stroke). Results not presented separately for target population.
Deems-Dluhy, Susan, Hoppe-Ludwig, Shenan, Mummidisetty, Chaithanya K et al. (2021) Microprocessor Controlled Knee Ankle Foot Orthosis (KAFO) vs Stance Control vs Locked KAFO: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 102(2): 233-244	- Country Study conducted in the US.
den Brave, Meike, Beaudart, Charlotte, de Noordhout, Benoit Maertens et al. (2023) Effect of robot-assisted gait training on quality of life and depression in neurological impairment: A systematic review and meta-analysis. Clinical rehabilitation 37(7): 876-890	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of quality of life and depressive symptoms. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Di Ludovico, Armando, Ciarelli, Francesca, La Bella, Saverio et al. (2023) The therapeutic effects of physical treatment for patients with hereditary spastic paraplegia: a narrative review. Frontiers in neurology 14: 1292527	- Study design (adults) Non-systematic literature review.
Di Sarno, L, Curatola, A, Cammisa, I et al. (2022) Non-pharmacologic approaches to neurological stimulation in patients with severe brain injuries: a systematic review. European review for medical and pharmacological sciences 26(18): 6856-6870	- Publication date Systematic review with 22/38 studies published 2013 onwards, and 16/38 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Ding, Kan, Tarumi, Takashi, Tomoto, Tsubasa et al. (2021) A proof-of-concept trial of a community-based	- Country Study conducted in the US.

Study	Reason for exclusion
aerobic exercise program for individuals with traumatic brain injury. Brain injury 35(2): 233-240	
Dixit, Snehil; Gular, Kumar; Asiri, Faisal (2020) Effect of diverse physical rehabilitative interventions on static postural control in diabetic peripheral neuropathy: a systematic review. Physiotherapy theory and practice 36(6): 679-690	- Publication date Systematic review with 4/8 studies published 2013 onwards, and 4/8 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Dixit, Snehil and Tedla, Jaya Shanker (2019) Effectiveness of robotics in improving upper extremity functions among people with neurological dysfunction: a systematic review. The International journal of neuroscience 129(4): 369-383	- Population Systematic review including participants in protocol (1/21 people with multiple sclerosis) and out of protocol (19/21 adults with stroke and 1/21 people with cerebral palsy). Study including participants with multiple sclerosis was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Dixon, J., Hatton, A.L., Robinson, J. et al. (2014) Effect of textured insoles on balance and gait in people with multiple sclerosis: An exploratory trial. Physiotherapy (United Kingdom) 100(2): 142-149	- Comparator Same intervention (wearable foot insole) but varied in terms of insole texture, and not timing, frequency, or intensity.
do Espirito Santo, C C, Swarowsky, A, Recchia, T L et al. (2015) Is body weight-support treadmill training effective in increasing muscle trophism after traumatic spinal cord injury? A systematic review. Spinal cord 53(3): 176-181	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Dockx, Kim, Bekkers, Esther Mj, Van den Bergh, Veerle et al. (2016) Virtual reality for rehabilitation in Parkinson's disease. The Cochrane database of systematic reviews 12: cd010760	- Country Systematic review with 1/8 of the included studies conducted in The Netherlands, 3/8 in Taiwan, 2/8 in Brazil, 1/8 in Hong Kong, and 1/8 in South Korea. Dutch study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Dogan, Mert; Ayvat, Ender; Kilinc, Muhammed (2023) Telerehabilitation versus virtual reality supported task-oriented circuit therapy on upper limbs and trunk functions in patients with multiple sclerosis: A randomized controlled study. Multiple sclerosis and related disorders 71: 104558	- Country Study conducted in Turkey.
Donenberg, Jennifer Glenna; Fetters, Linda; Johnson, Robert (2019) The effects of locomotor training in children with spinal cord injury: a systematic review. Developmental neurorehabilitation 22(4): 272-287	- Study design (CYP) Systematic review with 10/12 case studies, 1/12 case series, and 1/12 non-controlled studies. No studies checked against protocol criteria as did not include any randomised controlled trials, non-randomised controlled trials or systematic reviews.
Dong, Mingjie, Zhou, Yu, Li, Jianfeng et al. (2021) State of the art in parallel ankle rehabilitation robot: a systematic review. Journal of	- Study design (adults) Non-systematic literature review.

Study	Reason for exclusion
neuroengineering and rehabilitation 18(1): 52	
Donges, Siobhan C, Boswell-Ruys, Claire L, Butler, Jane E et al. (2019) The effect of paired corticospinal-motoneuronal stimulation on maximal voluntary elbow flexion in cervical spinal cord injury: an experimental study. Spinal cord 57(9): 796-804	- Outcomes No relevant outcomes reported. Reports measures of muscle maximal voluntary contractions, twitch amplitudes, maximal voluntary torque and electromyography.
Du, Yi-Hong, Ma, Jun, Hu, Jing-Yun et al. (2023) Effects of dual-task training on gait and motor ability in patients with Parkinson's disease: A systematic review and meta-analysis. Clinical rehabilitation 37(7): 942-953	- Intervention Systematic review investigating dual-task training to address gait and motor ability, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Duan, Ruimeng, Qu, Mingjia, Yuan, Yashuai et al. (2021) Clinical Benefit of Rehabilitation Training in Spinal Cord Injury: A Systematic Review and Meta-Analysis. Spine 46(6): e398-e410	- Country Study conducted in China.
Duarte, Gabriel Pereira, Ferraz, Daniel Dominguez, Trippo, Karen Valadares et al. (2023) Effects of three physical exercise modalities on respiratory function of older adults with Parkinson's disease: A randomized clinical trial. Journal of bodywork and movement therapies 36: 425-431	- Country Study conducted in Brazil.
Duddy, Damien, Doherty, Ronan, Connolly, James et al. (2021) The Effects of Powered Exoskeleton Gait Training on Cardiovascular Function and Gait Performance: A Systematic Review. Sensors (Basel, Switzerland) 21(9)	- Country Systematic review with 2/23 of the included studies conducted in Canada, 2/23 in Italy, 2/23 in the UK, 1/23 in Australia, 1/23 in multi-high-income European countries, 13/23 in the US, and 2/23 in South Korea. Canadian, Italian, UK, Australian and European studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Dudziec, Magdalena M, Lee, Laurence E, Massey, Charlotte et al. (2024) Home-based multi-sensory and proximal strengthening program to improve balance in Charcot-Marie-Tooth disease Type 1A: A proof of concept study. Muscle & nerve 69(3): 354-361	- Intervention Mixed intervention including components in protocol (multi-sensory balance rehabilitation and proximal strengthening exercises for balance) and out of protocol (self-management).
Duffell, L.D.; Brown, G.L.; Mirbagheri, M.M. (2015) Interventions to Reduce Spasticity and Improve Function in People with Chronic Incomplete Spinal Cord Injury. Neurorehabilitation and Neural Repair 29(6): 566-576	- Country Study conducted in the US.
Duffell, Lynsey D, Niu, Xun, Brown, Geoffrey et al. (2014) Variability in	- Publication type

Study	Reason for exclusion
responsiveness to interventions in people with spinal cord injury: Do some respond better than others?. Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference 2014: 5872-5	Conference abstract.
Duregon, Federica, Vendramin, Barbara, Bullo, Valentina et al. (2018) Effects of exercise on cancer patients suffering chemotherapy-induced peripheral neuropathy undergoing treatment: A systematic review. Critical reviews in oncology/hematology 121: 90-100	- Study design (adults) Systematic review with 2/5 randomised controlled trials and 3/5 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Edwards, Thomas, Motl, Robert W, Sebastiao, Emerson et al. (2018) Pilot randomized controlled trial of functional electrical stimulation cycling exercise in people with multiple sclerosis with mobility disability. Multiple sclerosis and related disorders 26: 103-111	- Country Study conducted in the US.
Edwards, Thomas and Pilutti, Lara A (2017) The effect of exercise training in adults with multiple sclerosis with severe mobility disability: A systematic review and future research directions. Multiple sclerosis and related disorders 16: 31-39	- Publication date Systematic review with 7/18 studies published 2013 onwards, and 11/18 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Eftekhar-Sadat, B., Azizi, R., Aliasgharzadeh, A. et al. (2015) Effect of balance training with Biodex Stability System on balance in diabetic neuropathy. Therapeutic Advances in Endocrinology and Metabolism 6(5): 233-240	- Country Study conducted in Iran.
Eftekharsadat, Bina, Babaei-Ghazani, Arash, Mohammadzadeh, Mehran et al. (2015) Effect of virtual reality-based balance training in multiple sclerosis. Neurological research 37(6): 539-44	- Country Study conducted in Iran.
Ehling, Rainer, Edlinger, Michael, Hermann, Kay et al. (2017) Successful long-term management of spasticity in patients with multiple sclerosis using a software application (APP): A pilot study. Multiple sclerosis and related disorders 17: 15-21	- Intervention Individualised exercise programme delivered via software application to address lower limb and truck coordination only, and not individualised exercise programme to address upper limb functioning, stability, and mobility together.
Eidenberger, Margit and Nowotny, Silvia (2014) Inspiratory muscle training in patients with Amyotrophic Lateral Sclerosis: A systematic	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.

Study	Reason for exclusion
review. NeuroRehabilitation 35(3): 349-61	
El Hayek, M., Lobo Jofili Lopes, J.L.M., Lelaurin, J.H. et al. (2023) Type, Timing, Frequency, and Durability of Outcome of Physical Therapy for Parkinson Disease: A Systematic Review and Meta-Analysis. JAMA Network Open 6(7): e2324860	- Country Systematic review with 19/46 of the included studies conducted in Italy, 3/46 in Spain, 2/46 in Australia, 2/46 in Poland, 2/46 in the UK, 2/46 in multi-high-income European countries, 1/46 in the Netherlands, 5/46 in Brazil, 5/46 in the US, 2/46 in India, 1/46 in China, 1/46 in Israel, and 1/46 in Turkey. Italian, Spanish, Australian, Polish, UK, and European studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening. Note: 15/46 only 32.6%. A further 7 papers can be excluded as published pre-2013, which means systematic review is excluded.
El Semary, M.M. and Daker, L.I. (2019) Influence of percentage of body-weight support on gait in patients with traumatic incomplete spinal cord injury. Egyptian Journal of Neurology, Psychiatry and Neurosurgery 55(1): 1-6	- Country Study conducted in Egypt.
Elbanna, Samar T; Elshennawy, Shorouk; Ayad, M N (2019) Noninvasive Brain Stimulation for Rehabilitation of Pediatric Motor Disorders Following Brain Injury: Systematic Review of Randomized Controlled Trials. Archives of physical medicine and rehabilitation 100(10): 1945-1963	- Population Systematic review including participants in protocol (3/14 children with stroke and 1/14 children with congenital hemiparesis), unclear (1/14 people with quadriplegia) and out of protocol (9/14 people with cerebral palsy). Studies including children with stroke, congenital hemiparesis, and quadriplegia were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Eldemir, Sefa, Guclu-Gunduz, Arzu, Eldemir, Kader et al. (2023) The effect of task-oriented circuit training-based telerehabilitation on upper extremity motor functions in patients with Parkinson's disease: A randomized controlled trial. Parkinsonism & related disorders 109: 105334	- Country Study conducted in Turkey.
Elena, Papamichael, Demetris, Solou, Christina, Michailidou et al. (2021) Differences Between Exergaming Rehabilitation and Conventional Physiotherapy on Quality of Life in Parkinson's Disease: A Systematic Review and Meta-Analysis. Frontiers in neurology 12: 683385	- Country Systematic review with 2/14 of the included studies conducted in Italy, 1/14 in Australia, 1/14 in Hungary, 4/14 in Brazil, 3/14 in Taiwan, 2/14 in China, and 1/14 in Chile. Italian, Australian, and Hungarian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Elhusein, Amal Mohamed, Fadlalmola, Hammad Ali, Awadalkareem, Eltayeb Mohammed et al. (2024) Exercise-based gaming in patients with multiple sclerosis: A systematic review and meta-analysis. Belitung nursing journal 10(1): 1-14	- Country Systematic review with 8/33 of the included studies conducted in Italy, 4/33 in Spain, 1/33 in Australia, 1/33 in France, 1/33 in Germany, 1/33 in Hungary, 1/33 in the UK, 6/33 in Turkey, 4/33 in Iran, 2/33 in the US, 1/33 in Israel, 1/33 in Jordan, and 1/33 in Taiwan. Italian, Spanish, Australian, French, Germany, Hungarian, and the UK studies were checked against protocol criteria and were

Study	Reason for exclusion
	either not relevant or had been separately located by the literature search and screened.
Ellapen, Terry J, Hammill, Henriette V, Swanepoel, Mariette et al. (2018) The benefits of hydrotherapy to patients with spinal cord injuries. African journal of disability 7(0): 450	- Study design (adults) Systematic review with 1/15 randomised controlled trials, 1/15 systematic reviews, 7/15 non-randomised controlled trials, 3/15 non-systematic literature reviews, 2/15 case studies, and 1/15 cross-sectional studies. Randomised controlled trial and systematic review were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Elwishy, Abeer, Ebraheim, Asmaa M, Ashour, Amal S et al. (2020) Influences of Dual-Task Training on Walking and Cognitive Performance of People With Relapsing Remitting Multiple Sclerosis: Randomized Controlled Trial. Journal of chiropractic medicine 19(1): 1-8	- Country Study conducted in Egypt.
Ely, Matthew R, Schleifer, Grant D, Singh, Tamanna K et al. (2023) Exercise Training Does Not Attenuate Cardiac Atrophy or Loss of Function in Individuals With Acute Spinal Cord Injury: A Pilot Study. Archives of physical medicine and rehabilitation 104(6): 909-917	- Country Study conducted in the US.
Ernst, Moritz, Folkerts, Ann-Kristin, Gollan, Romina et al. (2023) Physical exercise for people with Parkinson's disease: a systematic review and network meta-analysis. The Cochrane database of systematic reviews 1: cd013856	- Country Systematic review with 17/156 of the included studies conducted in Italy, 10/156 in Australia, 8/156 in Germany, 8/156 in the UK, 5/156 in Spain, 5/156 in Sweden, 4/156 in Canada, 4/156 in Poland, 2/156 in Hungary, 2/156 in Ireland, 2/156 in New Zealand, 1/156 in Belgium, 1/156 in Estonia, 1/156 in the Netherlands, 1/156 in the Netherlands and the US, 34/156 in the US, 15/156 in Brazil, 11/156 in China, 5/156 in Iran, 5/156 in Taiwan, 4/156 in Turkey, 3/156 in Hong Kong, 3/156 in South Korea, 2/156 in India, 2/156 in Japan, 1/156 in Thailand. Italian, Australian, German, UK, Spanish, Swedish, Canadian, Polish, Hungarian, Irish, New Zealand, Belgian, Estonian, and Dutch studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Escudero-Uribe, Shahid, Hochsprung, Anja, Heredia-Camacho, Beatriz et al. (2017) Effect of Training Exercises Incorporating Mechanical Devices on Fatigue and Gait Pattern in Persons with Relapsing-Remitting Multiple Sclerosis. Physiotherapy Canada. Physiotherapie Canada 69(4): 292-302	- Intervention Whole-body vibration plus standard exercise programme or Balance Trainer system plus standard exercise programme to address stability, and not: 1. Vestibular exercises, balance exercises, or perturbation training to address stability. 2. Individualised exercise programme to address upper limb functioning, stability, and mobility together.
Esquenazi, Alberto, Lee, Stella, Packel, Andrew T et al. (2013) A randomized comparative study of manually assisted versus robotic-	- Country Study conducted in the US.

Study	Reason for exclusion
assisted body weight supported treadmill training in persons with a traumatic brain injury. PM & R : the journal of injury, function, and rehabilitation 5(4): 280-90	
Etoom, Mohammad, Khraiwesh, Yazan, Lena, Francesco et al. (2018) Effectiveness of Physiotherapy Interventions on Spasticity in People With Multiple Sclerosis: A Systematic Review and Meta-Analysis. American journal of physical medicine & rehabilitation 97(11): 793-807	- Study design (adults) Systematic review with 16/29 randomised controlled trials and 13/29 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Fabbri, Isabella; Betti, Fabio; Tedeschi, Roberto (2023) Gait quality after robot therapy compared with physiotherapy in the patient with incomplete spinal cord injured: A systematic review. eNeurologicalSci 31: 100467	- Country Systematic review with 2/4 of the included studies conducted in Spain, 1/4 in South Korea, and 1/4 in Turkey. Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Faccioli, Silvia, Cavalagli, Angela, Falocci, Nicola et al. (2023) Gait analysis patterns and rehabilitative interventions to improve gait in persons with hereditary spastic paraplegia: a systematic review and meta-analysis. Frontiers in neurology 14: 1256392	- Study design (adults) Systematic review with 5/43 randomised controlled trials, 16/43 non-randomised controlled trials, 10/43 non-controlled studies, 10/43 case reports, and 2/43 case studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Fail, Luis B, Marinho, Daniel A, Marques, Elisa A et al. (2022) Benefits of aquatic exercise in adults with and without chronic disease-A systematic review with meta-analysis. Scandinavian journal of medicine & science in sports 32(3): 465-486	- Population Systematic review including participants in protocol (4/62 people with Parkinson's disease) and out of protocol (26/62 healthy adults, 5/62 adults with stroke, 5/62 people with fibromyalgia, 5/62 people with low back pain, 3/62 people with hypertension, 3/62 people with (osteo)arthritis, 2/62 people with coronary artery disease, and 1/62 people with general musculoskeletal disorders). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Fang, C.-Y., Hsu, M.-J., Chen, C.-C. et al. (2015) Robot-assisted passive exercise for ankle hypertonia in individuals with chronic spinal cord injury. Journal of Medical and Biological Engineering 35(4): 464-472	- Country Study conducted in China.
Fang, Chia-Ying, Lien, Angela Shin-Yu, Tsai, Jia-Ling et al. (2021) The Effect and Dose-Response of Functional Electrical Stimulation Cycling Training on Spasticity in Individuals With Spinal Cord Injury: A Systematic Review With Meta-Analysis. Frontiers in physiology 12: 756200	- Study design (adults) Systematic review with 7/18 randomised controlled trials and 11/18 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Fang, Chia-Ying, Tsai, Jia-Ling, Li, Guo-Sheng et al. (2020) Effects of Robot-Assisted Gait Training in Individuals with Spinal Cord Injury: A Meta-analysis. BioMed research international 2020: 2102785	- Study design (adults) Systematic review with 7/18 randomised controlled trials and 11/18 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Farkas, Gary J, Gorgey, Ashraf S, Dolbow, David R et al. (2021) Energy Expenditure, Cardiorespiratory Fitness, and Body Composition Following Arm Cycling or Functional Electrical Stimulation Exercises in Spinal Cord Injury: A 16-Week Randomized Controlled Trial. Topics in spinal cord injury rehabilitation 27(1): 121-134	- Country Study conducted in the US.
Feitosa, Jamille A, Fernandes, Corina A, Casseb, Raphael F et al. (2022) Effects of virtual reality-based motor rehabilitation: a systematic review of fMRI studies. Journal of neural engineering 19(1)	- Study design (adults) Systematic review with cross-sectional studies. No studies checked against protocol criteria as did not include any randomised controlled trials or systematic reviews.
Feng, Hao, Li, Cuiyun, Liu, Jiayu et al. (2019) Virtual Reality Rehabilitation Versus Conventional Physical Therapy for Improving Balance and Gait in Parkinson's Disease Patients: A Randomized Controlled Trial. Medical science monitor : international medical journal of experimental and clinical research 25: 4186-4192	- Country Study conducted in China.
Fenton, J.M., King, J.A., Hoekstra, S.P. et al. (2023) Protocols aiming to increase muscle mass in persons with motor complete spinal cord injury: a systematic review. Disability and rehabilitation 45(9): 1433-1443	- Publication date Systematic review with 27/50 studies published 2013 onwards, and 23/50 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Fernandez-Gonzalez, D, Rodriguez-Costa, I, Sanz-Esteban, I et al. (2023) Therapeutic intervention with virtual reality in patients with Parkinson's disease for upper limb motor training: A systematic review. Rehabilitacion 57(2): 100751	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Fernandez-Lago, Helena, Bello, Olalla, Mora-Cerda, Francina et al. (2017) Treadmill Walking Combined With Anodal Transcranial Direct Current Stimulation in Parkinson Disease: A Pilot Study of Kinematic and Neurophysiological Effects. American journal of physical medicine & rehabilitation 96(11): 801-808	- Intervention Electrical neuromodulation (anodal transcranial direct current stimulation) to address mobility only, and not to address upper limb functioning, stability, and mobility together.
Ferraz, Daniel Dominguez, Trippo, Karen Valadares, Duarte, Gabriel	- Country Study conducted in Brazil.

Study	Reason for exclusion
Pereira et al. (2018) The Effects of Functional Training, Bicycle Exercise, and Exergaming on Walking Capacity of Elderly Patients With Parkinson Disease: A Pilot Randomized Controlled Single-blinded Trial. Archives of physical medicine and rehabilitation 99(5): 826-833	
Ferreira, Fernanda M. R. M, Chaves, Maria Emilia A, Oliveira, Vinicius C et al. (2021) Effect of robot-assisted therapy on participation of people with limited upper limb functioning: A systematic review with GRADE recommendations. Occupational Therapy International 2021	- Population Systematic review including participants out of protocol (11/12 adults with stroke and 1/12 people with cerebral palsy). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Feys, Peter, Coninx, Karin, Kerkhofs, Lore et al. (2015) Robot-supported upper limb training in a virtual learning environment : a pilot randomized controlled trial in persons with MS. Journal of neuroengineering and rehabilitation 12: 60	- Outcomes Data only reported as median and interquartile ranges for intervention and control groups, with no comparative analysis results presented.
Feys, Peter, Moumdjian, Lousin, Van Halewyck, Florian et al. (2019) Effects of an individual 12-week community-located "start-to-run" program on physical capacity, walking, fatigue, cognitive function, brain volumes, and structures in persons with multiple sclerosis. Multiple sclerosis (Houndmills, Basingstoke, England) 25(1): 92-103	- Intervention Individualised start-to-run programme to address mobility, physical fitness, functional mobility, and quality of life, and not an individualised exercise programme to address upper limb functioning, stability, and mobility together.
Figoni, Stephen F, Dolbow, David R, Crawford, Edwin C et al. (2021) Does aerobic exercise benefit persons with tetraplegia from spinal cord injury? A systematic review. The journal of spinal cord medicine 44(5): 690-703	- Publication date Systematic review with 17/75 studies published 2013 onwards, and 58/75 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Fisahn, Christian, Aach, Mirko, Jansen, Oliver et al. (2016) The Effectiveness and Safety of Exoskeletons as Assistive and Rehabilitation Devices in the Treatment of Neurologic Gait Disorders in Patients with Spinal Cord Injury: A Systematic Review. Global spine journal 6(8): 822-841	- Publication date Systematic review with 7/11 studies published 2013 onwards, and 4/11 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
FitzGerald, T.L., Southby, A.K., Haines, T.P. et al. (2015) Is physiotherapy effective in the management of child and adolescent conversion disorder? A systematic review. Journal of Paediatrics and Child Health 51(2): 159-167	- Publication date Systematic review with 3/12 studies published 2013 onwards, and 9/12 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Flynn, Allyson, Allen, Natalie E, Dennis, Sarah et al. (2019) Home-based prescribed exercise improves balance-related activities in people with Parkinson's disease and has benefits similar to centre-based exercise: a systematic review. Journal of physiotherapy 65(4): 189-199	- Publication date Systematic review with 7/16 studies published 2013 onwards, and 9/16 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Fonseca, B.H.D.S., de Andrade, P.H.S., Borges, O. et al. (2023) Effects of non-invasive brain stimulation (NIBS) on vestibulopathy disorders: a systematic review. Hearing, Balance and Communication 21(1): 1-9	- Country Systematic review with 1/2 of the included studies conducted in Iran and 1/2 in Japan. No studies checked against protocol criteria as did not include any studies from target countries.
Fonzo, Marta; Sirico, Felice; Corrado, Bruno (2020) Evidence-Based Physical Therapy for Individuals with Rett Syndrome: A Systematic Review. Brain sciences 10(7)	- Publication date Systematic review with 10/22 studies published 2013 onwards, and 12/22 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Frazzitta, G, Bossio, F, Maestri, R et al. (2015) Crossover versus Stabilometric Platform for the Treatment of Balance Dysfunction in Parkinson's Disease: A Randomized Study. BioMed research international 2015: 878472	- Comparator Standard care plus crossover training, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Frazzitta, Giuseppe, Maestri, Roberto, Bertotti, Gabriella et al. (2015) Intensive rehabilitation treatment in early Parkinson's disease: a randomized pilot study with a 2-year follow-up. Neurorehabilitation and neural repair 29(2): 123-31	- Intervention Standardised multidisciplinary intensive rehabilitation programme, and not an individualised exercise programme.
Freidle, Malin, Johansson, Hanna, Ekman, Urban et al. (2022) Behavioural and neuroplastic effects of a double-blind randomised controlled balance exercise trial in people with Parkinson's disease. NPJ Parkinson's disease 8(1): 12	- Comparator Speech and communication, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Freitag, Fernanda, Brucki, Sonia Maria Dozzi, Barbosa, Alessandra Ferreira et al. (2019) Is virtual reality beneficial for dual-task gait training in patients with Parkinson's disease? A systematic review. Dementia & neuropsychologia 13(3): 259-267	- Country Systematic review with 2/19 of the included studies conducted in Canada, 1/19 in Australia, 1/19 in Belgium, 1/19 in Ireland, 1/19 in Italy, 1/19 in Spain, 5/19 in Brazil, 3/19 in Taiwan, 2/19 in the US, 1/19 in Belgium and Israel, and 1/19 in Israel. Canadian, Australian, Belgian, Irish, Italian, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Freyler, K., Weltin, E., Gollhofer, A. et al. (2014) Improved postural control in response to a 4-week balance training with partially unloaded bodyweight. Gait and Posture 40(2): 291-296	- Population Healthy participants. Not relevant according to protocol population criteria.

Study	Reason for exclusion
Fritz, Nora E; Cheek, Fern M; Nichols-Larsen, Deborah S (2015) Motor-Cognitive Dual-Task Training in Persons With Neurologic Disorders: A Systematic Review. Journal of neurologic physical therapy : JNPT 39(3): 142-53	- Publication date Systematic review with 2/14 studies published 2013 onwards, and 12/14 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Furnari, Anna, Calabro, Rocco Salvatore, De Cola, Maria Cristina et al. (2017) Robotic-assisted gait training in Parkinson's disease: a three-month follow-up randomized clinical trial. The International journal of neuroscience 127(11): 996-1004	- Outcomes Outcome of interest (limb/joint/muscle function [UPDRSIII]) only reported after mixed-effects analysis for intervention and control groups, with no comparative analysis results presented.
Fusco, Augusto, Giovannini, Silvia, Castelli, Letizia et al. (2022) Virtual Reality and Lower Limb Rehabilitation: Effects on Motor and Cognitive Outcome-A Crossover Pilot Study. Journal of clinical medicine 11(9)	- Intervention Virtual reality visual feedback to address mobility only, and not to address upper limb functioning, stability, and mobility together.
Galea, M, Dunlop, S, Geraghty, T et al. (2018) Intensive exercise program after spinal cord injury (SCIPA full-on): a randomized controlled trial. Annals of physical and rehabilitation medicine	- Publication type Conference abstract.
Galea, Mary P, Panisset, Maya G, El-Ansary, Doa et al. (2017) SCIPA Switch-On: A Randomized Controlled Trial Investigating the Efficacy and Safety of Functional Electrical Stimulation-Assisted Cycling and Passive Cycling Initiated Early After Traumatic Spinal Cord Injury. Neurorehabilitation and neural repair 31(6): 540-551	- Outcomes No relevant outcomes reported. Reports measures of muscle atrophy, neurological function, anthropometric measurements, body composition, quality of life, and adverse events.
Galeno, Erasmo, Pullano, Edoardo, Mourad, Firas et al. (2022) Effectiveness of Vestibular Rehabilitation after Concussion: A Systematic Review of Randomised Controlled Trial. Healthcare (Basel, Switzerland) 11(1)	- Country Systematic review with 2/7 of the included studies conducted in Canada, 2/7 in Norway, 2/7 in the US, and 1/7 in Iran. Canadian and Norwegian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Galli, M, Cimolin, V, De Pandis, M F et al. (2016) Robot-assisted gait training versus treadmill training in patients with Parkinson's disease: a kinematic evaluation with gait profile score. Functional neurology 31(3): 163-70	- Outcomes Data only reported as median and interquartile ranges for intervention and control groups, with no comparative analysis between groups presented.
Gallou-Guyot, M, Nuic, D, Mandigout, S et al. (2022) Effectiveness of home-based rehabilitation using active video games on quality of life, cognitive and motor functions in people with	- Study design (adults) Systematic review with 4/9 randomised controlled trials, 3/9 non-randomised controlled trials, and 2/9 non-controlled studies. Randomised controlled trials were checked against protocol criteria and were either not

Study	Reason for exclusion
Parkinson's disease: a systematic review. Disability and rehabilitation 44(26): 8222-8233	relevant or had been separately located by the literature search and screened.
Galperin, Irina, Mirelman, Anat, Schmitz-Hubsch, Tanja et al. (2023) Treadmill training with virtual reality to enhance gait and cognitive function among people with multiple sclerosis: a randomized controlled trial. Journal of neurology 270(3): 1388-1401	- Country Study conducted in Germany, Israel, and the US. Proportions of participants not reported, and results not reported separately for target country.
Gandhi, P., Chan, K., Verrier, M.C. et al. (2017) Training to Improve Walking after Pediatric Spinal Cord Injury: A Systematic Review of Parameters and Walking Outcomes. Journal of Neurotrauma 34(9): 1713-1725	- Publication date Systematic review with 2/13 studies published 2013 onwards, and 11/13 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Gandolfi, Marialuisa, Geroin, Christian, Picelli, Alessandro et al. (2014) Robot-assisted vs. sensory integration training in treating gait and balance dysfunctions in patients with multiple sclerosis: a randomized controlled trial. Frontiers in human neuroscience 8: 318	- Comparator 1. Balance exercises for mobility, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'. 2. Robotic assisted gait training for stability, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Gandolla, Marta, Antonietti, Alberto, Longatelli, Valeria et al. (2019) The Effectiveness of Wearable Upper Limb Assistive Devices in Degenerative Neuromuscular Diseases: A Systematic Review and Meta-Analysis. Frontiers in bioengineering and biotechnology 7: 450	- Publication date Systematic review with 9/14 studies published 2013 onwards, and 5/14 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ganesan, Mohan, Sathyaprabha, Talakad N, Gupta, Anupam et al. (2014) Effect of partial weight-supported treadmill gait training on balance in patients with Parkinson disease. PM & R : the journal of injury, function, and rehabilitation 6(1): 22-33	- Country Study conducted in India.
Ganesan, Mohan, Sathyaprabha, Talakad N, Pal, Pramod Kumar et al. (2015) Partial Body Weight-Supported Treadmill Training in Patients With Parkinson Disease: Impact on Gait and Clinical Manifestation. Archives of physical medicine and rehabilitation 96(9): 1557-65	- Country Study conducted in India.
Garcia-Agundez, Augusto, Folkerts, Ann-Kristin, Konrad, Robert et al. (2019) Recent advances in rehabilitation for Parkinson's Disease with Exergames: A Systematic Review. Journal of neuroengineering and rehabilitation 16(1): 17	- Study design (adults) Systematic review with 16/64 systematic reviews, 8/64 randomised controlled trials, 30/64 'technical papers with no specific therapeutic focus', 10/64 non-controlled studies, and 1/64 non-randomised controlled trials. Systematic reviews and randomised controlled trials were checked against protocol criteria and were either not

Study	Reason for exclusion
	relevant or had been separately located by the literature search and screened.
Garcia-Alen, Loreto, Kumru, Hatice, Castillo-Escario, Yolanda et al. (2023) Transcutaneous Cervical Spinal Cord Stimulation Combined with Robotic Exoskeleton Rehabilitation for the Upper Limbs in Subjects with Cervical SCI: Clinical Trial. Biomedicines 11(2)	- Intervention Electrical neuromodulation (transcranial direct current stimulation) to address upper limb functioning only, and not to address upper limb functioning, stability, and mobility together.
Garcia-Lopez, Hector, de Los Angeles Castillo-Pintor, Maria, Castro-Sanchez, Adelaida Maria et al. (2023) Efficacy of Dual-Task Training in Patients with Parkinson's Disease: A Systematic Review with Meta-Analysis. Movement disorders clinical practice 10(9): 1268-1284	- Country Systematic review with 2/17 of the included studies conducted in Belgium and the Netherlands, 2/17 in Canada, 2/17 in Spain, 2/17 in Sweden, 1/17 in Portugal, 3/17 in the US, 2/17 in Brazil, 1/17 in China, 1/17 in Saudi Arabia, and 1/17 in Taiwan. Belgian, Dutch, Canadian, Spanish, Swedish, and Portuguese studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Garcia-Lopez, Hector, Obrero-Gaitan, Esteban, Castro-Sanchez, Adelaida Maria et al. (2021) Non-Immersive Virtual Reality to Improve Balance and Reduce Risk of Falls in People Diagnosed with Parkinson's Disease: A Systematic Review. Brain sciences 11(11)	- Country Systematic review with 3/10 of the included studies conducted in Italy, 2/10 in multi-high-income European countries, 2/10 in Taiwan, 1/10 in Brazil, 1/10 in China, and 1/10 in South Korea. Italian and European studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Garcia-Munoz, Cristina, Cortes-Vega, Maria-Dolores, Heredia-Rizo, Alberto Marcos et al. (2020) Effectiveness of Vestibular Training for Balance and Dizziness Rehabilitation in People with Multiple Sclerosis: A Systematic Review and Meta-Analysis. Journal of clinical medicine 9(2)	- Country Systematic review with 2/7 of the included studies conducted in Italy, 2/7 in Iran, 2/7 in the US, and 1/7 in Turkey. Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Garlet, A.B., Righi, N.C., Schardong, J. et al. (2022) Effects of robotic rehabilitation using the Erigo device on patients with neurological injury: a systematic review and meta-analysis of randomized clinical trials. Disability and rehabilitation. Assistive technology: 1-10	- Population Systematic review including participants in protocol (1/9 people with traumatic brain injury), unclear (3/9 people in a minimally conscious state and 1/9 people with acquired brain injury including stroke), and out of protocol (4/9 adults with stroke). Studies including participants with traumatic brain injury, minimally conscious state and acquired brain injury including stroke were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Gasner, Heiko, Trutt, Elmar, Seifferth, Sarah et al. (2022) Treadmill training and physiotherapy similarly improve dual task gait performance: a randomized-controlled trial in Parkinson's disease. Journal of neural transmission (Vienna, Austria : 1996) 129(9): 1189-1200	- Outcomes Outcomes of interest (balance [Berg Balance Scale] and exercise capacity [2MWT]) data presented graphically and cannot be extracted for analysis.
Gaspar, Roberta, Padula, Natalia, Freitas, Tatiana B et al. (2019) Physical Exercise for Individuals With	- Publication date Systematic review with 10/25 studies published 2013 onwards, and 15/25 published pre-2013. Studies published

Study	Reason for exclusion
Spinal Cord Injury: Systematic Review Based on the International Classification of Functioning, Disability, and Health. Journal of sport rehabilitation 28(5): 505-516	2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Gasq, David, Dumas, Raphael, Causse, Benoit et al. (2023) Comparison between a novel helical and a posterior ankle-foot orthosis on gait in people with unilateral foot drop: a randomised crossover trial. Journal of neuroengineering and rehabilitation 20(1): 63	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Gee, Cameron M, Sinden, Adrienne R, Krassioukov, Andrei V et al. (2022) The effects of active upper-limb versus passive lower-limb exercise on quality of life among individuals with motor-complete spinal cord injury. Spinal cord 60(9): 805-811	- Comparator 1. Bodyweight supported treadmill training for upper limb, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'. 2. Arm-cycle ergometry for mobility, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Geroin, Christian, Nonnekes, Jorik, de Vries, Nienke M et al. (2018) Does dual-task training improve spatiotemporal gait parameters in Parkinson's disease?. Parkinsonism & related disorders 55: 86-91	- Intervention Dual task training to address mobility, and not to address upper limb functioning, stability and mobility together.
Ghahfarrokhi, Majid Mardaniyan, Banitalebi, Ebrahim, Negaresh, Raoof et al. (2021) Home-Based Exercise Training in Multiple Sclerosis: A Systematic Review with Implications for Future Research. Multiple sclerosis and related disorders 55: 103177	- Country Systematic review with 3/24 of the included studies conducted in Australia, 2/24 in Germany, 2/24 in Italy, 2/24 in Spain, 2/24 in the UK, 1/24 in Belgium, 1/24 in the Czech Republic, 8/24 in the US, and 2/24 in Turkey. Australian, German, Italian, Spanish, UK Belgian, and Czech studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ghai, Shashank; Ghai, Ishan; Effenberg, Alfred O (2017) Effects of dual tasks and dual-task training on postural stability: a systematic review and meta-analysis. Clinical interventions in aging 12: 557-577	- Publication date Systematic review with 9/42 studies published 2013 onwards, and 33/42 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ghai, Shashank; Ghai, Ishan; Lamontagne, Anouk (2020) Virtual reality training enhances gait poststroke: a systematic review and meta-analysis. Annals of the New York Academy of Sciences 1478(1): 18-42	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Goel, Tanya, Sharma, Nidhi, Gehlot, Ajay et al. (2023) Effectiveness of immersive virtual reality training to improve sitting balance control among individuals with acute and sub-acute paraplegia: A randomized clinical trial. The journal of spinal cord medicine 46(6): 964-974	- Country Study conducted in India.

Study	Reason for exclusion
Goffredo, Michela, Baglio, Francesca, DE Icco, Roberto et al. (2023) Efficacy of non-immersive virtual reality-based telerehabilitation on postural stability in Parkinson's disease: a multicenter randomized controlled trial. European journal of physical and rehabilitation medicine 59(6): 689-696	- Intervention Virtual reality telerehabilitation intervention to address stability and mobility only, and not to address upper limb functioning, stability, and mobility together.
Goffredo, Michela, Pagliari, Chiara, Turolla, Andrea et al. (2023) Non-Immersive Virtual Reality Telerehabilitation System Improves Postural Balance in People with Chronic Neurological Diseases. Journal of clinical medicine 12(9)	- Intervention Virtual reality telerehabilitation intervention to address stability and mobility only, and not to address upper limb functioning, stability, and mobility together.
Gomes Neto, Mansueto, Pontes, Sarah Souza, Almeida, Lorena de Oliveira et al. (2020) Effects of water-based exercise on functioning and quality of life in people with Parkinson's disease: a systematic review and meta-analysis. Clinical rehabilitation 34(12): 1425-1435	- Country Systematic review with 4/15 of the included studies conducted in Italy, 4/15 in Spain, 1/15 in Ireland, 2/15 in China, 2/15 in Iran, 1/15 in Brazil, and 1/15 in Turkey. Italian, Spanish, and Irish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Gomes-Osman, Joyce and Field-Fote, Edelle C (2015) Improvements in hand function in adults with chronic tetraplegia following a multiday 10-Hz repetitive transcranial magnetic stimulation intervention combined with repetitive task practice. Journal of neurologic physical therapy : JNPT 39(1): 23-30	- Country Study conducted in the US.
Gomes-Osman, Joyce and Field-Fote, Edelle C (2015) Cortical vs. afferent stimulation as an adjunct to functional task practice training: a randomized, comparative pilot study in people with cervical spinal cord injury. Clinical rehabilitation 29(8): 771-82	- Country Study conducted in the US.
Gorgey, Ashraf S, Abilmona, Sally M, Sima, Adam et al. (2020) A secondary analysis of testosterone and electrically evoked resistance training versus testosterone only (TEREX-SCI) on untrained muscles after spinal cord injury: a pilot randomized clinical trial. Spinal cord 58(3): 298-308	- Country Study conducted in the US.
Gorgey, Ashraf S, Khalil, Refka E, Carter, William et al. (2023) Effects of two different paradigms of electrical stimulation exercise on cardio-metabolic risk factors after spinal cord injury. A randomized clinical trial. Frontiers in neurology 14: 1254760	- Country Study conducted in the US.

Study	Reason for exclusion
Gorman, Peter H, Scott, William, VanHiel, Leslie et al. (2019) Comparison of peak oxygen consumption response to aquatic and robotic therapy in individuals with chronic motor incomplete spinal cord injury: a randomized controlled trial. Spinal cord 57(6): 471-481	- Country Study conducted in the US.
Gorman, Peter H, Scott, William, York, Henry et al. (2016) Robotically assisted treadmill exercise training for improving peak fitness in chronic motor incomplete spinal cord injury: A randomized controlled trial. The journal of spinal cord medicine 39(1): 32-44	- Country Study conducted in the US.
Graser, J.V., Bastiaenen, C.H.G., Gut, A. et al. (2021) Contextual interference in children with brain lesions: a pilot study investigating blocked vs. random practice order of an upper limb robotic exergame. Pilot and Feasibility Studies 7(1): 135	- Comparator Same intervention (upper limb robotic exergames) but varied in terms of play pattern for exergame trials (blocked order versus random order) and not timing, frequency, or intensity.
Grewal, Gurtej Singh, Schwenk, Michael, Lee-Eng, Jacqueline et al. (2015) Sensor-Based Interactive Balance Training with Visual Joint Movement Feedback for Improving Postural Stability in Diabetics with Peripheral Neuropathy: A Randomized Controlled Trial. Gerontology 61(6): 567-74	- Country Study conducted in Qatar and the US.
Grobbelaar, Rone; Venter, Ranel; Welman, Karen Estelle (2017) Backward compared to forward over ground gait retraining have additional benefits for gait in individuals with mild to moderate Parkinson's disease: A randomized controlled trial. Gait & posture 58: 294-299	- Country Study conducted in South Africa.
Gulcan, Kubilay, Guclu-Gunduz, Arzu, Yasar, Evren et al. (2023) The effects of augmented and virtual reality gait training on balance and gait in patients with Parkinson's disease. Acta neurologica Belgica 123(5): 1917-1925	- Country Study conducted in Turkey.
Gunduz, Aysegul, Rothwell, John, Vidal, Joan et al. (2017) Non-invasive brain stimulation to promote motor and functional recovery following spinal cord injury. Neural regeneration research 12(12): 1933-1938	- Study design (adults) Non-systematic literature review.
Gunn, Hilary, Markevics, Sophie, Haas, Bernhard et al. (2015) Systematic Review: The Effectiveness	- Publication date Systematic review with 7/15 studies published 2013 onwards, and 8/15 published pre-2013. Studies published

Study	Reason for exclusion
of Interventions to Reduce Falls and Improve Balance in Adults With Multiple Sclerosis. Archives of physical medicine and rehabilitation 96(10): 1898-912	2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Gurpinar, Baris; Kara, Bilge; Idiman, Egemen (2020) Effects of aquatic exercises on postural control and hand function in Multiple Sclerosis: Halliwick versus Aquatic Plyometric Exercises: a randomised trial. Journal of musculoskeletal & neuronal interactions 20(2): 249-255	- Country Study conducted in Turkey.
Gutierrez, RO, Galan Del Rio, F, Cano de la, Cuerda et al. (2013) A telerehabilitation program by virtual reality-video games improves balance and postural control in multiple sclerosis patients.	- Study design (adults) Non-randomised controlled trial.
Gutierrez-Cruz, Carmen, Rojas-Ruiz, F Javier, De la Cruz-Marquez, Juan Carlos et al. (2020) Effect of a Combined Program of Strength and Dual Cognitive-Motor Tasks in Multiple Sclerosis Subjects. International journal of environmental research and public health 17(17)	- Study design (adults) Non-systematic literature review.
Ha, S.-Y. and Sung, Y.-H. (2021) Vojta approach affects neck stability and static balance in sitting position of children with hypotonia. International Neurourology Journal 25: 90-s95	- Country Study conducted in South Korea.
Hajebrahimi, Farzin, Velioglu, Halil Aziz, Bayraktaroglu, Zubeyir et al. (2022) Clinical evaluation and resting state fMRI analysis of virtual reality based training in Parkinson's disease through a randomized controlled trial. Scientific reports 12(1): 8024	- Country Study conducted in Turkey.
Han, Tingting, Liu, Qian, Hu, Yaguang et al. (2023) Effect of Pro-kin visual feedback balance training on balance function of individuals with early Parkinson's disease: a randomized controlled pilot trial. African health sciences 23(2): 582-588	- Country Study conducted in China.
Hao, Zikang; Zhang, Xiaodan; Chen, Ping (2022) Effects of Different Exercise Therapies on Balance Function and Functional Walking Ability in Multiple Sclerosis Disease Patients-A Network Meta-Analysis of Randomized Controlled Trials. International journal of environmental research and public health 19(12)	- Country Systematic review with 4/30 of the included studies conducted in Italy, 2/30 in Spain, 1/30 in Austria, 1/30 in Belgium, 1/30 in Hungary, 8/30 in Iran, 6/30 in Turkey, 3/30 in Brazil, 2/30 in the US, 1/30 in Israel, and 1/30 in Jordan. Italian, Spanish, Austrian, Belgian, and Hungarian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
	Note: Article reports 31 included papers, but 1 study has been double counted.
Hao, Zikang; Zhang, Xiaodan; Chen, Ping (2022) Effects of Ten Different Exercise Interventions on Motor Function in Parkinson's Disease Patients-A Network Meta-Analysis of Randomized Controlled Trials. Brain sciences 12(6)	- Country Systematic review with 10/58 of the included studies conducted in Italy, 3/58 in Spain, 2/58 in Australia, 2/58 in Canada, 1/58 in Hungary, 1/58 in Germany, 1/58 in Ireland, 1/58 in the UK, 15/58 in the US, 9/58 in China, 5/58 in South Korea, 4/58 in Brazil, 1/58 in Hong Kong, 1/58 in India, 1/58 in Taiwan, and 1/58 in Turkey. Italian, Spanish, Australian, Canadia, Hungarian, German, Irish and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: Article reported 60 included studies, but 2 of these were 3-arm trials that had been counted per intervention.
Harbo, Thomas, Markvardsen, Lars Kjobsted, Hellfritzsch, Michel Bach et al. (2019) Neuromuscular electrical stimulation in early rehabilitation of Guillain-Barre syndrome: A pilot study. Muscle & nerve 59(4): 481-484	- Study design (adults) Non-randomised controlled study. Note: Study randomised legs of participants (that is, left or right) to receive treatment, not participants themselves.
Harris, Dale M, Rantalainen, Timo, Muthalib, Makii et al. (2015) Exergaming as a Viable Therapeutic Tool to Improve Static and Dynamic Balance among Older Adults and People with Idiopathic Parkinson's Disease: A Systematic Review and Meta-Analysis. Frontiers in aging neuroscience 7: 167	- Publication date Systematic review with 5/11 studies published 2013 onwards, and 6/11 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Harro, Cathy C, Shoemaker, Michael J, Frey, Oksana J et al. (2014) The effects of speed-dependent treadmill training and rhythmic auditory-cued overground walking on gait function and fall risk in individuals with idiopathic Parkinson's disease: a randomized controlled trial. NeuroRehabilitation 34(3): 557-72	- Country Study conducted in the US.
Hart, E., Humanitzki, E., Schroeder, J. et al. (2022) Neuromotor Rehabilitation Interventions After Pediatric Stroke: A Focused Review. Seminars in Pediatric Neurology 44: 100994	- Study design (CYP) Non-systematic literature review.
Harvey, L A; Glinsky, J V; Bowden, J L (2016) The effectiveness of 22 commonly administered physiotherapy interventions for people with spinal cord injury: a systematic review. Spinal cord 54(11): 914-923	- Publication date Systematic review with 11/38 studies published 2013 onwards, and 27/28 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Harvey, Lisa A, Dunlop, Sarah A, Churilov, Leonid et al. (2017) Early intensive hand rehabilitation is not more effective than usual care plus one-to-one hand therapy in people	- Population Participants' condition does not meet the guideline definition of chronic (3 months since diagnosis or injury). Median time since injury reported as 81 days for intervention group and 62 days for control group.

Study	Reason for exclusion
with sub-acute spinal cord injury ('Hands On'): a randomised trial. Journal of physiotherapy 63(4): 197-204	
Harvey, Lisa A; Glinsky, Joanne V; Chu, Jackie (2021) Do any physiotherapy interventions increase spinal cord independence measure or functional independence measure scores in people with spinal cord injuries? A systematic review. Spinal cord 59(7): 705-715	- Country Systematic review with 5/27 of the included studies conducted in Canada, 3/27 in Spain, 2/27 in Australia, 1/27 in Switzerland, 1/27 in multi-high-income European countries, 4/27 in South Korea, 4/27 in Turkey, 3/27 in the US, 2/27 in India, 1/27 in Hong Kong, and 1/27 in Iran. Canadian, Spanish, Australian, Swiss and multi-centre studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Hatem, S.M., Saussez, G., della Faille, M. et al. (2016) Rehabilitation of motor function after stroke: A multiple systematic review focused on techniques to stimulate upper extremity recovery. Frontiers in Human Neuroscience 10(sep2016): 442	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Hatton, Anna L, Williams, Katrina, Chatfield, Mark D et al. (2023) Effects of wearing textured versus smooth shoe insoles for 12 weeks on gait, foot sensation and patient-reported outcomes, in people with multiple sclerosis: a randomised controlled trial. Brain impairment : a multidisciplinary journal of the Australian Society for the Study of Brain Impairment 24(2): 148-167	- Comparator Same intervention (wearable foot insole) but varied in terms of insole texture, and not timing, frequency, or intensity.
Hayes, Stephen Clive, James Wilcox, Christopher Richard, Forbes White, Hollie Samantha et al. (2018) The effects of robot assisted gait training on temporal-spatial characteristics of people with spinal cord injuries: A systematic review. The journal of spinal cord medicine 41(5): 529-543	- Publication date Systematic review with 7/12 studies published 2013 onwards, and 5/12 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
He, M., Zhang, H.-N., Tang, Z.-C. et al. (2021) Balance and coordination training for patients with genetic degenerative ataxia: a systematic review. Journal of Neurology 268(10): 3690-3705	- Study design (adults) Systematic review with 8/33 randomised controlled trials, 15/33 non-comparative studies, 1/33 non-randomised controlled trials, and 8/33 case studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: Studies only add up to 32 but correct as reported in article.
Hebert, Jeffrey R, Corboy, John R, Vollmer, Timothy et al. (2018) Efficacy of Balance and Eye-Movement Exercises for Persons With Multiple Sclerosis (BEEMS). Neurology 90(9): e797-e807	- Country Study conducted in the US.

Study	Reason for exclusion
Heutinck, Lotte, Jansen, Merel, van den Elzen, Yolanda et al. (2018) Virtual Reality Computer Gaming with Dynamic Arm Support in Boys with Duchenne Muscular Dystrophy. Journal of neuromuscular diseases 5(3): 359-372	- Intervention Virtual reality computer gaming with dynamic arm support to address upper limb functioning and not: 1. Upper limb wearable to address upper limb functioning. 2. Virtual reality to address upper limb functioning, stability, and mobility together.
Hidalgo-Agudo, Ruben D, Lucena-Anton, David, Luque-Moreno, Carlos et al. (2020) Additional Physical Interventions to Conventional Physical Therapy in Parkinson's Disease: A Systematic Review and Meta-Analysis of Randomized Clinical Trials. Journal of clinical medicine 9(4)	- Intervention Systematic review with mix of interventions in protocol (2/11 hydrotherapy, 1/11 robotic assistance, and 1/11 wearable device), unclear (3/11 physiotherapy interventions) and out of protocol (3/11 dance-based therapy and 1/11 kayak intervention). Studies investigating hydrotherapy, robotic assistance, wearable devices, and physiotherapy interventions were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Hind, Daniel, Parkin, James, Whitworth, Victoria et al. (2017) Aquatic therapy for children with Duchenne muscular dystrophy: a pilot feasibility randomised controlled trial and mixed-methods process evaluation. Health technology assessment (Winchester, England) 21(27): 1-120	- Duplicate Reports same study and outcomes as Hind 2017.
Hitzig, S.L., Craven, B.C., Panjwani, A. et al. (2013) Randomized trial of functional electrical stimulation therapy for walking in incomplete spinal cord injury: Effects on quality of life and community participation. Topics in Spinal Cord Injury Rehabilitation 19(4): 245-258	- Outcomes Outcomes of interest (limb/joint/muscle functioning [CHART] and functioning [SCIM-III) reported as individual sub-scores, and not a global domain scale.
Hizomi Arani, R., Fakhri, F., Shams, A. et al. (2023) Effect of an Exercise Program on the Balance, Gait, Vibration Sense, and Cardiometabolic Parameters Among Patients with Diabetic Peripheral Neuropathy: a Randomized Controlled Trial. SN Comprehensive Clinical Medicine 5(1): 129	- Country Study conducted in Iran.
Ho, Jocelyn Sze-Wing, Ko, Koko Shaau-Yiu, Law, Sheung Wai et al. (2023) The effectiveness of robotic-assisted upper limb rehabilitation to improve upper limb function in patients with cervical spinal cord injuries: a systematic literature review. Frontiers in neurology 14: 1126755	- Study design (adults) Systematic review with 1/7 randomised controlled trials, 1/17 non-controlled studies, 4/7 case series, and 1/7 case report. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Hoffman, Larisa and Field-Fote, Edelle (2013) Effects of practice combined with somatosensory or motor stimulation on hand function in persons with spinal cord injury. Topics	- Country Study conducted in the US.

Study	Reason for exclusion
in spinal cord injury rehabilitation 19(4): 288-99	
Hogan, N., Kehoe, M., Larkin, A. et al. (2014) The effect of community exercise interventions for people with ms who use bilateral support for gait. Multiple Sclerosis International: 109142	- Intervention 1. Standardised group physiotherapy programme, and not individualised exercise programme. 2. Individual physiotherapy programmes to address stability and mobility only, and not to address upper limb functioning, stability, and mobility together. 3. Yoga for stability, and not balance exercises.
Holanda, Ledycnarf J, Silva, Patricia M M, Amorim, Thiago C et al. (2017) Robotic assisted gait as a tool for rehabilitation of individuals with spinal cord injury: a systematic review. Journal of neuroengineering and rehabilitation 14(1): 126	- Study design (adults) Systematic review with 2/39 randomised controlled trials, 20/39 non-controlled studies, 12/39 non-randomised controlled trials, 3/39 case studies, 1/39 case series, and 1/39 cross-sectional studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Hortobagyi, T., Sipos, D., Borbely, G. et al. (2021) Detraining Slows and Maintenance Training Over 6 Years Halts Parkinsonian Symptoms-Progression. Frontiers in Neurology 12: 737726	- Intervention Exergaming sensorimotor programme to address stability and mobility, and not to address upper limb functioning, stability, and mobility together.
Hortobagyi, Tibor, Acs, Pongrac, Baumann, Petra et al. (2022) Comparative Effectiveness of 4 Exercise Interventions Followed by 2 Years of Exercise Maintenance in Multiple Sclerosis: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 103(10): 1908-1916	- Outcomes Outcomes of interest (functioning [MSIS-29], balance [Berg Balance Scale] and exercise capacity [6MWT]) data presented graphically and cannot be extracted for analysis or reported narratively with insufficient information to conduct analysis.
Hota, D.; Das, S.; Joseph, N.M. (2020) Effect of dual task exercise to develop body balance, movement co-ordination and walking speed among post cervical injury clients. International Journal of Research in Pharmaceutical Sciences 11(1): 1117-1122	- Country Study conducted in India.
Hsu, C.-Y., Cheng, Y.-H., Lai, C.-H. et al. (2020) Clinical non-superiority of technology-assisted gait training with body weight support in patients with subacute stroke: A meta-analysis. Annals of Physical and Rehabilitation Medicine 63(6): 535-542	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Hu, Xiaomin, Lu, Jiachun, Wang, Yunyun et al. (2024) Effects of a lower limb walking exoskeleton on quality of life and activities of daily living in patients with complete spinal cord injury: A randomized controlled trial. Technology and health care : official journal of the European Society for	- Country Study conducted in China.

Study	Reason for exclusion
Engineering and Medicine 32(1): 243-253	
Huang, Lei, Huang, Hai Liang, Dang, Xiao Wen et al. (2024) Effect of Body Weight Support Training on Lower Extremity Motor Function in Patients With Spinal Cord Injury: A Systematic Review and Meta-analysis. American journal of physical medicine & rehabilitation 103(2): 149-157	- Country Systematic review with 1/19 of the included studies conducted in Italy, 17/19 in China, and 1/19 in Turkey. Italian study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened. Note: Studies noted as being conducted in China were not explicitly stated as such but were published in Chinese language journals and could not be located using an English-language search engine.
Hubble, Ryan P, Silburn, Peter A, Naughton, Geraldine A et al. (2019) Trunk Exercises Improve Balance in Parkinson Disease: A Phase II Randomized Controlled Trial. Journal of neurologic physical therapy : JNPT 43(2): 96-105	- Outcomes No relevant outcomes reported. Reports measures of balance (measurement data such as 95% elliptical area, sway velocity, and sway variability, not measured using validated scales).
Hulzinga, Femke, de Rond, Veerle, Vandendoorent, Britt et al. (2021) Repeated Gait Perturbation Training in Parkinson's Disease and Healthy Older Adults: A Systematic Review and Meta-Analysis. Frontiers in human neuroscience 15: 732648	- Population Systematic review including participants in protocol (5/8 people with Parkinson's disease), unclear (1/8 people with Parkinson's disease and healthy adults), and out of protocol (2/8 healthy adults). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Hulzinga, Femke, Seuthe, Jana, D'Cruz, Nicholas et al. (2023) Split-Belt Treadmill Training to Improve Gait Adaptation in Parkinson's Disease. Movement disorders : official journal of the Movement Disorder Society 38(1): 92-103	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data such as velocity, step length, and asymmetry, not measured using validated scale) and turning performance.
Human, Anri, Corten, Lieselotte, Jelsma, Jennifer et al. (2017) Inspiratory muscle training for children and adolescents with neuromuscular diseases: A systematic review. Neuromuscular disorders : NMD 27(6): 503-517	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Hung, Erica Shih-Wei, Chen, Shih-Ching, Chang, Fan-Chien et al. (2019) Effects of Interactive Video Game-Based Exercise on Balance in Diabetic Patients with Peripheral Neuropathy: An Open-Level, Crossover Pilot Study. Evidence-based complementary and alternative medicine : eCAM 2019: 4540709	- Country Study conducted in Taiwan.
Hussain, Fouzia, Farooqui, Sumaira, Khan, Inayat Ali et al. (2023) Effects of Exercise-based Management on Motor Symptoms in Parkinson's Disease - A Meta-analysis. Journal of the College of Physicians and	- Country Systematic review with 6/21 of the included studies conducted in Italy, 2/21 in Australia, 2/21 in Spain, 1/21 in Germany, 1/21 in Sweden, 3/21 in Taiwan, 2/21 in Brazil, 2/21 in China, 1/21 in India, and 1/21 in South Korea. Italian, Australian, Spanish, German, and Swedish studies

Study	Reason for exclusion
Surgeons--Pakistan : JCPSP 33(8): 919-926	were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Hvingelby, Victor Schwartz, Glud, Andreas Norgaard, Sorensen, Jens Christian Hedemann et al. (2022) Interventions to improve gait in Parkinson's disease: a systematic review of randomized controlled trials and network meta-analysis. Journal of neurology 269(8): 4068-4079	- Publication date Systematic review with 114/148 studies published 2013 onwards, and 34/148 published pre-2013. Studies published 2013 onwards were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening. Note: 34/148 only 23.0%. A further 27 papers can be excluded as being conducted in countries outside of protocol (that is, not high-income European, Canada, Australia, or New Zealand), which means systematic review is excluded.
Iatridou, Georgia, Pelidou, Henrietta-Syngliti, Varvarousis, Dimitrios et al. (2018) The effectiveness of hydrokinesiotherapy on postural balance of hemiplegic patients after stroke: A systematic review and meta-analysis. Clinical Rehabilitation 32(5): 583-593	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Ibitoye, M.O., Hamzaid, N.A., Hayashibe, M. et al. (2019) Restoring prolonged standing via functional electrical stimulation after spinal cord injury: A systematic review of control strategies. Biomedical Signal Processing and Control 49: 34-47	- Publication date Systematic review with 4/25 studies published 2013 onwards, and 21/25 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ibitoye, Morufu Olusola; Hamzaid, Nur Azah; Ahmed, Yusuf Kola (2023) Effectiveness of FES-supported leg exercise for promotion of paralysed lower limb muscle and bone health-a systematic review. Biomedizinische Technik. Biomedical engineering 68(4): 329-350	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Iodice, Rosa, Dubbioso, Raffaele, Ruggiero, Lucia et al. (2015) Anodal transcranial direct current stimulation of motor cortex does not ameliorate spasticity in multiple sclerosis. Restorative neurology and neuroscience 33(4): 487-92	- Intervention Electrical neuromodulation (anodal transcranial direct current stimulation) to address lower limb spasticity, and not to address upper limb functioning, stability, and mobility together.
Ionite, C., Rotariu, M., Turnea, M. et al. (2022) A Review about the Effectiveness of Virtual Therapy in the Recovery of Patients with Spinal Cord Injuries. Journal of Men's Health 18(8): 160	- Study design (adults) Non-systematic literature review.
Isernia, S., Di Tella, S., Pagliari, C. et al. (2020) Effects of an Innovative Telerehabilitation Intervention for People With Parkinson's Disease on Quality of Life, Motor, and Non-motor	- Study design (adults) Non-randomised controlled trial.

Study	Reason for exclusion
Abilities. Frontiers in Neurology 11: 846	
Jabbar, R., Khan, Z., Saif, A. et al. (2021) Effect of transcutaneous spinal direct current stimulation (TsDCS) combined with other therapies on walking capacity in patients with neurological disorders: A systematic review. NeuroRegulation 8(2): 112-120	- Population Systematic review including participants in protocol (1/5 people with neurodegenerative ataxia) and out of protocol (3/5 adults with stroke and 1/5 people with cerebral palsy). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Jackman, Michelle, Novak, Iona, Lannin, Natasha et al. (2019) Immediate effect of a functional wrist orthosis for children with cerebral palsy or brain injury: A randomized controlled trial. Journal of hand therapy : official journal of the American Society of Hand Therapists 32(1): 10-16	- Population Mixed population including participants in protocol (2/30 people with brain injury) and out of protocol (28/30 people with cerebral palsy). Results not presented separately for target population.
Jaggi, Salome, Wachter, Annina, Adcock, Manuela et al. (2023) Feasibility and effects of cognitive-motor exergames on fall risk factors in typical and atypical Parkinson's inpatients: a randomized controlled pilot study. European journal of medical research 28(1): 30	- Intervention Dual-task exergame intervention to address stability and mobility, and not to address upper limb functioning, stability, and mobility together.
Jahantigh Akbari, N., Hosseinifar, M., Naimi, S.S. et al. (2020) The efficacy of physiotherapy interventions in mitigating the symptoms and complications of diabetic peripheral neuropathy: A systematic review. Journal of Diabetes and Metabolic Disorders 19(2): 1995-2004	- Study design (adults) Non-systematic literature review.
Jenkins, H.M., Stocki, A., Kriellaars, D. et al. (2014) Breath stacking in children with neuromuscular disorders. Pediatric Pulmonology 49(6): 544-553	- Intervention Involuntary breath stacking to increase respiratory function and not to address upper limb functioning, stability, and mobility together.
Jiang, Xiaoyu, Zhou, Jianpeng, Chen, Qiang et al. (2024) Effect of robot-assisted gait training on motor dysfunction in Parkinson's patients:A systematic review and meta-analysis. Journal of back and musculoskeletal rehabilitation 37(2): 253-268	- Country Systematic review with 10/17 of the included studies conducted in Italy, 5/17 in China, 1/17 in Japan, and 1/17 in South Korea. Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: Studies noted as being conducted in China were not explicitly stated as such but were published in Chinese language journals and could not be located using an English-language search engine.
Jimenez-Garcia, A.M., Bonnel, G., Alvarez-Mota, A. et al. (2024) Current perspectives on neuromodulation in ALS patients: A systematic review and meta-analysis. PLoS ONE 19(3march): e0300671	- Publication date Systematic review with 4/10 studies published 2013 onwards, and 6/10 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Jitkritsadakul, Onanong, Thanawattano, Chusak, Anan, Chanawat et al. (2017) Tremor's glove-an innovative electrical muscle stimulation therapy for intractable tremor in Parkinson's disease: A randomized sham-controlled trial. Journal of the neurological sciences 381: 331-340	- Country Study conducted in Thailand.
Johansson, Hanna, Folkerts, Ann-Kristin, Hammarstrom, Ida et al. (2023) Effects of motor-cognitive training on dual-task performance in people with Parkinson's disease: a systematic review and meta-analysis. Journal of neurology 270(6): 2890-2907	- Country Systematic review with 5/17 of the included studies conducted in Sweden, 3/17 in Belgium and the Netherlands, 1/17 in Spain, 4/17 in the US, 2/17 in Taiwan, 1/17 in Brazil, and 1/17 in Israel. Swedish, Belgian and Dutch, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Jones, Michael L, Evans, Nicholas, Tefertiller, Candace et al. (2014) Activity-based therapy for recovery of walking in individuals with chronic spinal cord injury: results from a randomized clinical trial. Archives of physical medicine and rehabilitation 95(12): 2239-46e2	- Publication type Conference abstract.
Jonsdottir, Johanna, Bertoni, Rita, Lawo, Michael et al. (2018) Serious games for arm rehabilitation of persons with multiple sclerosis. A randomized controlled pilot study. Multiple sclerosis and related disorders 19: 25-29	- Intervention Serious Games-based upper extremity therapy to address upper limb functioning only and not upper limb functioning, stability, and mobility together.
Jonsdottir, Johanna, Gervasoni, Elisa, Bowman, Thomas et al. (2018) Intensive Multimodal Training to Improve Gait Resistance, Mobility, Balance and Cognitive Function in Persons With Multiple Sclerosis: A Pilot Randomized Controlled Trial. Frontiers in neurology 9: 800	- Intervention Dual task treadmill training to address stability and mobility, and not to address upper limb functioning, stability, and mobility together.
Jose, L., Martins, L.B., Cordeiro, T.M. et al. (2023) Non-Invasive Neuromodulation Methods to Alleviate Symptoms of Huntington's Disease: A Systematic Review of the Literature. Journal of Clinical Medicine 12(5): 2002	- Publication date Systematic review with 12/19 studies published 2013 onwards, and 7/19 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Joseph, Conran, Brodin, Nina, Leavy, Breiffni et al. (2019) Cost-effectiveness of the HiBalance training program for elderly with Parkinson's disease: analysis of data from a randomized controlled trial. Clinical rehabilitation 33(2): 222-232	- Duplicate Same study as Conradsson 2015 (included study), with no new data presented.
Joseph, Conran, Leavy, Breiffni, Mattsson, Sara et al. (2018)	- Outcomes

Study	Reason for exclusion
Implementation of the HiBalance training program for Parkinson's disease in clinical settings: A feasibility study. Brain and behavior 8(8): e01021	Outcomes of interest (balance [Mini-BESTest] and exercise capacity [10MWT]) data presented graphically and cannot be extracted for analysis or reported narratively with insufficient information to conduct analysis.
Jung, JaeHyun, Chung, EunJung, Kim, Kyoung et al. (2014) The effects of aquatic exercise on pulmonary function in patients with spinal cord injury. Journal of physical therapy science 26(5): 707-9	- Country Study conducted in South Korea.
Jung, Joo Hwan, Lee, Hye Jin, Cho, Duk Youn et al. (2019) Effects of Combined Upper Limb Robotic Therapy in Patients With Tetraplegic Spinal Cord Injury. Annals of rehabilitation medicine 43(4): 445-457	- Country Study conducted in South Korea.
Kalron, Alon, Fonkatz, Ilia, Frid, Lior et al. (2016) The effect of balance training on postural control in people with multiple sclerosis using the CAREN virtual reality system: a pilot randomized controlled trial. Journal of neuroengineering and rehabilitation 13: 13	- Country Study conducted in Israel.
Kaminski, Diogo Machado, Schaan, Beatriz D, da Silva, Antonio Marcos Vargas et al. (2015) Inspiratory muscle training in patients with diabetic autonomic neuropathy: a randomized clinical trial. Clinical autonomic research : official journal of the Clinical Autonomic Research Society 25(4): 263-6	- Country Study conducted in Brazil.
Kapadia, Naaz; Zivanovic, Vera; Popovic, Milos R (2013) Restoring voluntary grasping function in individuals with incomplete chronic spinal cord injury: pilot study. Topics in spinal cord injury rehabilitation 19(4): 279-87	- Outcomes Outcomes of interest (functioning [SCIM and FIM]) data presented with insufficient information to conduct analysis.
Kargarfard, Mehdi, Shariat, Ardalan, Ingle, Lee et al. (2018) Randomized Controlled Trial to Examine the Impact of Aquatic Exercise Training on Functional Capacity, Balance, and Perceptions of Fatigue in Female Patients With Multiple Sclerosis. Archives of physical medicine and rehabilitation 99(2): 234-241	- Country Study conducted in Iran.
Kashif, Muhammad, Ahmad, Ashfaq, Bandpei, Muhammad Ali Mohseni et al. (2022) Systematic review of the application of virtual reality to improve balance, gait and motor function in	- Country Systematic review with 3/25 of the included studies conducted in Italy, 1/25 in Hungary, 1/25 in the Netherlands, 1/25 in Slovenia, 1/25 in Spain, 7/25 in Taiwan, 6/25 in Brazil, 2/25 in China, 2/25 in South Korea, and 1/25 in Israel. Italian, Hungarian, Dutch, Slovenian,

Study	Reason for exclusion
patients with Parkinson's disease. Medicine 101(31): e29212	and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Kashif, Muhammad, Ahmad, Ashfaq, Bandpei, Muhammad Ali Mohseni et al. (2022) Combined effects of virtual reality techniques and motor imagery on balance, motor function and activities of daily living in patients with Parkinson's disease: a randomized controlled trial. BMC geriatrics 22(1): 381	- Country Study conducted in Pakistan.
Kashif, Muhammad, Ahmad, Ashfaq, Bandpei, Muhammad Ali Mohseni et al. (2022) A Randomized Controlled Trial of Motor Imagery Combined with Virtual Reality Techniques in Patients with Parkinson's Disease. Journal of personalized medicine 12(3)	- Country Study conducted in Pakistan.
Kashif, Muhammad, Albalwi, Abdulaziz Aoudh, Zulfiqar, Ayesha et al. (2024) Effects of virtual reality versus motor imagery versus routine physical therapy in patients with parkinson's disease: a randomized controlled trial. BMC geriatrics 24(1): 229	- Country Study conducted in Pakistan.
Kasser, S.L. and Jacobs, J.V. (2014) Understanding and treating balance impairment in multiple sclerosis. Journal of Clinical Outcomes Management 21(9): 419-432	- Study design (adults) Case study and non-systematic literature review.
Kawashima, Noriko, Hasegawa, Kazuko, Iijima, Masako et al. (2022) Efficacy of Wearable Device Gait Training on Parkinson's Disease: A Randomized Controlled Open-label Pilot Study. Internal medicine (Tokyo, Japan) 61(17): 2573-2580	- Country Study conducted in Japan.
Kegelmeyer, Deb A, Minarsch, Raquel, Kostyk, Sandra K et al. (2024) Use of a Robotic Walking Device for Home and Community Mobility in Parkinson Disease: A Randomized Controlled Trial. Journal of neurologic physical therapy : JNPT 48(2): 102-111	- Country Study conducted in the US.
Khalid, Sumayya, Alnajjar, Fady, Gochoo, Munkhjargal et al. (2023) Robotic assistive and rehabilitation devices leading to motor recovery in upper limb: a systematic review. Disability and rehabilitation. Assistive technology 18(5): 658-672	- Population Systematic review including participants in protocol (5/28 people with spinal cord injury, 1/28 people with tetraplegia, and 1/28 people with multiple sclerosis) and out or protocol (17/28 adults with stroke, 2/28 people with cerebral palsy, 1/28 healthy adults, and 1/28 older adults). Studies including participants with spinal cord injury, tetraplegia, and multiple sclerosis were checked against protocol

Study	Reason for exclusion
	criteria and were either not relevant or had been separately located by the literature search and screened.
Khalil, Hanan, Al-Sharman, Alham, El-Salem, Khalid et al. (2018) The development and pilot evaluation of virtual reality balance scenarios in people with multiple sclerosis (MS): A feasibility study. NeuroRehabilitation 43(4): 473-482	- Country Study conducted in Jordan.
Khan, Azka; Podlasek, Anna; Somaa, Fahad (2023) Virtual reality in post-stroke neurorehabilitation - a systematic review and meta-analysis. Topics in stroke rehabilitation 30(1): 53-72	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Khan, Fary, Amatya, Bhasker, Bensmail, Djamel et al. (2019) Non-pharmacological interventions for spasticity in adults: An overview of systematic reviews. Annals of physical and rehabilitation medicine 62(4): 265-273	- Population Systematic review of systematic reviews including participants in protocol (1/18 people with acquired brain injury, 1/18 people with multiple sclerosis, and 1/18 people with spinal cord injury), unclear (9/18 people with mixed neurological conditions) and out of protocol (6/18 adults with stroke). Systematic reviews including participants with acquired brain injury, multiple sclerosis, spinal cord injury, and mixed neurological conditions were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Khan, K., Ghous, M., Malik, A.N. et al. (2018) Effects of turning and cognitive training in fall prevention with dual task training in elderly with balance impairment. Rawal Medical Journal 43(1): 124-128	- Country Study conducted in Pakistan.
Khan, Muhammad Ahmed, Fares, Hoda, Ghayvat, Hemant et al. (2023) A systematic review on functional electrical stimulation based rehabilitation systems for upper limb post-stroke recovery. Frontiers in neurology 14: 1272992	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Khurana, Meetika; Walia, Shefali; Noohu, Majumi M (2017) Study on the Effectiveness of Virtual Reality Game-Based Training on Balance and Functional Performance in Individuals with Paraplegia. Topics in spinal cord injury rehabilitation 23(3): 263-270	- Country Study conducted in India.
Kietrys, D.M., Galantino, M.L.A., Belthoff, C. et al. (2014) Physical therapy interventions for individuals with HIV associated distal sensory polyneuropathy: A systematic review. Rehabilitation Oncology 32(3): 52-55	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Kim, E., Kim, H., Yun, S.J. et al. (2023) Effects of gait training on structural brain changes in Parkinson's disease. Restorative	- Country Study conducted in South Korea.

Study	Reason for exclusion
Neurology and Neuroscience 40(46): 271-288	
Kim, Heejae, Kim, Eunkyung, Yun, Seo Jung et al. (2022) Robot-assisted gait training with auditory and visual cues in Parkinson's disease: A randomized controlled trial. Annals of physical and rehabilitation medicine 65(3): 101620	- Country Study conducted in South Korea.
Kimberley, Teresa J, Schmidt, Rebekah L. S, Chen, Mo et al. (2015) Mixed effectiveness of rTMS and retraining in the treatment of focal hand dystonia. Frontiers in Human Neuroscience 9	- Country Study conducted in the US.
King, Laurie A, Wilhelm, Jennifer, Chen, Yiyi et al. (2015) Effects of Group, Individual, and Home Exercise in Persons With Parkinson Disease: A Randomized Clinical Trial. Journal of neurologic physical therapy : JNPT 39(4): 204-12	- Country Study conducted in the US.
Kirton, Adam, Ciechanski, Patrick, Zewdie, Ephrem et al. (2017) Transcranial direct current stimulation for children with perinatal stroke and hemiparesis. Neurology 88(3): 259-267	- Population Children with stroke and cerebral palsy. Not relevant according to protocol population criteria.
Klamroth, Sarah, Gasner, Heiko, Winkler, Jurgen et al. (2019) Interindividual Balance Adaptations in Response to Perturbation Treadmill Training in Persons With Parkinson Disease. Journal of neurologic physical therapy : JNPT 43(4): 224-232	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data not validated scales) and centre of pressure.
Klamroth, Sarah, Steib, Simon, Gasner, Heiko et al. (2016) Immediate effects of perturbation treadmill training on gait and postural control in patients with Parkinson's disease. Gait & posture 50: 102-108	- Outcomes No relevant outcomes reported. Secondary analysis of historical study, comparing intervention responders with intervention non-responders.
Kneis, S, Wehrle, A, Muller, J et al. (2019) It's never too late - balance and endurance training improves functional performance, quality of life, and alleviates neuropathic symptoms in cancer survivors suffering from chemotherapy-induced peripheral neuropathy: results of a randomized controlled trial. BMC cancer 19(1): 414	- Outcomes No relevant outcomes reported. Reports measures of balance (measurement data such as sway path and duration, not measured using validated scales), jumping performance, cardiorespiratory fitness, vibration sense, and quality of life.
Koehler-McNicholas, Sara R, Danzl, Lori, Cataldo, Alana Y et al. (2019) Neuromodulation to improve gait and balance function using a sensory	- Country Study conducted in the US.

Study	Reason for exclusion
neuroprosthesis in people who report insensate feet - A randomized control cross-over study. PloS one 14(4): e0216212	
Kontos, Anthony P, Eagle, Shawn R, Mucha, Anne et al. (2021) A Randomized Controlled Trial of Precision Vestibular Rehabilitation in Adolescents following Concussion: Preliminary Findings. The Journal of pediatrics 239: 193-199	- Country Study conducted in the US.
Kottaras, A., Lytras, D., Kottaras, S. et al. (2021) Effect of aquatic physiotherapy on functioning, balance performance, motor performance, and health-related quality of life in patients with parkinson's disease: A review of structure and dosimetry of aquatic exercise programs. Critical Reviews in Physical and Rehabilitation Medicine 33(1): 67-86	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Kovari, M, Tomaskova, A, Slaby, K et al. (2022) Effects of electrical stimulation according to Jantsch on spasticity – a pilot study. Ceska a slovenska neurologie a neurochirurgie 85(3): 239-244	- Other protocol criteria Czech language article.
Kramer, Andreas; Dettmers, Christian; Gruber, Markus (2014) Exergaming with additional postural demands improves balance and gait in patients with multiple sclerosis as much as conventional balance training and leads to high adherence to home-based balance training. Archives of physical medicine and rehabilitation 95(10): 1803-9	- Study design (adults) Non-randomised controlled trial.
Kressler, Jochen, Nash, Mark S, Burns, Patricia A et al. (2013) Metabolic responses to 4 different body weight-supported locomotor training approaches in persons with incomplete spinal cord injury. Archives of physical medicine and rehabilitation 94(8): 1436-42	- Country Study conducted in the US.
Kumar Goothy, Sai Sailesh, Gawarikar, Sudhir, Choudhary, Anita et al. (2023) Effectiveness of electrical vestibular nerve stimulation on the range of motion in patients with Parkinson's disease. Journal of basic and clinical physiology and pharmacology 34(6): 791-795	- Country Study conducted in India.
Kumari, Radha, Dybus, Aleksandra, Purcell, Mariel et al. (2024) Motor priming to enhance the effect of	- Intervention

Study	Reason for exclusion
physical therapy in people with spinal cord injury. The journal of spinal cord medicine: 1-15	Neuromodulation to address upper limb functioning only, and not to address upper limb functioning, stability, and mobility together.
Kumru, H, Benito-Penalva, J, Valls-Sole, J et al. (2016) Placebo-controlled study of rTMS combined with Lokomat® gait training for treatment in subjects with motor incomplete spinal cord injury. Experimental brain research 234(12): 3447-3455	- Intervention Transcranial magnetic stimulation to address mobility, and not: 1. Electrical stimulation to address mobility. 2. Neuromodulation to address upper limb functioning, stability and mobility together.
Kumru, Hatice, Murillo, Narda, Benito-Penalva, Jesus et al. (2016) Transcranial direct current stimulation is not effective in the motor strength and gait recovery following motor incomplete spinal cord injury during Lokomat(R) gait training. Neuroscience letters 620: 143-7	- Intervention Electrical neuromodulation (anodal transcranial direct current stimulation) to address mobility and lower limb functioning only, and not to address upper limb functioning, stability, and mobility together.
Kuo, Li-Chieh, Yang, Chien-Ju, Lin, Cheng-Feng et al. (2019) Effects of a task-based biofeedback training program on improving sensorimotor function in neuropathic hands in diabetic patients: a randomized controlled trial. European journal of physical and rehabilitation medicine 55(5): 618-626	- Country Study conducted in Taiwan.
Kurt, Emine Eda, Buyukturan, Buket, Buyukturan, Oznur et al. (2018) Effects of Ai Chi on balance, quality of life, functional mobility, and motor impairment in patients with Parkinson's disease. Disability and rehabilitation 40(7): 791-797	- Country Study conducted in Turkey.
Kurt-Aydin, Merve, Savas-Kalender, Dilan, Tarsuslu, Tulay et al. (2024) Feasibility of virtual reality and comparison of its effectiveness to biofeedback in children with Duchenne and Becker muscular dystrophies. Muscle & nerve	- Country Study conducted in Turkey.
Kuwahara, Wataru, Sasaki, Shun, Yamamoto, Rieko et al. (2022) The effects of robot-assisted gait training combined with non-invasive brain stimulation on lower limb function in patients with stroke and spinal cord injury: A systematic review and meta-analysis. Frontiers in human neuroscience 16: 969036	- Population Systematic review including participants in protocol (2/5 people with spinal cord injury) and out of protocol (3/5 adults with stroke). Studies including participants with spinal cord injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Kwok, Jojo Yan Yan, Smith, Robert, Chan, Lily Man Lee et al. (2022) Managing freezing of gait in Parkinson's disease: a systematic	- Intervention Systematic review with mix of interventions in protocol (5/37 treadmill-based gait training, 1/37 dual-task training, and 1/37 robotic-assisted walking), unclear (14/37

Study	Reason for exclusion
review and network meta-analysis. Journal of neurology 269(6): 3310-3324	conventional physiotherapy and 8/37 general exercises) and out of protocol (9/37 mind-body exercises, 7/37 external cueing, 3/37 action observation training, 2/37 real-time biofeedback, 1/37 psychoeducation, and 1/37 obstacle training). Studies investigating treadmill-based gait training, dual-task training, robotic-assisted walking, conventional physiotherapy, and general exercises were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: Adds up to 52 as some included studies were multi-arm trials that investigated multiple interventions.
Kwon, Sun-Ho; Park, Jae Kyung; Koh, Young Ho (2023) A systematic review and meta-analysis on the effect of virtual reality-based rehabilitation for people with Parkinson's disease. Journal of neuroengineering and rehabilitation 20(1): 94	- Country Systematic review with 3/14 of the included studies conducted in Italy, 1/14 in the Netherlands, 5/14 in Brazil, 3/14 in Taiwan, 1/14 in China, and 1/14 in Pakistan. Italian and Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
La Rosa, Giuseppe, Avola, Marianna, Di Gregorio, Tiziana et al. (2023) Gait Recovery in Spinal Cord Injury: A Systematic Review with Metanalysis Involving New Rehabilitative Technologies. Brain sciences 13(5)	- Country Systematic review with 1/18 of the included studies conducted in Denmark, 1/18 in Spain, 1/18 in Switzerland, 10/18 in the US, 2/18 in Turkey, 1/18 in Chile,, 1/12 in Hong Kong, and 1/12 in South Korea. Denmark, Spanish, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Labruyere, Rob and van Hedel, Hubertus J A (2014) Strength training versus robot-assisted gait training after incomplete spinal cord injury: a randomized pilot study in patients depending on walking assistance. Journal of neuroengineering and rehabilitation 11: 4	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Ladenheim, Barbara, Altenburger, Peter, Cardinal, Ryan et al. (2013) The effect of random or sequential presentation of targets during robot-assisted therapy on children. NeuroRehabilitation 33(1): 25-31	- Country Study conducted in the US.
Lahude, Arthur Both, Souza Correa, Philipe, P Cabeleira, Maria Eduarda et al. (2023) The impact of virtual reality on manual dexterity of Parkinson's disease subjects: a systematic review. Disability and rehabilitation. Assistive technology 18(7): 1237-1244	- Study design (adults) Systematic review with 1/18 mixed methods study, 1/8 randomised controlled trial, 4/8 non-comparative studies, and 3/8 non-randomised controlled trials. Randomised controlled trial and mixed methods study were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lajeunesse, Veronique, Vincent, Claude, Routhier, Francois et al. (2016) Exoskeletons' design and usefulness evidence according to a systematic review of lower limb exoskeletons used for functional mobility by people with spinal cord	- Publication date Systematic review with 4/7 studies published 2013 onwards, and 3/7 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
injury. Disability and rehabilitation. Assistive technology 11(7): 535-47	
Lamberti, Nicola, Manfredini, Fabio, Baroni, Andrea et al. (2021) Motor Cortical Activation Assessment in Progressive Multiple Sclerosis Patients Enrolled in Gait Rehabilitation: A Secondary Analysis of the RAGTIME Trial Assisted by Functional Near-Infrared Spectroscopy. Diagnostics (Basel, Switzerland) 11(6)	- Outcomes No relevant outcomes reported. Reports measures of cortical activation.
Lamers, Ilse, Maris, Anneleen, Severijns, Deborah et al. (2016) Upper Limb Rehabilitation in People With Multiple Sclerosis: A Systematic Review. Neurorehabilitation and neural repair 30(8): 773-93	- Publication date Systematic review with 10/30 studies published 2013 onwards, and 20/30 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lamers, Ilse, Raats, Joke, Spaas, Jan et al. (2019) Intensity-dependent clinical effects of an individualized technology-supported task-oriented upper limb training program in Multiple Sclerosis: A pilot randomized controlled trial. Multiple sclerosis and related disorders 34: 119-127	- Intervention Individualised task-oriented training programme to address upper limb functioning, and not: 1. Repetitive task training to address upper limb functioning. 2. Individualised exercise programme to address upper limb functioning, stability and mobility together.
Lamotte, Guillaume, Rafferty, Miriam R, Prodoehl, Janey et al. (2015) Effects of endurance exercise training on the motor and non-motor features of Parkinson's disease: a review. Journal of Parkinson's disease 5(1): 21-41	- Publication date Systematic review with 1/8 studies published 2013 onwards, and 7/8 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Landers, Merrill R, Hatlevig, Rebecca M, Davis, Alyssa D et al. (2016) Does attentional focus during balance training in people with Parkinson's disease affect outcome? A randomised controlled clinical trial. Clinical rehabilitation 30(1): 53-63	- Country Study conducted in the US.
Lazaro, Rolando (2021) The Immediate Effect of Trunk Weighting on Balance and Functional Measures of People with Parkinson's Disease: A Feasibility Study. Journal of allied health 50(1): 38-46	- Country Study conducted in the US.
Lee, Jae-Hyoung, Baker, Lucinda L, Johnson, Robert E et al. (2017) Effectiveness of neuromuscular electrical stimulation for management of shoulder subluxation post-stroke: A systematic review with meta-analysis. Clinical Rehabilitation 31(11): 1431-1444	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Lee, K.E. and Jeoung, B. (2023) An analysis of the effectiveness of	- Country

Study	Reason for exclusion
rehabilitation protocols for patients with spinal cord injury: A systematic review. Journal of Public Health (Germany)	Systematic review with 1/17 of the included studies conducted in Norway, 13/17 in the US, 1/17 in Brazil, 1/17 in Iran, and 1/17 in South Korea. Norwegian study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Lee, SA and Kim, MK (2021) The Effect of Transcranial Direct Current Stimulation Combined with Visual Cueing Training on Motor Function, Balance, and Gait Ability of Patients with Parkinson's Disease. Medicina (Kaunas, Lithuania) 57(11)	- Country Study conducted in South Korea.
Lee, Ya-Yun; Tai, Chun-Hwei; Fisher, Beth E (2022) Training in Varying Environmental Contexts Facilitates Transfer of Improved Gait Performance to New Contexts for Individuals With Parkinson Disease: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 103(10): 1917-1923	- Country Study conducted in Taiwan.
Lefaivre, S.C.; Brown, M.J.N.; Almeida, Q.J. (2016) Cerebellar involvement in Parkinson's disease resting tremor. Cerebellum and Ataxias 3(1): 13	- Intervention Transcranial magnetic stimulation to address upper limb function, and not electrical stimulation.
Lefeber, Nina; Swinnen, Eva; Kerckhofs, Eric (2017) The immediate effects of robot-assistance on energy consumption and cardiorespiratory load during walking compared to walking without robot-assistance: a systematic review. Disability and rehabilitation. Assistive technology 12(7): 657-671	- Publication date Systematic review with 6/14 studies published 2013 onwards, and 8/14 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lefmann, S.; Russo, R.; Hillier, S. (2017) The effectiveness of robotic-assisted gait training for paediatric gait disorders: Systematic review. Journal of NeuroEngineering and Rehabilitation 14(1): 1	- Publication date Systematic review with 6/17 studies published 2013 onwards, and 11/17 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lei, Cheng, Sunzi, Kejimu, Dai, Fengling et al. (2019) Effects of virtual reality rehabilitation training on gait and balance in patients with Parkinson's disease: A systematic review. PloS one 14(11): e0224819	- Country Systematic review with 1/16 of the included studies conducted in Italy, 1/16 in the Netherlands, 5/16 in Brazil, 4/16 in Taiwan, 2/16 in China, 1/16 in Hong Konh, 1/16 in South Korea, and 1/16 in Turkey. Italian and Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: Studies noted as being conducted in China were not explicitly stated as such but were published in Chinese language journals and could not be located using an English-language search engine.
Lena, Francesco, Modugno, Nicola, Greco, Giulio et al. (2023)	- Outcomes

Study	Reason for exclusion
Rehabilitation Interventions for Improving Balance in Parkinson's Disease: A Narrative Review. American journal of physical medicine & rehabilitation 102(3): 270-274	Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Leone, Enza, Pandyan, Anand, Rogers, Alison et al. (2023) Effectiveness of conservative non-pharmacological interventions in people with muscular dystrophies: a systematic review and meta-analysis. Journal of neurology, neurosurgery, and psychiatry	- Study design (adults) Systematic review with 15/39 randomised controlled trials, 18/39 non-controlled studies, 4/39 non-randomised controlled trials, 1/39 case series, and 1/39 retrospective studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Li, Chunxiao; Khoo, Selina; Adnan, Athirah (2017) Effects of aquatic exercise on physical function and fitness among people with spinal cord injury: A systematic review. Medicine 96(11): e6328	- Publication date Systematic review with 3/8 studies published 2013 onwards, and 5/8 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Li, Kuan-Yi; Cho, Yu-Ju; Chen, Rou-Shayn (2021) The Effect of Whole-Body Vibration on Proprioception and Motor Function for Individuals with Moderate Parkinson Disease: A Single-Blind Randomized Controlled Trial. Occupational therapy international 2021: 9441366	- Country Study conducted in Taiwan.
Li, Ling-Ling, Wu, Jia-Jia, Li, Kun-Peng et al. (2024) Comparative efficacy of different noninvasive brain stimulation protocols on upper-extremity motor function and activities of daily living after stroke: a systematic review and network meta-analysis. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Li, Ran, Ding, Mingfu, Wang, Jiao et al. (2023) Effectiveness of robotic-assisted gait training on cardiopulmonary fitness and exercise capacity for incomplete spinal cord injury: A systematic review and meta-analysis of randomized controlled trials. Clinical rehabilitation 37(3): 312-329	- Country Systematic review with 2/19 of the included studies conducted in Spain, 1/19 in Canada, 1/19 in Norway, 11/19 in the US, 1/19 in Hong Kong, 1/19 in South Africa, and 1/19 in South Korea, and 1/19 in Turkey. Spanish, Canadian, and Norwegian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Li, Runze, Zhang, Yanran, Jiang, Yunxia et al. (2021) Rehabilitation training based on virtual reality for patients with Parkinson's disease in improving balance, quality of life, activities of daily living, and depressive symptoms: A systematic review and meta-regression analysis.	- Country Systematic review with 3/22 of the included studies conducted in Italy, 2/22 in Hungary, 1/22 in Australia, 1/22 in the Netherlands, 6/22 in China, 5/22 in Brazil, 3/22 in Taiwan, and 1/22 in South Korea. Italian, Hungarian, Australian, and Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Clinical rehabilitation 35(8): 1089-1102	
Li, Zhenlan, Wang, Tian, Liu, Haoyang et al. (2020) Dual-task training on gait, motor symptoms, and balance in patients with Parkinson's disease: a systematic review and meta-analysis. Clinical rehabilitation 34(11): 1355-1367	- Study design (adults) Systematic review with 11/17 randomised controlled trials and 6/17 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Liao, Y.-Y., Yang, Y.-R., Wu, Y.-R. et al. (2015) Virtual Reality-Based Wii Fit Training in Improving Muscle Strength, Sensory Integration Ability, and Walking Abilities in Patients with Parkinson's Disease: A Randomized Control Trial. International Journal of Gerontology 9(4): 190-195	- Country Study conducted in Taiwan.
Liao, Ying-Yi, Yang, Yea-Ru, Cheng, Shih-Jung et al. (2015) Virtual Reality-Based Training to Improve Obstacle-Crossing Performance and Dynamic Balance in Patients With Parkinson's Disease. Neurorehabilitation and neural repair 29(7): 658-67	- Country Study conducted in Taiwan.
Lima de Albuquerque, Lidio, Pantovic, Milan, Clingo, Mitchel et al. (2020) An Acute Application of Cerebellar Transcranial Direct Current Stimulation Does Not Improve Motor Performance in Parkinson's Disease. Brain sciences 10(10)	- Country Study conducted in the US.
Lin, B.-S., Zhang, Z., Peng, C.-W. et al. (2023) Effectiveness of Repetitive Transcranial Magnetic Stimulation Combined with Transspinal Electrical Stimulation on Corticospinal Excitability for Individuals with Incomplete Spinal Cord Injury: A Pilot Study. IEEE Transactions on Neural Systems and Rehabilitation Engineering 31: 4790-4800	- Country Study conducted in Taiwan.
Lin, Wen-Li, Wang, Ruey-Hsia, Chou, Fan-Hao et al. (2021) The effects of exercise on chemotherapy-induced peripheral neuropathy symptoms in cancer patients: a systematic review and meta-analysis. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer 29(9): 5303-5311	- Country Systematic review with 2/5 of the included studies conducted in Germany, 1/5 in Canada, 1/5 in India, and 1/5 in the US. German and Canadian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lina, Chen, Guoen, Cai, Huidan, Weng et al. (2020) The Effect of Virtual Reality on the Ability to Perform Activities of Daily Living, Balance During Gait, and Motor	- Country Systematic review with 2/12 of the included studies conducted in Italy, 5/12 in China, 4/12 in Brazil, and 1/12 in South Korea. Italian studies were checked against protocol

Study	Reason for exclusion
Function in Parkinson Disease Patients: A Systematic Review and Meta-Analysis. American journal of physical medicine & rehabilitation 99(10): 917-924	criteria and were either not relevant or had been separately located by the literature search and screened.
Lindblad, Katarina; Bergkvist, Leif; Johansson, Ann-Christin (2016) Evaluation of the treatment of chronic chemotherapy-induced peripheral neuropathy using long-wave diathermy and interferential currents: a randomized controlled trial. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer 24(6): 2523-31	- Intervention Interferential therapy and long-wave diathermy, and not neuromodulation (electrical/vibratory).
Liu, Hongju, Li, Jianjun, Du, Liangjie et al. (2019) Short-term effects of core stability training on the balance and ambulation function of individuals with chronic spinal cord injury: a pilot randomized controlled trial. Minerva medica 110(3): 216-223	- Country Study conducted in China.
Liu, Hsin-Hsuan, Wang, Ray-Yau, Cheng, Shih-Jung et al. (2022) Balance Training Modulates Cortical Inhibition in Individuals with Parkinson's Disease: A Randomized Controlled Trial. Neurorehabilitation and neural repair 36(9): 613-620	- Country Study conducted in Taiwan.
Liu, Wentan and Chen, Jianer (2023) The efficacy of exoskeleton robotic training on ambulation recovery in patients with spinal cord injury: A meta-analysis. The journal of spinal cord medicine: 1-10	- Country Systematic review with 2/11 of the included studies conducted in Spain, 1/11 in Canada, 1/11 in Norway, 3/11 in Turkey, 2/11 in the US, 1/11 in China, and 1/11 in South Korea. Spanish, Canadian, and Norwegian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Liu, Zicai, Huang, Miao, Liao, Ya et al. (2023) Long-term efficacy of hydrotherapy on balance function in patients with Parkinson's disease: a systematic review and meta-analysis. Frontiers in aging neuroscience 15: 1320240	- Intervention Systematic review investigating hydrotherapy to address stability, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Llorens, R., Albiol, S., Gil-Gomez, J.-A. et al. (2014) Balance rehabilitation using custom-made Wii Balance Board exercises: Clinical effectiveness and maintenance of gains in an acquired brain injury population. International Journal on Disability and Human Development 13(3): 327-332	- Population Mixed population including participants in protocol (3/17 people with traumatic brain injury and 3/17 people with benign cerebral neoplasm) and out of protocol (11/17 adults with stroke). Results not presented separately for target population.
Lopez-Liria, Remedios, Vega-Tirado, Sofia, Valverde-Martinez, Maria	- Intervention

Study	Reason for exclusion
Angeles et al. (2023) Efficacy of Specific Trunk Exercises in the Balance Dysfunction of Patients with Parkinson's Disease: A Systematic Review and Meta-Analysis. Sensors (Basel, Switzerland) 23(4)	Systematic review with mix of interventions in protocol (4/9 trunk stabilisation and mobility exercises, and 1/9 trunk stabilisation and mobility exercises plus other balance exercises plus gait exercises) and out of protocol (2/9 falls prevention interventions, trunk stabilisation and mobility exercises plus respiratory exercises, 1/9 trunk stabilisation and mobility exercises plus taping). Studies investigating trunk stabilisation and mobility exercises, balance exercises, and gait exercises were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Loprinzi, Charles, Le-Rademacher, Jennifer G, Majithia, Neil et al. (2020) Scrambler therapy for chemotherapy neuropathy: a randomized phase II pilot trial. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer 28(3): 1183-1197	- Country Study conducted in the US.
Lorenzo-Garcia, Patricia, Cavero-Redondo, Ivan, Nunez de Arenas-Arroyo, Sergio et al. (2024) Effects of physical exercise interventions on balance, postural stability and general mobility in Parkinson's disease: a network meta-analysis. Journal of rehabilitation medicine 56: jrm10329	- Country Systematic review with 11/86 of the included studies conducted in Italy, 5/86 in Australia, 4/86 in Spain, 4/86 in Sweden, 3/86 in Canada, 3/86 in Hungary, 3/86 in the UK, 2/86 in Germany, 2/86 in the Netherlands, 1/86 in Belgium, 1/86 in Poland, 11/86 in the US, 10/86 in China, 7/86 in Brazil, 5/86 in South Korea, 4/86 in Turkey, 3/86 in Taiwan, 2/86 in India, 2/86 in Iran, 1/86 in Hong Kong, 1/86 in Jordan, and 1/86 in Turkey. Italian, Australian, Spanish, Swedish, Canadian, Hungarian, UK, German, Dutch, Belgian, and Polish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lorenzo-Garcia, Patricia, Cavero-Redondo, Ivan, Torres-Costoso, Ana Isabel et al. (2021) Body Weight Support Gait Training for Patients With Parkinson Disease: A Systematic Review and Meta-analyses. Archives of physical medicine and rehabilitation 102(10): 2012-2021	- Country Systematic review with 6/12 of the included studies conducted in Italy, 2/12 in India, 2/12 in Japan, 1/12 in Turkey, and 1/12 in the US. Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lorenzo-Garcia, Patricia, Nunez de Arenas-Arroyo, Sergio, Cavero-Redondo, Ivan et al. (2023) Physical Exercise Interventions on Quality of Life in Parkinson Disease: A Network Meta-analysis. Journal of neurologic physical therapy : JNPT 47(2): 64-74	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of quality of life. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Lotfi, Yones, Farahani, Akram, Azimiyan, Mojtaba et al. (2021) Comparison of efficacy of vestibular rehabilitation and noisy galvanic vestibular stimulation to improve dizziness and balance in patients with multiple sclerosis. Journal of vestibular research : equilibrium & orientation 31(6): 541-551	- Country Study conducted in Iran.

Study	Reason for exclusion
Louie, Dennis R, Eng, Janice J, Lam, Tania et al. (2015) Gait speed using powered robotic exoskeletons after spinal cord injury: a systematic review and correlational study. Journal of neuroengineering and rehabilitation 12: 82	- Study design (adults) Systematic review including non-controlled studies. No studies checked against protocol criteria as did not include any randomised controlled trials or systematic reviews.
Loyd, Brian J, Fangman, Annie, Peterson, Daniel S et al. (2022) Rehabilitation to Improve Gaze and Postural Stability in People With Multiple Sclerosis: A Randomized Clinical Trial. Neurorehabilitation and neural repair 36(1011): 678-688	- Country Study conducted in the US.
Lu, C., Amundsen Huffmaster, S.L., Tuite, P.J. et al. (2018) The effects of anodal tDCS over the supplementary motor area on gait initiation in Parkinson's disease with freezing of gait: a pilot study. Journal of Neurology 265(9): 2023-2032	- Country Study conducted in the US.
Lu, Xiao, Battistuzzo, Camilla R, Zoghi, Maryam et al. (2015) Effects of training on upper limb function after cervical spinal cord injury: a systematic review. Clinical rehabilitation 29(1): 3-13	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Luna, Natalia Mariana Silva, Brech, Guilherme Carlos, Canonica, Alexandra et al. (2020) Effects of treadmill training on gait of elders with Parkinson's disease: a literature review. Einstein (Sao Paulo, Brazil) 18: erw5233	- Study design (adults) Non-systematic literature review.
Ma, Da-Nian, Zhang, Xia-Qi, Ying, Jie et al. (2017) Efficacy and safety of 9 nonoperative regimens for the treatment of spinal cord injury: A network meta-analysis. Medicine 96(47): e8679	- Country Systematic review with 2/9 of the included studies conducted in Spain, 5/9 in the US, 1/9 in India, and 1/9 in South Korea. Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ma, Ting-Ting, Zhang, Qi, Zhou, Tian-Tian et al. (2022) Effects of robotic-assisted gait training on motor function and walking ability in children with thoracolumbar incomplete spinal cord injury. NeuroRehabilitation 51(3): 499-508	- Country Study conducted in China.
Maggio, Maria Grazia, Naro, Antonino, De Luca, Rosaria et al. (2022) Body Representation in Patients with Severe Spinal Cord Injury: A Pilot Study on the Promising Role of Powered Exoskeleton for Gait Training. Journal of personalized medicine 12(4)	- Outcomes No relevant outcomes reported. Reports measures of body uneasiness, quality of life, and depressive symptoms.

Study	Reason for exclusion
Maggio, Maria Grazia, Russo, Margherita, Cuzzola, Marilena Foti et al. (2019) Virtual reality in multiple sclerosis rehabilitation: A review on cognitive and motor outcomes. Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia 65: 106-111	- Study design (adults) Non-systematic literature review.
Maggio, Maria Grazia, Stagnitti, Maria Chiara, Rizzo, Erika et al. (2023) Limb apraxia in individuals with multiple sclerosis: Is there a role of semi-immersive virtual reality in treating the Cinderella of neuropsychology?. Multiple sclerosis and related disorders 69: 104405	- Intervention Semi-immersive virtual reality to address upper limb functioning only and not upper limb functioning, stability, and mobility together.
Maidan, Inbal, Nieuwhof, Freek, Bernad-Elazari, Hagar et al. (2018) Evidence for Differential Effects of 2 Forms of Exercise on Prefrontal Plasticity During Walking in Parkinson's Disease. Neurorehabilitation and neural repair 32(3): 200-208	- Country Conducted in countries in protocol (17/64 participants recruited from the Netherlands) and out of protocol (47/64 participants recruited from Israel). Results not presented separately for target country.
Mak, Margaret K Y and Wong-Yu, Irene S K (2021) Six-Month Community-Based Brisk Walking and Balance Exercise Alleviates Motor Symptoms and Promotes Functions in People with Parkinson's Disease: A Randomized Controlled Trial. Journal of Parkinson's disease 11(3): 1431-1441	- Country Study conducted in Hong Kong.
Manfredini, Fabio, Straudi, Sofia, Lamberti, Nicola et al. (2020) Rehabilitation Improves Mitochondrial Energetics in Progressive Multiple Sclerosis: The Significant Role of Robot-Assisted Gait Training and of the Personalized Intensity. Diagnostics (Basel, Switzerland) 10(10)	- Duplicate Same study as Straudi 2020 (included study), with no new data presented.
Mansfield, Avril, Wong, Jennifer S, Bryce, Jessica et al. (2015) Does perturbation-based balance training prevent falls? Systematic review and meta-analysis of preliminary randomized controlled trials. Physical therapy 95(5): 700-9	- Publication date Systematic review with 3/8 studies published 2013 onwards, and 5/8 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mansour, W.T.; Atya, A.M.; Aboumousa, A.M. (2013) Improving gait and balance in multiple sclerosis using partial body weight supported treadmill training. Egyptian Journal of Neurology, Psychiatry and Neurosurgery 50(3): 271-276	- Country Study conducted in Egypt.

Study	Reason for exclusion
Marcos-Anton, S., Jardon-Huete, A., Ona-Simbana, E.D. et al. (2023) sEMG-controlled forearm bracelet and serious game-based rehabilitation for training manual dexterity in people with multiple sclerosis: a randomised controlled trial. Journal of NeuroEngineering and Rehabilitation 20(1): 110	- Intervention Serious game with arm motion sensor to address upper limb functioning only, and not to address upper limb functioning, stability, and mobility together.
Marotta, Nicola, de Sire, Alessandro, Marinaro, Cinzia et al. (2022) Efficacy of Transcranial Direct Current Stimulation (tDCS) on Balance and Gait in Multiple Sclerosis Patients: A Machine Learning Approach. Journal of clinical medicine 11(12)	- Country Systematic review with 1/8 of the included studies conducted in Australia, 1/8 in Hungary, 4/8 in Brazil, and 2/8 in Taiwan. Australian and Hungarian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Marotta, Nicola, Demeco, Andrea, Indino, Angelo et al. (2022) Nintendo WiiTM versus Xbox KinectTM for functional locomotion in people with Parkinson's disease: a systematic review and network meta-analysis. Disability and rehabilitation 44(3): 331-336	- Intervention Transcranial direct current stimulation to address stability and mobility only, and not to address upper limb functioning, stability, and mobility together.
Marquer, A; Barbieri, G; Perennou, D (2014) The assessment and treatment of postural disorders in cerebellar ataxia: a systematic review. Annals of physical and rehabilitation medicine 57(2): 67-78	- Study design (adults) Systematic review with 3/19 randomised controlled trials, 12/19 non-randomised trials, and 4/19 case studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Martin-Nunez, Javier, Calvache-Mateo, Andres, Lopez-Lopez, Laura et al. (2023) Effects of Exercise-Based Interventions on Physical Activity Levels in Persons With Parkinson's Disease: A Systematic Review With Meta-analysis. Journal of geriatric physical therapy (2001) 46(4): 207-213	- Intervention Systematic review with mix of interventions in protocol (3/6 balance exercises), unclear (1/6 multimodal exercise) and out of protocol (2/6 aerobic exercise). Studies investigating balance exercises and multimodal exercises were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Martin-Valero, Rocio; Zamora-Pascual, Noelia; Armenta-Peinado, Juan Antonio (2014) Training of respiratory muscles in patients with multiple sclerosis: a systematic review. Respiratory care 59(11): 1764-72	- Publication date Systematic review with 1/15 studies published 2013 onwards, and 14/15 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Martinez, Stephanie A, Nguyen, Nhuquynh D, Bailey, Eric et al. (2018) Multimodal cortical and subcortical exercise compared with treadmill training for spinal cord injury. PloS one 13(8): e0202130	- Country Study conducted in the US.
Martino Cinnera, Alex, Bisirri, Alessio, Leone, Enza et al. (2021) Effect of dual-task training on balance in patients with multiple sclerosis: A	- Country Systematic review with 2/13 of the included studies conducted in Italy, 1/13 in Australia, 1/13 in Belgium, 1/13 in Germany, 1/13 in Spain, 1/13 in Sweden, 3/13 in Iran,

Study	Reason for exclusion
systematic review and meta-analysis. Clinical rehabilitation 35(10): 1399-1412	1/13 Brazil, 1/13 in Turkey, and 1/13 in the US. Italian, Australian, Belgian, German, Spanish, and Swedish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Massetti, Thais, da Silva, Talita Dias, Crocetta, Tania Brusque et al. (2018) The Clinical Utility of Virtual Reality in Neurorehabilitation: A Systematic Review. Journal of central nervous system disease 10: 1179573518813541	- Population Systematic review of systematic reviews including participants in protocol (2/37 people with spinal cord injury, 1/37 people with ataxia, 1/37 people with multiple sclerosis, and 1/37 people with Parkinson's disease), unclear (3/37 people with lower limb rehabilitation needs, 3/37 people with upper limb rehabilitation needs, 1/37 children with cerebral palsy, paediatric stroke and traumatic brain injury, and 1/37 people with postural rehabilitation needs) and out of protocol (16/37 adults with stroke, 1/37 people with attention deficit hyperactivity disorder, 1/37 people with cerebral palsy, 1/37 people with cerebral palsy and dyspraxia, 1/37 people with dyslexia, 1/37 people with epilepsy, 1/37 people with motion sickness, 2/37 undefined participants). Systematic reviews including participants with spinal cord injury, ataxia, multiple sclerosis, Parkinson's disease, lower limb rehabilitation needs, upper limb rehabilitation needs, paediatric stroke and traumatic brain, and postural rehabilitation needs were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Massetti, Thais, Trevizan, Isabela Lopes, Arab, Claudia et al. (2016) Virtual reality in multiple sclerosis - A systematic review. Multiple sclerosis and related disorders 8: 107-12	- Publication date Systematic review with 6/10 studies published 2013 onwards, and 4/10 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mate, Suzanne, Sinan-Fornusek, Canan, Dhopte, Prakash et al. (2023) Effects of Functional Electrical Stimulation Cycling Combined With Arm Cranking Exercise on Cardiorespiratory Fitness in People With Central Nervous System Disorders: A Systematic Review and Meta-analysis. Archives of physical medicine and rehabilitation 104(11): 1928-1940	- Publication date Systematic review with 4/13 studies published 2013 onwards, and 9/13 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mateo, Sebastien, Di Marco, Julie, Cucherat, Michel et al. (2020) Inconclusive efficacy of intervention on upper-limb function after tetraplegia: A systematic review and meta-analysis. Annals of physical and rehabilitation medicine 63(3): 230-240	- Publication date Systematic review with 11/29 studies published 2013 onwards, and 18/29 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mayo, Nancy E, Bayley, Mark, Duquette, Pierre et al. (2013) The role of exercise in modifying outcomes for people with multiple sclerosis: a randomized trial. BMC neurology 13: 69	- Publication type Study protocol.

Study	Reason for exclusion
Mayo, Nancy E, Mate, Kedar Kv, Reid, Ryan et al. (2020) Participation in and outcomes from a 12-month tailored exercise programme for people with multiple sclerosis (MSTEP©): a randomized trial. Clinical rehabilitation 34(7): 927-937	- Comparator Education control, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Mazhar, Tahzeeb, Jameel, Ayesha, Sharif, Faiza et al. (2023) Effects of conventional physical therapy with and without proprioceptive neuromuscular facilitation on balance, gait, and function in patients with Parkinson's disease. JPMA. The Journal of the Pakistan Medical Association 73(6): 1280-1283	- Country Study conducted in Pakistan.
McClanachan, Nelson J, Gesch, Janelle, Wuthapanich, Nampech et al. (2013) Feasibility of gaming console exercise and its effect on endurance, gait and balance in people with an acquired brain injury. Brain injury 27(12): 1402-8	- Population Unclear population. Participants included people with traumatic brain injury, adults with stroke and people with aterio-venous malformation resection. Proportions not reported and results not presented separately for target population.
McGibbon, Chris A; Sexton, Andrew; Gryfe, Pearl (2024) Exercising with a robotic exoskeleton can improve memory and gait in people with Parkinson's disease by facilitating progressive exercise intensity. Scientific reports 14(1): 4417	- Intervention Robotic exoskeleton for stability and mobility only, and not to address upper limb functioning, stability and mobility together.
McGibbon, Chris A, Sexton, Andrew, Jayaraman, Arun et al. (2018) Evaluation of the Keeogo exoskeleton for assisting ambulatory activities in people with multiple sclerosis: an open-label, randomized, cross-over trial. Journal of neuroengineering and rehabilitation 15(1): 117	- Study design (adults) Crossover randomised controlled trial with no longitudinal aspect to first intervention period. It simply consisted of participants performing assessment test with or without exoskeleton.
McGibbon, Chris, Sexton, Andrew, Gryfe, Pearl et al. (2023) Effect of using of a lower-extremity exoskeleton on disability of people with multiple sclerosis. Disability and rehabilitation. Assistive technology 18(5): 475-482	- Outcomes Data only reported for complete experimental sample rather than separately for intervention and control groups, so unable to perform comparative analysis.
McLoughlin, James V, Lord, Stephen R, Barr, Christopher J et al. (2015) Dorsiflexion assist orthosis reduces the physiological cost and mitigates deterioration in strength and balance associated with walking in people with multiple sclerosis. Archives of physical medicine and rehabilitation 96(2): 226-232e1	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Megia Garcia, Alvaro, Serrano-Munoz, Diego, Taylor, Julian et al.	- Study design (adults)

Study	Reason for exclusion
(2020) Transcutaneous Spinal Cord Stimulation and Motor Rehabilitation in Spinal Cord Injury: A Systematic Review. Neurorehabilitation and neural repair 34(1): 3-12	Systematic review with 2/13 randomised controlled trials, 6/13 case series, and 5/13 case reports. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mehrholz, J, Harvey, L A, Thomas, S et al. (2017) Is body-weight-supported treadmill training or robotic-assisted gait training superior to overground gait training and other forms of physiotherapy in people with spinal cord injury? A systematic review. Spinal cord 55(8): 722-729	- Publication date Systematic review with 9/16 studies published 2013 onwards, and 7/16 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mehrholz, Jan, Kugler, Joachim, Storch, Alexander et al. (2015) Treadmill training for patients with Parkinson's disease. The Cochrane database of systematic reviews: cd007830	- Publication date Systematic review with 6/18 studies published 2013 onwards, and 12/18 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Melese, Haimanot, Alamer, Abayneh, Hailu Temesgen, Melaku et al. (2020) Effectiveness of Exercise Therapy on Gait Function in Diabetic Peripheral Neuropathy Patients: A Systematic Review of Randomized Controlled Trials. Diabetes, metabolic syndrome and obesity : targets and therapy 13: 2753-2764	- Country Systematic review with 1/9 of the included studies conducted in the Netherlands, 1/9 in Italy, 1/9 in Switzerland, 2/9 in Egypt, 2/9 in the US, 1/9 in Brazil, and 1/9 in Japan. Dutch, Italian, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Melo, G., Kleiner, A.F.R., Lopes, J. et al. (2018) P100 - Effects of virtual reality training on mobility in individuals with Parkinson's disease. Gait and Posture 65(supplement1): 394-395	- Country Study conducted in Brazil.
Menon, Vikas, Varadharajan, Natarajan, Bascarane, Sharmi et al. (2023) Efficacy of repetitive transcranial magnetic stimulation and transcranial direct current stimulation in focal hand dystonia: Systematic review of intervention trials. Asian journal of psychiatry 80: 103437	- Study design (adults) Systematic review with 8/14 randomised controlled trials and 6/14 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Methajarunon, Pichanan, Eitivipart, Chachris, Diver, Claire J et al. (2016) Systematic review of published studies on aquatic exercise for balance in patients with multiple sclerosis, Parkinson's disease, and hemiplegia. Hong Kong physiotherapy journal : official publication of the Hong Kong Physiotherapy Association Limited = Wu li chih liao 35: 12-20	- Study design (adults) Systematic review with 4/8 randomised controlled trials, 2/8 non-controlled studies, and 2/8 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Midik, Melike, Paker, Nurdan, Bugdayci, Derya et al. (2020) Effects of robot-assisted gait training on lower	- Country Study conducted in Turkey.

Study	Reason for exclusion
extremity strength, functional independence, and walking function in men with incomplete traumatic spinal cord injury. Turkish journal of physical medicine and rehabilitation 66(1): 54-59	
Miguel-Rubio, Amaranta De, Rubio, M Dolores, Salazar, Alejandro et al. (2020) Is Virtual Reality Effective for Balance Recovery in Patients with Spinal Cord Injury? A Systematic Review and Meta-Analysis. Journal of clinical medicine 9(9)	- Intervention Systematic review investigating virtual reality to address stability only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Miller Renfrew, Linda, Lord, Anna C, McFadyen, Angus K et al. (2018) A comparison of the initial orthotic effects of functional electrical stimulation and ankle-foot orthoses on the speed and oxygen cost of gait in multiple sclerosis. Journal of rehabilitation and assistive technologies engineering 5: 2055668318755071	- Duplicate Same study as Renfrew 2019 (included study), with no new data presented.
Miller Renfrew, Linda, Lord, Anna C, Warren, Jake et al. (2019) Evaluating the Effect of Functional Electrical Stimulation Used for Foot Drop on Aspects of Health-Related Quality of Life in People with Multiple Sclerosis: A Systematic Review. International journal of MS care 21(4): 173-182	- Study design (adults) Systematic review with 2/8 randomised controlled trials, 3/8 non-randomised controlled trials, and 3/8 observational studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Miller, Linda, McFadyen, Angus, Lord, Anna C et al. (2017) Functional Electrical Stimulation for Foot Drop in Multiple Sclerosis: A Systematic Review and Meta-Analysis of the Effect on Gait Speed. Archives of physical medicine and rehabilitation 98(7): 1435-1452	- Study design (adults) Systematic review with 2/19 randomised controlled trials, 8/19 non-randomised controlled trials, and 9/19 observational studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Milne, S.C., Corben, L.A., Georgiou-Karistianis, N. et al. (2017) Rehabilitation for Individuals with Genetic Degenerative Ataxia: A Systematic Review. Neurorehabilitation and Neural Repair 31(7): 609-622	- Study design (adults) Systematic review with 4/16 randomised controlled trials, 6/16 case series, 5/16 non-controlled studies, and 1/16 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mirbagheri, Mehdi M (2015) Comparison between the therapeutic effects of robotic-assisted locomotor training and an anti-spastic medication on spasticity. Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual	- Publication type Conference abstract.

Study	Reason for exclusion
International Conference 2015: 4675-8	
Mirelman, A.; Maidan, I.; Deutsch, J.E. (2013) Virtual reality and motor imagery: Promising tools for assessment and therapy in Parkinson's disease. Movement Disorders 28(11): 1597-1608	- Publication date Systematic review with 6/16 studies published 2013 onwards, and 10/16 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mirkowski, Magdalena, McIntyre, Amanda, Faltynek, Pavlina et al. (2019) Nonpharmacological rehabilitation interventions for motor and cognitive outcomes following pediatric stroke: a systematic review. European journal of pediatrics 178(4): 433-454	- Publication date Systematic review with 10/18 studies published 2013 onwards, and 8/18 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Moeinzadeh, Amir Majid, Calder, Allyson, Petersen, Carl et al. (2023) Comparing virtual reality exergaming with conventional exercise in rehabilitation of people with multiple sclerosis: A systematic review. Neuropsychological rehabilitation 33(8): 1430-1455	- Country Systematic review with 4/14 of the included studies conducted in Spain, 1/14 in Germany, 1/14 in Hungary, 1/14 in the UK, 2/14 in Iran, and 2/14 in Turkey. Spanish, German, Hungarian, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Moggio, L., de Sire, A., Marotta, N. et al. (2022) Exoskeleton versus end-effector robot-assisted therapy for finger-hand motor recovery in stroke survivors: systematic review and meta-analysis. Topics in Stroke Rehabilitation 29(8): 539-550	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Mohammadkhanbeigi, Sima, Tabrizi, Yousef Moghadas, Nabavi, Seyed Massood et al. (2022) The comparable effect of tDCS and core exercises on balance and mobility in patients with multiple sclerosis. Iranian Rehabilitation Journal 20(4): 569-578	- Country Study conducted in Iran.
Molhemi, Farshad, Mehravar, Mohammad, Monjezi, Saeideh et al. (2023) Effects of exergaming on cognition, lower limb functional coordination, and stepping time in people with multiple sclerosis: a randomized controlled trial. Disability and rehabilitation 45(8): 1343-1351	- Country Study conducted in Iran.
Momsen, A.-M.H.; Ortenblad, L.; Maribo, T. (2022) Effective rehabilitation interventions and participation among people with multiple sclerosis: An overview of reviews. Annals of Physical and Rehabilitation Medicine 65(1): 101529	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mondal, B., Choudhury, S., Banerjee, R. et al. (2021) Non-invasive vagus	- Other protocol criteria Article retracted November 2022.

Study	Reason for exclusion
nerve stimulation improves clinical and molecular biomarkers of Parkinson's disease in patients with freezing of gait. npj Parkinson's Disease 7(1): 46	
Monjezi, Saeideh, Molhemi, Farshad, Shaterzadeh-Yazdi, Mohammad-Jafar et al. (2023) Perturbation-based Balance Training to improve postural responses and falls in people with multiple sclerosis: a randomized controlled trial. Disability and rehabilitation 45(22): 3649-3655	- Country Study conducted in Iran.
Montero, S.M. and Gomez-Conesa, A. (2014) Technical devices in children with motor disabilities: A review. Disability and Rehabilitation: Assistive Technology 9(1): 3-11	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Monticone, Marco, Ambrosini, Emilia, Laurini, Alessandro et al. (2015) In-patient multidisciplinary rehabilitation for Parkinson's disease: A randomized controlled trial. Movement disorders : official journal of the Movement Disorder Society 30(8): 1050-8	- Intervention Standardised inpatient multidisciplinary rehabilitative programme, and not an individualised exercise programme.
Moon, J.-H.; Jung, J.-H.; Cho, H.-Y. (2020) Effects of balance training using a wii fit balance board on balance, gait and activities of daily living in patients with parkinson disease: A pilot, randomized controlled trial. Medico-Legal Update 20(1): 1799-1803	- Country Study conducted in South Korea.
Morawietz, Christina and Moffat, Fiona (2013) Effects of locomotor training after incomplete spinal cord injury: a systematic review. Archives of physical medicine and rehabilitation 94(11): 2297-308	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Moreira, Marcela Cavalcanti, de Amorim Lima, Anne Michelle, Ferraz, Karla Monica et al. (2013) Use of virtual reality in gait recovery among post stroke patients--a systematic literature review. Disability and rehabilitation. Assistive technology 8(5): 357-62	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Morelli, Nathan and Morelli, Haley (2021) Dual task training effects on gait and balance outcomes in multiple sclerosis: A systematic review. Multiple sclerosis and related disorders 49: 102794	- Country Systematic review with 2/5 of the included studies conducted in Italy, 1/5 in multi-high-income European countries plus Israel, 1/5 in Iran, and 1/5 in the US. Italian and European studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Mori, L, Signori, A, Prada, V et al. (2020) Treadmill training in patients affected by Charcot-Marie-Tooth neuropathy: results of a multicenter, prospective, randomized, single-blind, controlled study. European journal of neurology 27(2): 280-287	- Intervention Standardised aerobic treadmill training, and not: 1. Gait training. 2. Individualised aerobic exercise programme.
Moritz, Tamara A; Snowdon, David A; Peiris, Casey L (2020) Combining aquatic physiotherapy with usual care physiotherapy for people with neurological conditions: A systematic review. Physiotherapy research international : the journal for researchers and clinicians in physical therapy 25(1): e1813	- Population Systematic review including participants in protocol (2/10 people with Parkinson's disease) and out of protocol (8/10 adults with stroke). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Morone, Giovanni, de Sire, Alessandro, Martino Cinnera, Alex et al. (2021) Upper Limb Robotic Rehabilitation for Patients with Cervical Spinal Cord Injury: A Comprehensive Review. Brain sciences 11(12)	- Study design (adults) Systematic review with 2/11 randomised controlled trials, 2/11 systematic reviews, 5/11 case series, 1/11 non-controlled studies, and 1/11 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Morrow, Brenda, Argent, Andrew, Zampoli, Marco et al. (2021) Cough augmentation techniques for people with chronic neuromuscular disorders. The Cochrane database of systematic reviews 4: cd013170	- Country Systematic review with 7/11 studies published 2013 onwards, and 4/11 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mubin, Omar, Alnajjar, Fady, Jishtu, Nalini et al. (2019) Exoskeletons With Virtual Reality, Augmented Reality, and Gamification for Stroke Patients' Rehabilitation: Systematic Review. JMIR rehabilitation and assistive technologies 6(2): e12010	- Population Systematic review including participants in protocol (2/72 children with stroke) and out of protocol (70/72 adults with stroke). Studies including participants with paediatric stroke were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Mueller, Michael J, Tuttle, Lori J, Lemaster, Joseph W et al. (2013) Weight-bearing versus nonweight-bearing exercise for persons with diabetes and peripheral neuropathy: a randomized controlled trial. Archives of physical medicine and rehabilitation 94(5): 829-38	- Country Study conducted in the US.
Munari, Daniele, Fonte, Cristina, Varalta, Valentina et al. (2020) Effects of robot-assisted gait training combined with virtual reality on motor and cognitive functions in patients with multiple sclerosis: A pilot, single-blind, randomized controlled trial. Restorative neurology and neuroscience 38(2): 151-164	- Intervention Virtual reality to address mobility only and not upper limb functioning, stability, and mobility together. Note: Participants also received robot-assisted gait training which is also included in protocol. However, this was given to both intervention and control groups (using the same protocol) and therefore cannot be compared.
Murray, Drew A; Meldrum, Dara; Lennon, Olive (2017) Can vestibular rehabilitation exercises help patients	- Country Study conducted in the US.

Study	Reason for exclusion
with concussion? A systematic review of efficacy, prescription and progression patterns. British journal of sports medicine 51(5): 442-451	
Murray, Lynda M, Edwards, Dylan J, Ruffini, Giulio et al. (2015) Intensity dependent effects of transcranial direct current stimulation on corticospinal excitability in chronic spinal cord injury. Archives of physical medicine and rehabilitation 96(4suppl): 114-21	- Publication date Systematic review with 4/10 studies published 2013 onwards, and 6/10 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Musselman, Kristin E and Yang, Jaynie F (2014) Spinal Cord Injury Functional Ambulation Profile: a preliminary look at responsiveness. Physical therapy 94(2): 240-50	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Na, Yoonju, Kim, Jinuk, Lee, Su-Hyun et al. (2022) Multichannel Transcranial Direct Current Stimulation Combined With Treadmill Gait Training in Patients With Parkinson's Disease: A Pilot Study. Frontiers in neurology 13: 804206	- Country Study conducted in South Korea.
Nadeau, Alexandra; Pourcher, Emmanuelle; Corbeil, Philippe (2014) Effects of 24 wk of treadmill training on gait performance in Parkinson's disease. Medicine and science in sports and exercise 46(4): 645-55	- Comparator Adapted low-intensity exercise programme for older adults, and not no intervention, waitlist, standard rehabilitation care alone, or ‘usual care’.
Nair, Manasa S; Kulkarni, Vivek N; Shyam, Ashok K (2022) Combined Effect of Virtual Reality Training (VRT) and Conventional Therapy on Sitting Balance in Patients with Spinal Cord Injury (SCI): Randomized Control Trial. Neurology India 70(supplement): 245-s250	- Country Study conducted in India.
Najafi, Bijan; Crews, Ryan T; Wrobel, James S (2013) A novel plantar stimulation technology for improving protective sensation and postural control in patients with diabetic peripheral neuropathy: a double-blinded, randomized study. Gerontology 59(5): 473-80	- Country Study conducted in the US.
Najafi, Bijan, Talal, Talal K, Grewal, Gurtej Singh et al. (2017) Using Plantar Electrical Stimulation to Improve Postural Balance and Plantar Sensation Among Patients With Diabetic Peripheral Neuropathy: A Randomized Double Blinded Study. Journal of diabetes science and technology 11(4): 693-701	- Country Study conducted in the US.

Study	Reason for exclusion
Nakagawa, Natsuki, Yamamoto, Sena, Hanai, Akiko et al. (2024) Exercise intervention for the management of chemotherapy-induced peripheral neuropathy: a systematic review and network meta-analysis. Frontiers in neurology 15: 1346099	- Country Systematic review with 6/12 of the included studies conducted in Germany, 3/12 in the US, 1/12 in India, 1/12 in Thailand, and 1/12 in Turkey. German studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Nam, Ki Yeun, Kim, Hyun Jung, Kwon, Bum Sun et al. (2017) Robot-assisted gait training (Lokomat) improves walking function and activity in people with spinal cord injury: a systematic review. Journal of neuroengineering and rehabilitation 14(1): 24	- Country Systematic review with 2/10 of the included studies conducted in Spain, 1/10 in Switzerland, 1/10 in the UK, 4/10 in the US, 1/10 in China, and 1/10 in South Korea. Spanish, Swiss and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Narayan, Sunil K; Jayan, Jeshma; Arumugam, Murugesan (2022) Short-term Effect of Noninvasive Brain Stimulation Techniques on Motor Impairment in Chronic Ischemic Stroke: A Systematic Review with Meta-Analysis. Neurology India 70(1): 37-49	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Nascimento, Andreia Santos, Fagundes, Cindy Vieira, Mendes, Felipe Augusto Dos Santos et al. (2021) Effectiveness of Virtual Reality Rehabilitation in Persons with Multiple Sclerosis: A Systematic Review and Meta-analysis of Randomized Controlled Trials. Multiple sclerosis and related disorders 54: 103128	- Country Systematic review with 1/9 of the included studies conducted in Hungary, 1/9 in Italy, 1/9 in Spain, 1/9 in Sweden, 1/9 in the UK, 2/9 in Jordan, and 2/9 in Turkey. Hungarian, Italian, Spanish, Swedish, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Navarrete-Opazo, Angela, Alcayaga, Julio J, Sepulveda, Oscar et al. (2017) Intermittent Hypoxia and Locomotor Training Enhances Dynamic but Not Standing Balance in Patients With Incomplete Spinal Cord Injury. Archives of physical medicine and rehabilitation 98(3): 415-424	- Country Study conducted in Chile.
Navarro-Lozano, Francisco, Kiper, Pawel, Carmona-Perez, Cristina et al. (2022) Effects of Non-Immersive Virtual Reality and Video Games on Walking Speed in Parkinson Disease: A Systematic Review and Meta-Analysis. Journal of clinical medicine 11(22)	- Intervention Systematic review investigating virtual reality to address mobility only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Nemanich, Samuel T, Lench, Daniel H, Sutter, Ellen N et al. (2023) Safety and feasibility of transcranial direct current stimulation stratified by corticospinal organization in children with hemiparesis. European journal of paediatric neurology : EJPN : official	- Country Study conducted in the US.

Study	Reason for exclusion
journal of the European Paediatric Neurology Society 43: 27-35	
Nguyen, Thi Xuan Dieu, Mai, Phuc Thi, Chang, Ya-Ju et al. (2024) Effects of transcranial direct current stimulation alone and in combination with rehabilitation therapies on gait and balance among individuals with Parkinson's disease: a systematic review and meta-analysis. Journal of neuroengineering and rehabilitation 21(1): 27	- Intervention Systematic review investigating virtual reality to address stability and mobility only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Niedermeier, Martin, Ledochowski, Larissa, Mayr, Andreas et al. (2017) Immediate affective responses of gait training in neurological rehabilitation: A randomized crossover trial. Journal of rehabilitation medicine 49(4): 341-346	- Population Mixed population including participants in protocol (2/14 people with traumatic brain injury, 1/14 people with spinal cord injury, and 1/14 people with multiple sclerosis) and out of protocol (10/14 adults with stroke). Results not presented separately for target population.
Nikaido, Yasutaka, Urakami, Hideyuki, Okada, Yohei et al. (2023) Rehabilitation effects in idiopathic normal pressure hydrocephalus: a randomized controlled trial. Journal of neurology 270(1): 357-368	- Country Study conducted in Japan.
Nishikawa, Y., Watanabe, K., Kawade, S. et al. (2019) The effect of a portable electrical muscle stimulation device at home on muscle strength and activation patterns in locomotive syndrome patients: A randomized control trial. Journal of Electromyography and Kinesiology 45: 46-52	- Country Study conducted in Japan.
Niu, Xun, Varoqui, Deborah, Kindig, Matthew et al. (2014) Prediction of gait recovery in spinal cord injured individuals trained with robotic gait orthosis. Journal of neuroengineering and rehabilitation 11: 42	- Country Study conducted in the US.
Nojima, I., Horiba, M., Sahashi, K. et al. (2023) Gait-combined closed-loop brain stimulation can improve walking dynamics in Parkinsonian gait disturbances: A randomised-control trial. Journal of Neurology, Neurosurgery and Psychiatry 94(11): 938-944	- Country Study conducted in Japan.
Norouzi, Ebrahim, Gerber, Markus, Puhse, Uwe et al. (2021) Combined virtual reality and physical training improved the bimanual coordination of women with multiple sclerosis. Neuropsychological rehabilitation 31(4): 552-569	- Country Study conducted in Iran.

Study	Reason for exclusion
Nuic, Dijana, van de Weijer, Sjors, Cherif, Saoussen et al. (2024) Home-based exergaming to treat gait and balance disorders in patients with Parkinson's disease: A phase II randomized controlled trial. European journal of neurology 31(1): e16055	- Comparator Same intervention (tailored exergame) but varied in terms of game control (whole body movements versus keyboard), and not timing, frequency, or intensity.
Oddsson, Lars I E, Bisson, Teresa, Cohen, Helen S et al. (2022) Extended effects of a wearable sensory prosthesis on gait, balance function and falls after 26 weeks of use in persons with peripheral neuropathy and high fall risk-The walk2Wellness trial. Frontiers in aging neuroscience 14: 931048	- Country Study conducted in the US.
Oguz, Semra, Gurses, Hulya Nilgun, Kuran Aslan, Goksen et al. (2022) Walking training augments the effects of expiratory muscle training in Parkinson's disease. Acta neurologica Scandinavica 145(1): 79-86	- Country Study conducted in Turkey.
Oh, Sejun and Lee, SangHeon (2021) Effect of aquatic exercise on physical function and QOL in individuals with neurological disorder: A systematic review and meta-analysis. Journal of bodywork and movement therapies 27: 67-76	- Population Systematic review including participants in protocol (3/8 people with Parkinson's disease and 2/8 people with multiple sclerosis) and out of protocol (1/8 adults with stroke, 1/8 people with cerebral palsy, and 1/8 people with fibromyalgia). Studies including participants with Parkinson's disease and multiple sclerosis were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Okubo, Yoshiro, Mohamed Suhaimy, Mohamed Suhair Bin, Hoang, Phu et al. (2023) Training reactive balance using trips and slips in people with multiple sclerosis: A blinded randomised controlled trial. Multiple sclerosis and related disorders 73: 104607	- Outcomes No relevant outcomes reported. Reports measures of adherence, study retention, falls, and gait and balance parametrics (measurement data not validated scales).
Omar Ahmad, S., Longhurst, J., Stiles, D. et al. (2023) A meta-analysis of exercise intervention and the effect on Parkinson's Disease symptoms. Neuroscience Letters 801: 137162	- Study design (adults) Non-systematic literature review.
Ona, E D, Cano-de la Cuerda, R, Sanchez-Herrera, P et al. (2018) A Review of Robotics in Neurorehabilitation: Towards an Automated Process for Upper Limb. Journal of healthcare engineering 2018: 9758939	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ong, Dorothea Sze Min; Weibin, Melvyn Zhang; Vallabhajosyula, Ranganath (2021) Serious games as	- Population Systematic review including participants who are in protocol (7/46 people with Parkinson's disease, 6/46

Study	Reason for exclusion
rehabilitation tools in neurological conditions: A comprehensive review. Technology and health care : official journal of the European Society for Engineering and Medicine 29(1): 15-31	people with multiple sclerosis, 5/46 people with traumatic brain injury, and 1/46 people with traumatic brain and spinal cord injury) and out of protocol (26/46 adults with stroke and 1/46 people with schizophrenia). Studies including participants with Parkinson's disease, multiple sclerosis, acquired brain injury, and spinal cord injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Onose, G., Popescu, N., Munteanu, C. et al. (2018) Mobile mechatronic/robotic orthotic devices to assist-rehabilitate neuromotor impairments in the upper limb: A systematic and synthetic review. Frontiers in Neuroscience 12(sep): 577	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Oo, Win Min (2014) Efficacy of addition of transcutaneous electrical nerve stimulation to standardized physical therapy in subacute spinal spasticity: a randomized controlled trial. Archives of physical medicine and rehabilitation 95(11): 2013-20	- Country Study conducted in Myanmar.
Oriuwa, C., Mollica, A., Feinstein, A. et al. (2022) Neuromodulation for the treatment of functional neurological disorder and somatic symptom disorder: a systematic review. Journal of Neurology, Neurosurgery and Psychiatry 93(3): 280-290	- Study design (adults) Systematic review with 4/12 randomised controlled trials, 5/14 case series, 2/14 non-comparative studies, and 1/14 non-randomised controlled trial. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ortiz, M., Koch, A.K., Cramer, H. et al. (2023) Clinical effects of Kneipp hydrotherapy: a systematic review of randomised controlled trials. BMJ Open 13(7): e070951	- Population Systematic review including studies with unclear populations (1/20 people with polyneuropathy) and participants out of protocol (4/20 healthy adults, 3/20 children with recurrent colds or fever, 3/20 people with cardiovascular diseases, 3/20 people with varicosis, 1/20 people with breast cancer and menopause, 1/20 people with osteoarthritis, 2/20 people with pain after haemorrhoids, anal fissures or episiotomy, and 1/20 people with post-polio syndrome). Study including participants with polyneuropathy was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened. Note: Studies add up to 19 but correct as reported in article.
Ortiz-Rubio, Araceli, Cabrera-Martos, Irene, Torres-Sanchez, Irene et al. (2018) Effects of a resistance training program on balance and fatigue perception in patients with Parkinson's disease: A randomized controlled trial. Medicina clinica 150(12): 460-464	- Comparator Low-intensity exercise programme, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Oveisgharan, Shahram, Karimi, Zahra, Abdi, Siamak et al. (2019) The use of brain stimulation in the	- Country Study conducted in Iran.

Study	Reason for exclusion
rehabilitation of walking disability in patients with multiple sclerosis: A randomized double-blind clinical trial study. Iranian journal of neurology 18(2): 57-63	
Ozdogar, Asiye Tuba, Baba, Cavid, Kahraman, Turhan et al. (2022) Effects and safety of exergaming in persons with multiple sclerosis during corticosteroid treatment: a pilot study. Multiple sclerosis and related disorders 63: 103823	- Country Study conducted in Turkey.
Ozdogar, Asiye Tuba, Ertekin, Ozge, Kahraman, Turhan et al. (2023) Effect of exergaming in people with restless legs syndrome with multiple sclerosis: A single-blind randomized controlled trial. Multiple sclerosis and related disorders 70: 104480	- Country Study conducted in Turkey.
Ozdogar, Asiye Tuba, Ertekin, Ozge, Kahraman, Turhan et al. (2020) Effect of video-based exergaming on arm and cognitive function in persons with multiple sclerosis: A randomized controlled trial. Multiple sclerosis and related disorders 40: 101966	- Country Study conducted in Turkey.
Ozgen, Gulnur, Karapolat, Hale, Akkoc, Yesim et al. (2016) Is customized vestibular rehabilitation effective in patients with multiple sclerosis? A randomized controlled trial. European journal of physical and rehabilitation medicine 52(4): 466-78	- Country Study conducted in Turkey.
Ozkul, C., Guclu-Gunduz, A., Yazici, G. et al. (2020) Effect of immersive virtual reality on balance, mobility, and fatigue in patients with multiple sclerosis: A single-blinded randomized controlled trial. European Journal of Integrative Medicine 35: 101092	- Country Study conducted in Turkey.
Ozkul, Cagla, Eldemir, Kader, Apaydin, Yasemin et al. (2023) Effects of multi-task training on motor and cognitive performances in multiple sclerosis patients without clinical disability: a single-blinded randomized controlled trial. Acta neurologica Belgica 123(4): 1301-1312	- Country Study conducted in Turkey.
Ozsoy-Unubol, Tugba, Ata, Emre, Cavlak, Muyesser et al. (2022) Effects of Robot-Assisted Gait Training in Patients With Multiple Sclerosis: A Single-Blinded Randomized Controlled Study. American journal of	- Country Study conducted in Turkey.

Study	Reason for exclusion
physical medicine & rehabilitation 101(8): 768-774	
Pachman, Deirdre R, Weisbrod, Breanna L, Seisler, Drew K et al. (2015) Pilot evaluation of Scrambler therapy for the treatment of chemotherapy-induced peripheral neuropathy. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer 23(4): 943-51	- Country Study conducted in the US.
Padilha, Cristiano, Souza, Renan, Grossl, Fernando Schorr et al. (2023) Physical exercise and its effects on people with Parkinson's disease: Umbrella review. PloS one 18(11): e0293826	- Study design (adults) Scoping review of systematic reviews.
Pagliari, Chiara, Di Tella, Sonia, Jonsdottir, Johanna et al. (2024) Effects of home-based virtual reality telerehabilitation system in people with multiple sclerosis: A randomized controlled trial. Journal of telemedicine and telecare 30(2): 344-355	- Intervention Unclear intervention. Virtual reality motor and cognitive telerehabilitation intervention with no description of targeted domains (for example, upper limb functioning, mobility or stability). Supplementary materials to confirm content of intervention were unavailable.
Paleg, Ginny and Livingstone, Roslyn (2015) Outcomes of gait trainer use in home and school settings for children with motor impairments: A systematic review. Clinical Rehabilitation 29(11): 1077-1091	- Publication date Systematic review with 2/17 studies published 2013 onwards, and 15/17 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Palheta de Lima, K., Nascimento da Silva, C., Ferreira de Seixas, N. et al. (2022) Effect of resistance training on balance and postural control in people with Parkinson's: A systematic review. Revista Cientifica de la Sociedad Espanola de Enfermeria Neurologica 56: 18-28	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Palladino, Ludovica, Ruotolo, Ilaria, Berardi, Anna et al. (2023) Efficacy of aquatic therapy in people with spinal cord injury: a systematic review and meta-analysis. Spinal cord 61(6): 317-322	- Country Systematic review with 1/3 of the included studies conducted in South Korea, 1/3 in Turkey, and 1/3 in the US. No studies checked against protocol criteria as did not include any studies from target countries.
Panisset, M G; Galea, M P; El-Ansary, D (2016) Does early exercise attenuate muscle atrophy or bone loss after spinal cord injury?. Spinal cord 54(2): 84-92	- Publication date Systematic review with 1/11 studies published 2013 onwards, and 10/11 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Panisset, Maya G, El-Ansary, Doa, Dunlop, Sarah Alison et al. (2022) Factors influencing thigh muscle volume change with cycling exercises in acute spinal cord injury - a	- Outcomes No relevant outcomes reported. Reported measures of muscle power and volume.

Study	Reason for exclusion
secondary analysis of a randomized controlled trial. The journal of spinal cord medicine 45(4): 510-521	
Papa, L., LaMee, A., Tan, C.N. et al. (2014) Systematic review and meta-analysis of noninvasive cranial nerve neuromodulation for nervous system disorders. Archives of Physical Medicine and Rehabilitation 95(12): 2435-2443	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Park, Chang Sune; Oh, Gku Bin; Cho, Ki Hun (2023) Effects of gait training with weight support feedback walker on walker dependence, lower limb muscle activation, and gait ability in patients with incomplete spinal cord injury: A pilot randomized controlled trial. The journal of spinal cord medicine: 1-9	- Country Study conducted in South Korea.
Park, Jung E, Hallett, Mark, Jang, Hyung-Ryeol et al. (2022) Effects of anodal stimulation and motor practice on limb-kinetic apraxia in Parkinson's disease. Experimental brain research 240(4): 1249-1256	- Country Study conducted in South Korea.
Parra-Moreno, M; Rodriguez-Juan, J J; Ruiz-Cardenas, J D (2021) Use of commercial video games to improve postural balance in patients with multiple sclerosis:a systematic review and meta-analysis of randomised controlled clinical trials. Neurologia 36(8): 618-624	- Intervention Systematic review investigating exergaming to address stability only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Patathong, Tanyaporn, Klaewkasikum, Krongkaew, Woratanarat, Patarawan et al. (2023) The efficacy of gait rehabilitations for the treatment of incomplete spinal cord injury: a systematic review and network meta-analysis. Journal of orthopaedic surgery and research 18(1): 60	- Country Systematic review with 2/17 of the included studies conducted in Canada, 2/17 in Spain, 1/17 in Switzerland, 7/17 in the US, 2/17 in China, 1/17 in Brazil, 1/17 in India, and 1/17 in South Korea. Canadian, Spanish and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Patil, Siddeshwar, Raza, Wajid A, Jamil, Firas et al. (2014) Functional electrical stimulation for the upper limb in tetraplegic spinal cord injury: a systematic review. Journal of medical engineering & technology 39(7): 419-23	- Study design (adults) Systematic review with 2/5 randomised controlled trials, 2/5 case studies, and 1/5 non-comparative studies. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Paton, Joanne, Glasser, Sam, Collings, Richard et al. (2016) Getting the right balance: insole design alters the static balance of people with diabetes and neuropathy. Journal of foot and ankle research 9: 40	- Outcomes No relevant outcomes reported. Reports measures of standing balance (measurement data such as centre of pressure velocity and path length, not measured using validated scales), perceived stability, and step reaction time (measurement data, not measured using validated scales).

Study	Reason for exclusion
Pau, Massimiliano, Corona, Federica, Coghe, Giancarlo et al. (2018) Quantitative assessment of the effects of 6 months of adapted physical activity on gait in people with multiple sclerosis: a randomized controlled trial. Disability and rehabilitation 40(2): 144-151	- Intervention Standardised physical activity programme and not an individualised exercise programme.
Payedimarri, Anil Babu, Ratti, Matteo, Rescinito, Riccardo et al. (2022) Effectiveness of Platform-Based Robot-Assisted Rehabilitation for Musculoskeletal or Neurologic Injuries: A Systematic Review. Bioengineering (Basel, Switzerland) 9(4)	- Study design (adults) Systematic review with 6/38 randomised controlled trials, 26/38 case studies, 2/38 observational studies, and 4/36 undefined study designs. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Pearson, M.; Dieberg, G.; Smart, N. (2015) Exercise as a Therapy for Improvement of Walking Ability in Adults With Multiple Sclerosis: A Meta-Analysis. Archives of Physical Medicine and Rehabilitation 96(7): 1339-1348	- Publication date Systematic review with 4/13 studies published 2013 onwards, and 9/13 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Pelicioni, Paulo H S, Lord, Stephen R, Menant, Jasmine C et al. (2023) Combined Reactive and Volitional Step Training Improves Balance Recovery and Stepping Reaction Time in People With Parkinson's Disease: A Randomised Controlled Trial. Neurorehabilitation and neural repair 37(10): 694-704	- Outcomes No relevant outcomes reported. Reports measures of step reaction time and frequency of falls.
Pelosin, Elisa, Cerulli, Cecilia, Ogliastro, Carla et al. (2020) A Multimodal Training Modulates Short Afferent Inhibition and Improves Complex Walking in a Cohort of Faller Older Adults With an Increased Prevalence of Parkinson's Disease. The journals of gerontology. Series A, Biological sciences and medical sciences 75(4): 722-728	- Intervention Non-immersive virtual reality intervention to address mobility only, and not to address upper limb functioning, stability, and mobility together. Note: Participants also received treadmill training which is also included in protocol. However, this was given to both intervention and control groups (using the same protocol) and therefore cannot be compared.
Pelosin, Elisa, Ponte, Chiara, Putzolu, Martina et al. (2021) Motor-Cognitive Treadmill Training With Virtual Reality in Parkinson's Disease: The Effect of Training Duration. Frontiers in aging neuroscience 13: 753381	- Intervention Dual-task treadmill training plus virtual reality to address mobility only, and not to address upper limb functioning, stability, and mobility together.
Pena, Gisele M, Pavao, Silvia L, Oliveira, Maria F et al. (2019) Dual-task effects in children with neuromotor dysfunction: a systematic review. European journal of physical and rehabilitation medicine 55(2): 281-290	- Publication date Systematic review with 5/13 studies published 2013 onwards, and 8/13 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Peppe, A., Paravati, S., Baldassarre, M.G. et al. (2019) Proprioceptive Focal Stimulation (Equistasi) May Improve the Quality of Gait in Middle-Moderate Parkinson's Disease Patients. Double-Blind, Double-Dummy, Randomized, Crossover, Italian Multicentric Study. Frontiers in Neurology 10: 998	- Intervention Vibratory neuromodulation device (Equistasi®) to address mobility only, and not to address upper limb functioning, stability, and mobility together.
Pereira, M.F., Prahm, C., Kolbenschlag, J. et al. (2020) Application of AR and VR in hand rehabilitation: A systematic review. Journal of Biomedical Informatics 111: 103584	- Population Systematic review including participants in protocol (1/8 people with multiple sclerosis) and out of protocol (4/8 adults with stroke, 1/8 people with burns, 1/8 people with traumatic hand injury, and 1/8 people with juvenile idiopathic arthritis, cerebral palsy or brachial plexus birth injury). Study including participants with multiple sclerosis was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Perez de la Cruz, Sagrario (2017) Effectiveness of aquatic therapy for the control of pain and increased functionality in people with Parkinson's disease: a randomized clinical trial. European journal of physical and rehabilitation medicine 53(6): 825-832	- Other protocol criteria Concerns over the authenticity of presented results. They appear too similar at different timepoints to be due to chance (including 1 outcome for which data are identical at all timepoints). Additionally, 2 separate papers written by this author on the same study but presenting different numbers of participants and different lengths of intervention. Protocol has been published but accessed and amended several times throughout the study, even after publication of papers.
Perez-de la Cruz, Sagrario (2019) Mental health in Parkinson's disease after receiving aquatic therapy: a clinical trial. Acta neurologica Belgica 119(2): 193-200	- Outcomes Outcome of interest (functioning) reported as a sub-score of SF-36 (quality of life scale), and not a global domain scale.
Perez-de la Cruz, Sagrario (2022) Use of Robotic Devices for Gait Training in Patients Diagnosed with Multiple Sclerosis: Current State of the Art. Sensors (Basel, Switzerland) 22(7)	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Perez-de la Cruz, Sagrario (2018) A bicentric controlled study on the effects of aquatic Ai Chi in Parkinson disease. Complementary therapies in medicine 36: 147-153	- Other protocol criteria Same study as Perez de la Cruz 2017, which has raised concerns over the authenticity of presented results. Different numbers of participants and different lengths of intervention were reported. Protocol has been published but accessed and amended several times throughout the study, even after publication of papers.
Perez-Rodriguez, Marta, Gutierrez-Suarez, Andrea, Arias, Jacobo Angel Rubio et al. (2022) Effects of Exercise Programs on Functional Capacity and Quality of Life in People With Acquired Brain Injury: A Systematic Review and Meta-Analysis. Physical therapy 103(1)	- Population Systematic review including participants in protocol (2/38 people with acquired brain injury and 2/38 people with traumatic brain injury) and out of protocol (34/38 adults with stroke). Studies including participants with acquired brain injury and traumatic brain injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Perju-Dumbrava, Lacramioara, Barsan, Maria, Leucuta, Daniel Corneliu et al. (2022) Artificial intelligence applications and robotic systems in Parkinson's disease (Review). Experimental and therapeutic medicine 23(2): 153	- Study design (adults) Non-systematic literature review.
Perrochon, Anaick, Borel, Benoit, Istrate, Dan et al. (2019) Exercise-based games interventions at home in individuals with a neurological disease: A systematic review and meta-analysis. Annals of physical and rehabilitation medicine 62(5): 366-378	- Population Systematic review including participants in protocol (4/11 people with Parkinson's disease and 3/11 people with multiple sclerosis), and out of protocol (4/11 adults with stroke). Studies including participants with Parkinson's disease and multiple sclerosis were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Perucca, Laura, Scarano, Stefano, Russo, Giovanna et al. (2024) Fatigue may improve equally after balance and endurance training in multiple sclerosis: a randomised, crossover clinical trial. Frontiers in neurology 15: 1274809	- Outcomes Outcomes of interest (balance [Equiscale and Equitest Sensory Organisation Test] and exercise capacity [6MWT]) data presented graphically and cannot be extracted for analysis.
Peruzzi, Agnese, Zarbo, Ignazio Roberto, Cereatti, Andrea et al. (2017) An innovative training program based on virtual reality and treadmill: effects on gait of persons with multiple sclerosis. Disability and rehabilitation 39(15): 1557-1563	- Intervention Virtual reality based treadmill training to address mobility and not: 1. To address upper limb functioning, stability, and mobility together. 2. Dual task training to address upper limb functioning, stability, and mobility together. Note: Participants also received treadmill training which is also included in protocol. However, this was given to both intervention and control groups (using the same protocol) and therefore cannot be compared.
Piccinini, G., Cuccagna, C., Caliandro, P. et al. (2020) Efficacy of electrical stimulation of denervated muscle: A multicenter, double-blind, randomized clinical trial. Muscle and Nerve 61(6): 773-778	- Population Participants with isolated traumatic nerve axonal injuries.
Picelli, Alessandro, Melotti, Camilla, Origano, Francesca et al. (2015) Robot-assisted gait training is not superior to balance training for improving postural instability in patients with mild to moderate Parkinson's disease: a single-blind randomized controlled trial. Clinical rehabilitation 29(4): 339-47	- Comparator 1. Balance exercises for mobility, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'. 2. Robotic assisted gait training for stability, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Picelli, Alessandro, Varalta, Valentina, Melotti, Camilla et al. (2016) Effects of treadmill training on cognitive and motor features of patients with mild to moderate Parkinson's disease: a pilot, single-blind, randomized controlled trial. Functional neurology 31(1): 25-31	- Comparator Lifestyle programme with specified social interactions, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.

Study	Reason for exclusion
Pietrzak, Eva; Pullman, Stephen; McGuire, Annabel (2014) Using Virtual Reality and Videogames for Traumatic Brain Injury Rehabilitation: A Structured Literature Review. Games for health journal 3(4): 202-14	- Publication date Systematic review with 1/18 study published 2013 onwards, and 17/18 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Piira, Anu, Lannem, Anne M, Gjesdal, Knut et al. (2020) Quality of life and psychological outcomes of body-weight supported locomotor training in spinal cord injured persons with long-standing incomplete lesions. Spinal cord 58(5): 560-569	- Outcomes No relevant outcomes reported. Reports measures of quality of life, psychological symptoms, and physical activity.
Pilloni, Giuseppina, Choi, Claire, Shaw, Michael T et al. (2020) Walking in multiple sclerosis improves with tDCS: a randomized, double-blind, sham-controlled study. Annals of clinical and translational neurology 7(11): 2310-2319	- Country Study conducted in the US.
Pilutti, Lara A, Paulseth, John E, Dove, Carin et al. (2016) Exercise Training in Progressive Multiple Sclerosis: A Comparison of Recumbent Stepping and Body Weight-Supported Treadmill Training. International journal of MS care 18(5): 221-229	- Country Study conducted in the US.
Pinto, Camila, Salazar, Ana Paula, Marchese, Ritchele R et al. (2019) The Effects of Hydrotherapy on Balance, Functional Mobility, Motor Status, and Quality of Life in Patients with Parkinson Disease: A Systematic Review and Meta-analysis. PM & R : the journal of injury, function, and rehabilitation 11(3): 278-291	- Publication date Systematic review with 12/19 studies published 2013 onwards, and 7/19 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Platz, Thomas and Lotze, Martin (2018) Arm Ability Training (AAT) Promotes Dexterity Recovery After a Stroke-a Review of Its Design, Clinical Effectiveness, and the Neurobiology of the Actions. Frontiers in neurology 9: 1082	- Study design (adults) Non-systematic literature review.
Pol, Fateme, Salehinejad, Mohammad Ali, Baharlouei, Hamzeh et al. (2021) The effects of transcranial direct current stimulation on gait in patients with Parkinson's disease: a systematic review. Translational neurodegeneration 10(1): 22	- Intervention Systematic review investigating electrical neuromodulation to address mobility only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Polizzi, Agata, Rinella, Sergio, Ruggieri, Martino et al. (2023) Efficacy of videogames and exergames in pediatric	- Population Systematic review including participants in protocol (4/55 children with neurological gait disorders and 2/55 children with brain tumours), unclear (14/55 children with mixed

Study	Reason for exclusion
neurorehabilitation: a systematic review. Minerva pediatrics	neuromotor disorders), and out of protocol (30/55 children with cerebral palsy, 2/55 children with autism spectrum disorder, 2/55 children with dyspraxia, 1/55 children with amblyopia, and 1/55 children with dyslexia). Studies including participants with neurological gait disorders, brain tumours, and mixed neuromotor disorders were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Postma, Karin, Haisma, Janneke A, Hopman, Maria T E et al. (2014) Resistive inspiratory muscle training in people with spinal cord injury during inpatient rehabilitation: a randomized controlled trial. Physical therapy 94(12): 1709-19	- Intervention Resistive inspiratory muscle training to address respiratory function, and not to address upper limb functioning, stability, and mobility together.
Postol, Nicola, Marquez, Jodie, Spartalis, Stephanie et al. (2019) Do powered over-ground lower limb robotic exoskeletons affect outcomes in the rehabilitation of people with acquired brain injury?. Disability and rehabilitation. Assistive technology 14(8): 764-775	- Country Systematic review with 7/13 of the included studies conducted in Japan, 5/13 in the US, and 1/13 in China. No studies checked against protocol criteria as did not include any studies from target countries.
Prieto Vega, D.M. and Costa, M.L.G. (2013) Transcranial Direct Current Stimulation (tDCS) in Parkinson's - Systematic Review. Revista Neurociencias 21(3): 356-363	- Other protocol criteria Portuguese language paper.
Prokopiusova, Terezie, Pavlikova, Marketa, Markova, Magdalena et al. (2020) Randomized comparison of functional electric stimulation in posturally corrected position and motor program activating therapy: treating foot drop in people with multiple sclerosis. European journal of physical and rehabilitation medicine 56(4): 394-402	- Comparator Motor programme activating therapy (individual neuroproprioceptive facilitation physiotherapy), and not no intervention, waitlist, standard rehabilitation care alone, or ‘usual care’.
Prosperini, Luca, Tomassini, Valentina, Castelli, Letizia et al. (2021) Exergames for balance dysfunction in neurological disability: a meta-analysis with meta-regression. Journal of neurology 268(9): 3223-3237	- Population Systematic review including participants in protocol (8/41 people with Parkinson's disease, 7/41 people with multiple sclerosis, 2/41 people with myelopathy, 2/41 people with traumatic brain injury), unclear (1/41 people with stroke, traumatic brain injury, and benign cerebral neoplasm) and out of protocol (18/41 adults with stroke and 3/41 people with dementia). Studies including participants with Parkinson's disease, multiple sclerosis, myelopathy, traumatic brain injury and benign cerebral neoplasm were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Pulman, Jennifer and Buckley, Emily (2013) Assessing the efficacy of different upper limb hemiparesis interventions on improving health-related quality of life in stroke	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol

Study	Reason for exclusion
patients: A systematic review. Topics in Stroke Rehabilitation 20(2): 171-188	criteria as did not include any participants with chronic neurological disorders included in protocol.
Pulverenti, Timothy S, Zaaya, Morad, Grabowski, Ewelina et al. (2022) Brain and spinal cord paired stimulation coupled with locomotor training facilitates motor output in human spinal cord injury. Frontiers in neurology 13: 1000940	- Country Study conducted in the US.
Pulverenti, Timothy S, Zaaya, Morad, Grabowski, Monika et al. (2021) Neurophysiological Changes After Paired Brain and Spinal Cord Stimulation Coupled With Locomotor Training in Human Spinal Cord Injury. Frontiers in neurology 12: 627975	- Country Study conducted in the US.
Pulverenti, Timothy S; Zaaya, Morad; Knikou, Maria (2022) Brain and spinal cord paired stimulation coupled with locomotor training affects polysynaptic flexion reflex circuits in human spinal cord injury. Experimental brain research 240(6): 1687-1699	- Country Study conducted in the US.
Qayyum, S., Hashmi, Z., Waqas, S. et al. (2022) Effects of Exer-Gaming on Balance and Gait in Parkinson's Patients. Pakistan Journal of Medical and Health Sciences 16(12): 213-214	- Country Study conducted in Pakistan.
Qian, Yujia, Fu, Xueying, Zhang, Haoyang et al. (2023) Comparative efficacy of 24 exercise types on postural instability in adults with Parkinson's disease: a systematic review and network meta-analysis. BMC geriatrics 23(1): 522	- Intervention Systematic review with mix of interventions in protocol (48/199 gait training, 37/199 balance and gait training, 27/199 dual-task training, 20/199 exergaming, and 15/199 hydrotherapy), unclear (46/199 multi-component interventions and 29/199 conventional physiotherapy) and out of protocol (34/199 resistance training, 26/199 cueing or attention training, 23/199 Pilates/qigong/tai chi/yoga, 17/199 aerobic exercise, 17/199 dance interventions, 11/199 stretching interventions, 3/199 power training, and 1/99 whole-body vibration). Studies investigating gait training, virtual reality, dual-task training, balance and gait training, hydrotherapy, multi-component interventions, and conventional physiotherapy were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening. Note: Adds up to 354 as some included studies were multi-arm trials that investigated multiple interventions.
Qin, Penny Ping, Jin, Minxia, Xia, Adam Weili et al. (2024) The effectiveness and safety of low-intensity transcranial ultrasound stimulation: A systematic review of human and animal studies. Neuroscience and Biobehavioral Reviews 156	- Population Systematic review including participants out of protocol (8/11 healthy adults, 2/11 people with depression, and 1/11 people with chronic pain). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.

Study	Reason for exclusion
Qiu, L., Chang, A., Ma, R. et al. (2024) Neuromodulation for the treatment of Prader-Willi syndrome - A systematic review. Neurotherapeutics 21(3): e00339	- Study design (adults) Systematic review with 1/9 randomised controlled trials, 4/9 case series, 3/9 case reports, and 1/9 non-randomised controlled trials. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Quigley, Patricia A, Bulat, Tatjana, Schulz, Brian et al. (2014) Exercise interventions, gait, and balance in older subjects with distal symmetric polyneuropathy: a three-group randomized clinical trial. American journal of physical medicine & rehabilitation 93(1): 1-6	- Country Study conducted in the US.
Radder, Danique L M, Ligia Silva de Lima, Ana, Domingos, Josefa et al. (2020) Physiotherapy in Parkinson's Disease: A Meta-Analysis of Present Treatment Modalities. Neurorehabilitation and neural repair 34(10): 871-880	- Intervention Systematic review with mix of interventions in protocol (35/191 gait training, 28/191 balance and gait training, 9/191 exergaming, 8/191 hydrotherapy, and 3/191 dual-task training), unclear (45/191 conventional physiotherapy) and out of protocol (17/191 resistance training, 14/191 strategy training, 11/191 dance interventions, 11/191 martial arts interventions, and 5/191 aerobic exercise). Studies investigating gait training, virtual reality, dual-task training, balance and gait training, hydrotherapy, multi-component interventions, and conventional physiotherapy were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening. Note: Studies add up to 186 but correct as reported in article.
Rafiq, Muhammad K, Bradburn, Michael, Proctor, Alison R et al. (2015) A preliminary randomized trial of the mechanical insufflator-exsufflator versus breath-stacking technique in patients with amyotrophic lateral sclerosis. Amyotrophic lateral sclerosis & frontotemporal degeneration 16(78): 448-55	- Intervention Breath stacking to increase respiratory function and cough effectiveness, and not to address upper limb functioning, stability, and mobility together.
Raithatha, Ravi, Carrico, Cheryl, Powell, Elizabeth Salmon et al. (2016) Non-invasive brain stimulation and robot-assisted gait training after incomplete spinal cord injury: A randomized pilot study. NeuroRehabilitation 38(1): 15-25	- Country Study conducted in the US.
Rajan, R., Garg, K., Srivastava, A.K. et al. (2022) Device-Assisted and Neuromodulatory Therapies for Parkinson's Disease: A Network Meta-Analysis. Movement Disorders 37(9): 1785-1797	- Publication date Systematic review with 6/26 studies published 2013 onwards, and 20/26 published pre-2013. Studies published 2013 onwards were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Ralston, Keira E, Harvey, Lisa, Batty, Julia et al. (2013) Functional electrical stimulation cycling has no clear effect on urine output, lower limb swelling,	- Intervention Mixed intervention including components in protocol (functional electrical stimulation) and out of protocol (standardised cycling exercise programme).

Study	Reason for exclusion
and spasticity in people with spinal cord injury: a randomised cross-over trial. Journal of physiotherapy 59(4): 237-43	
Ramzy, G.M., Ahmed, G.M., Labib, D.M. et al. (2015) Can vibratory insoles improve gait in patients with diabetic peripheral neuropathy?. Egyptian Journal of Neurology, Psychiatry and Neurosurgery 52(2): 147-151	- Country Study conducted in Egypt.
Readioff, Rosti, Siddiqui, Zaha Kamran, Stewart, Caroline et al. (2022) Use and evaluation of assistive technologies for upper limb function in tetraplegia. The journal of spinal cord medicine 45(6): 809-820	- Publication date Systematic review with 9/24 studies published 2013 onwards, and 15/24 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Reid, Susan A; Farbenblum, Joshua; McLeod, Shreya (2022) Do physical interventions improve outcomes following concussion: a systematic review and meta-analysis?. British journal of sports medicine 56(5): 292-298	- Intervention Systematic review with 3/12 studies investigating individualised exercise programmes and 9/12 investigating standardised exercise programmes. Studies investigating individualised exercise programmes were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Reina-Gutierrez, Sara, Cavero-Redondo, Ivan, Martinez-Vizcaino, Vicente et al. (2022) The type of exercise most beneficial for quality of life in people with multiple sclerosis: A network meta-analysis. Annals of physical and rehabilitation medicine 65(3): 101578	- Country Systematic review with 9/72 of the included studies conducted in Belgium, 5/72 in Denmark, 5/72 in Germany, 5/72 in the UK, 4/72 in Italy, 2/72 in Norway, 2/72 in Spain, 1/72 in Canada, 1/72 in Croatia, 1/72 in Hungary, 1/72 in Ireland, 15/72 in Iran, 11/72 in the US, 5/72 in Turkey, 3/72 in Brazil, and 2/72 in Israel. Belgian, Danish, German, UK, Italian, Norwegian, Spanish, Canadian, Croatian, Hungarian, and Irish studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Reina-Gutierrez, Sara, Meseguer-Henarejos, Ana Belen, Torres-Costoso, Ana et al. (2023) Effect of different types of exercise on fitness in people with multiple sclerosis: A network meta-analysis. Scandinavian journal of medicine & science in sports 33(10): 1916-1928	- Country Systematic review with 6/45 of the included studies conducted in the UK, 4/45 in Germany, 4/45 in Italy, 3/45 in Denmark, 3/34 in Ireland, 1/45 in Australia, 1/45 in Belgium, 1/45 in Canada, 1/45 in Finland, 1/45 in Hungary, 1/45 in Spain, 1/45 in Switzerland, 6/45 in Iran, 6/45 in Turkey, and 6/45 in the US. UK, German, Italian, Danish, Irish, Australian, Belgian, Canadian, Finnish, Hungarian, Spanish, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Reis, S.B., Bernardo, W.M., Oshiro, C.A. et al. (2021) Effects of Robotic Therapy Associated With Noninvasive Brain Stimulation on Upper-Limb Rehabilitation After Stroke: Systematic Review and Meta-analysis of Randomized Clinical Trials. Neurorehabilitation and Neural Repair 35(3): 256-266	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.

Study	Reason for exclusion
Rennie, Linda, Opheim, Arve, Dietrichs, Espen et al. (2021) Highly challenging balance and gait training for individuals with Parkinson's disease improves pace, rhythm and variability domains of gait - A secondary analysis from a randomized controlled trial. Clinical rehabilitation 35(2): 200-212	- Outcomes No relevant outcomes reported. Reports measures of gait (measurement data such as velocity, step length, swing time, and asymmetry, not measured using validated scale).
Reyes, Alvaro, Castillo, Adrian, Castillo, Javiera et al. (2018) The effects of respiratory muscle training on peak cough flow in patients with Parkinson's disease: a randomized controlled study. Clinical rehabilitation 32(10): 1317-1327	- Country Study conducted in Chile.
Ribas, Camila Gemin, Alves da Silva, Leticia, Correa, Marina Ribas et al. (2017) Effectiveness of exergaming in improving functional balance, fatigue and quality of life in Parkinson's disease: A pilot randomized controlled trial. Parkinsonism & related disorders 38: 13-18	- Country Study conducted in Brazil.
Ribeiro de Souza, C., Avila de Oliveira, J., Takazono, P.S. et al. (2023) Perturbation-based balance training leads to improved reactive postural responses in individuals with Parkinson's disease and freezing of gait. European Journal of Neuroscience 57(12): 2174-2186	- Country Study conducted in Brazil.
Rich, Tonya L, Menk, Jeremiah, Krach, Linda E et al. (2016) Repetitive Transcranial Magnetic Stimulation/Behavioral Intervention Clinical Trial: Long-Term Follow-Up of Outcomes in Congenital Hemiparesis. Journal of child and adolescent psychopharmacology 26(7): 598-605	- Country Study conducted in the US.
Rietberg, Marc B, Veerbeek, Janne M, Gosselink, Rik et al. (2017) Respiratory muscle training for multiple sclerosis. The Cochrane database of systematic reviews 12: cd009424	- Publication date Systematic review with 1/6 studies published 2013 onwards, and 5/6 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Rintala, Aki, Hakala, Sanna, Paltamaa, Jaana et al. (2018) Effectiveness of technology-based distance physical rehabilitation interventions on physical activity and walking in multiple sclerosis: a systematic review and meta-analysis of randomized controlled trials. Disability and rehabilitation 40(4): 373-387	- Country Systematic review with 1/11 of the included studies conducted in Australia, 1/11 in Germany, 1/11 in Italy, 1/11 in the UK, and 7/11 in the US. Australian, German, Italian, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Rippetoe, Josiah, Wang, Hongwu, James, Shirley A et al. (2020) Improvement of Gait after 4 Weeks of Wearable Focal Muscle Vibration Therapy for Individuals with Diabetic Peripheral Neuropathy. Journal of clinical medicine 9(11)	- Country Study conducted in the US.
Rodriguez Tapia, Gonzalo, Doumas, Ioannis, Lejeune, Thierry et al. (2022) Wearable powered exoskeletons for gait training in tetraplegia: a systematic review on feasibility, safety and potential health benefits. Acta neurologica Belgica 122(5): 1149-1162	- Study design (adults) Systematic review with 6/41 randomised controlled trials, 23/41 cohort studies, and 12/41 case series. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Rodriguez, Miguel Angel, Crespo, Irene, Del Valle, Miguel et al. (2020) Should respiratory muscle training be part of the treatment of Parkinson's disease? A systematic review of randomized controlled trials. Clinical rehabilitation 34(4): 429-437	- Publication date Systematic review with 1/5 studies published 2013 onwards, and 4/5 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Rodriguez-Diaz, Julio Cesar, Velazquez-Perez, Luis, Rodriguez Labrada, Roberto et al. (2018) Neurorehabilitation therapy in spinocerebellar ataxia type 2: A 24-week, rater-blinded, randomized, controlled trial. Movement disorders : official journal of the Movement Disorder Society 33(9): 1481-1487	- Country Study conducted in Cuba.
Rodriguez-Fernandez, A.; Lobo-Prat, J.; Font-Llagunes, J.M. (2021) Systematic review on wearable lower-limb exoskeletons for gait training in neuromuscular impairments. Journal of NeuroEngineering and Rehabilitation 18(1): 22	- Study design (adults) Systematic review with 6/87 randomised controlled trials, 35/87 observational studies, 31/87 pilot studies, and 15/87 validation studies. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Rodriguez-Fernandez, A., Lobo-Prat, J., Tolra-Campanya, M. et al. (2023) Randomized, Crossover Clinical Trial on the Safety, Feasibility, and Usability of the ABLE Exoskeleton: A Comparative Study with Knee-Ankle-Foot Orthoses. medRxiv	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Rodriguez-Fernandez, Antonio, Lobo-Prat, Joan, Tarrago, Rafael et al. (2022) Comparing walking with knee-ankle-foot orthoses and a knee-powered exoskeleton after spinal cord injury: a randomized, crossover clinical trial. Scientific reports 12(1): 19150	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Rodriguez-Mansilla, Juan, Bedmar-Vargas, Celia, Garrido-Ardila, Elisa Maria et al. (2023) Effects of Virtual	- Publication date Systematic review with 7/20 studies published 2013 onwards, and 13/20 published pre-2013. Study published

Study	Reason for exclusion
Reality in the Rehabilitation of Parkinson's Disease: A Systematic Review. Journal of clinical medicine 12(15)	2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Rojhani-Shirazi, Zahra; Barzintaj, Fatemeh; Salimifard, Mohamad Reza (2017) Comparison the effects of two types of therapeutic exercises Frenkele vs. Swiss ball on the clinical balance measures in patients with type II diabetic neuropathy. Diabetes & metabolic syndrome 11suppl1: 29-s32	- Country Study conducted in Iran.
Romanato, M, Guiotto, A, Spolaor, F et al. (2021) Changes of biomechanics induced by Equistasi® in Parkinson's disease: coupling between balance and lower limb joints kinematics. Medical & biological engineering & computing 59(78): 1403-1415	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Romano, A., Favetta, M., Summa, S. et al. (2022) Upper Body Physical Rehabilitation for Children with Ataxia through IMU-Based Exergame. Journal of Clinical Medicine 11(4): 1065	- Intervention Exergaming intervention to address upper limb functioning only, and not upper limb functioning, stability, and mobility together.
Romanov, R., Mesaric, L., Peric, D. et al. (2021) The effects of adapted physical exercise during rehabilitation in patients with traumatic brain injury. Turkish Journal of Physical Medicine and Rehabilitation 67(4): 482-489	- Country Study conducted in Slovenia and Serbia. Proportions of participants not reported, and results not reported separately for target country.
Rosley, Nurhaida, Hasnan, Nazirah, Hamzaid, Nur Azah et al. (2023) Effects of a combined progressive resistance training and functional electrical stimulation-evoked cycling exercise on lower limb muscle strength of individuals with incomplete spinal cord injury: A randomized controlled study. Turkish journal of physical medicine and rehabilitation 69(1): 23-30	- Country Study conducted in Malaysia.
Rosset-Llobet, Jaume; Fabregas-Molas, Silvia; Pascual-Leone, Alvaro (2015) Effect of Transcranial Direct Current Stimulation on Neurorehabilitation of Task-Specific Dystonia: A Double-Blind, Randomized Clinical Trial. Medical problems of performing artists 30(3): 178-84	- Population People with task-specific focal hand dystonia. Not relevant according to protocol population criteria.
Rossi-Izquierdo, M, Santos-Perez, S, Rubio-Rodriguez, J P et al. (2014) What is the optimal number of	- Outcomes

Study	Reason for exclusion
treatment sessions of vestibular rehabilitation?. European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery 271(2): 275-80	No relevant outcomes reported. Reports measures of dizziness, sensorial organisation, and limits of stability (measurement data not validated scales).
Rudroff, T. and Workman, C.D. (2021) Transcranial direct current stimulation as a treatment tool for mild traumatic brain injury. Brain Sciences 11(6): 806	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Ruiz, Jennifer, Labas, Michele P, Triche, Elizabeth W et al. (2013) Combination of robot-assisted and conventional body-weight-supported treadmill training improves gait in persons with multiple sclerosis: a pilot study. Journal of neurologic physical therapy : JNPT 37(4): 187-93	- Country Study conducted in the US.
Russo, Margherita, Dattola, Vincenzo, De Cola, Maria C et al. (2018) The role of robotic gait training coupled with virtual reality in boosting the rehabilitative outcomes in patients with multiple sclerosis. International journal of rehabilitation research. Internationale Zeitschrift fur Rehabilitationsforschung. Revue internationale de recherches de readaptation 41(2): 166-172	- Outcomes Outcomes of interest (gait and balance [Timed Up and Go test and Tinetti Balance Scale] and functioning [Functional Independence Measure]) only presented after multivariate analysis conducted and did not report association effect estimates.
Rutz, Dionys G and Benninger, David H (2020) Physical Therapy for Freezing of Gait and Gait Impairments in Parkinson Disease: A Systematic Review. PM & R : the journal of injury, function, and rehabilitation 12(11): 1140-1156	- Publication date Systematic review with 11/20 studies published 2013 onwards, and 9/20 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Rytter, Hana Mala, Graff, Heidi J, Henriksen, Henriette K et al. (2021) Nonpharmacological Treatment of Persistent Postconcussion Symptoms in Adults: A Systematic Review and Meta-analysis and Guideline Recommendation. JAMA network open 4(11): e2132221	- Publication date Systematic review with 12/19 studies published 2013 onwards, and 7/19 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Saadat, Z; Rojhani-Shirazi, Z; Abbasi, L (2017) Dose postural control improve following application of transcutaneous electrical nerve stimulation in diabetic peripheral neuropathic patients? A randomized placebo control trial. Diabetes &	- Country Study conducted in Iran.

Study	Reason for exclusion
metabolic syndrome 11suppl2: 755-s757	
Sabel, Magnus, Sjolund, Anette, Broeren, Jurgen et al. (2016) Active video gaming improves body coordination in survivors of childhood brain tumours. Disability and rehabilitation 38(21): 2073-84	- Outcomes Outcome of interest (functioning) reported as a sub-scores of BOT-2, and not a global measure of domain.
Sabel, Magnus, Sjolund, Anette, Broeren, Jurgen et al. (2017) Effects of physically active video gaming on cognition and activities of daily living in childhood brain tumor survivors: a randomized pilot study. Neuro-oncology practice 4(2): 98-110	- Intervention Exergaming intervention to address cognitive functioning and activities of daily living, and not upper limb functioning, stability, and mobility together.
Salari, Nader, Hayati, Aida, Kazeminia, Mohsen et al. (2022) The effect of exercise on balance in patients with stroke, Parkinson, and multiple sclerosis: a systematic review and meta-analysis of clinical trials. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology 43(1): 167-185	- Population Systematic review including participants in protocol (15/96 people with multiple sclerosis, 9/96 people with Parkinson's disease, 3/96 people with myelomeningocele, 2/96 people with spinal cord injury, and 1/96 children with stroke), unclear (15/96 people with hemiplegia), and out of protocol (41/96 adults with stroke, 8/96 people with cerebral palsy, and 2/96 people with fibromyalgia) of protocol. Studies including participants with multiple sclerosis, Parkinson's disease, paediatric stroke, and hemiplegia were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Salci, Yeliz, Fil, Ayla, Armutlu, Kadriye et al. (2017) Effects of different exercise modalities on ataxia in multiple sclerosis patients: a randomized controlled study. Disability and rehabilitation 39(26): 2626-2632	- Country Study conducted in Turkey.
Sale, Patrizio, De Pandis, Maria Francesca, Le Pera, Domenica et al. (2013) Robot-assisted walking training for individuals with Parkinson's disease: a pilot randomized controlled trial. BMC neurology 13: 50	- Outcomes No relevant outcomes reported. Reports measures of gait (measurement data such as velocity, cadence, step length, and swing time, not measured using validated scales).
Saleem, Ghazala T, Crasta, Jewel E, Slomine, Beth S et al. (2019) Transcranial Direct Current Stimulation in Pediatric Motor Disorders: A Systematic Review and Meta-analysis. Archives of physical medicine and rehabilitation 100(4): 724-738	- Population Systematic review including participants in protocol (3/23 children with dystonia and 1/23 children with acquired brain injury), unclear (1/23 children with delayed neuromotor development and 1/23 children with involuntary movements) and out of protocol (17/23 children with cerebral palsy). Studies including participants with dystonia, acquired brain injury, delayed motor development and involuntary movements were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Saleh, Marwa Shafiek Mustafa, Elbanna, Rana Hesham Mohamed, Abdelhakiem, Nadia Mohamed et al.	- Country Study conducted in Egypt.

Study	Reason for exclusion
(2024) Sensorimotor training improves gait, ankle joint proprioception, and quality of life in patients with diabetic peripheral neuropathy: A single-blinded randomized controlled trial. American journal of physical medicine & rehabilitation	
San Martin Valenzuela, Constanza, Moscardo, Lirios Duenas, Lopez-Pascual, Juan et al. (2020) Effects of Dual-Task Group Training on Gait, Cognitive Executive Function, and Quality of Life in People With Parkinson Disease: Results of Randomized Controlled DUALGAIT Trial. Archives of physical medicine and rehabilitation 101(11): 1849-1856e1	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data such as stride length, speed, cadence, not measured using validated scales), cognitive functioning, and quality of life.
Sandroff, Brian M, Bollaert, Rachel E, Pilutti, Lara A et al. (2017) Multimodal exercise training in multiple sclerosis: A randomized controlled trial in persons with substantial mobility disability. Contemporary clinical trials 61: 39-47	- Country Study conducted in the US.
Sangelaji, Bahram, Kordi, Mohammadreza, Banihashemi, Farzaneh et al. (2016) A combined exercise model for improving muscle strength, balance, walking distance, and motor agility in multiple sclerosis patients: A randomized clinical trial. Iranian journal of neurology 15(3): 111-20	- Country Study conducted in Iran.
Santos, Pietro, Machado, Tacia, Santos, Luan et al. (2019) Efficacy of the Nintendo Wii combination with Conventional Exercises in the rehabilitation of individuals with Parkinson's disease: A randomized clinical trial. NeuroRehabilitation 45(2): 255-263	- Country Study conducted in Brazil.
Santos, Pietro, Scaldaferri, Giselle, Santos, Luan et al. (2019) Effects of the Nintendo Wii training on balance rehabilitation and quality of life of patients with Parkinson's disease: A systematic review and meta-analysis. NeuroRehabilitation 44(4): 569-577	- Country Systematic review with 3/5 of the included studies conducted in Brazil, 1/5 in South Korea, and 1/5 in Taiwan. No studies checked against protocol criteria as did not include any studies from target countries.
Santos, Suhaila M, da Silva, Rubens A, Terra, Marcelle B et al. (2017) Balance versus resistance training on postural control in patients with Parkinson's disease: a randomized controlled trial. European journal of	- Country Study conducted in Brazil.

Study	Reason for exclusion
physical and rehabilitation medicine 53(2): 173-183	
Sarasso, Elisabetta, Gardoni, Andrea, Tettamanti, Andrea et al. (2022) Virtual reality balance training to improve balance and mobility in Parkinson's disease: a systematic review and meta-analysis. Journal of neurology 269(4): 1873-1888	- Country Systematic review with 3/22 of the included studies conducted in Italy, 1/22 in The Netherlands, 2/22 from multi-high-income European countries and Israel, 6/22 in Brazil, 4/22 in China, 4/22 in Taiwan, and 2/22 in South Korea. Italian, Dutch, and multi-centre studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Sattelmayer, Martin, Chevalley, Odile, Steuri, Ruedi et al. (2019) Over-ground walking or robot-assisted gait training in people with .multiple sclerosis: does the effect depend on baseline walking speed and disease related disabilities? A systematic review and meta-regression. BMC neurology 19(1): 93	- Country Systematic review with 3/9 of the included studies conducted in Italy, 2/11 in Switzerland, 3/9 in the US, and 1/9 in Israel. Italian and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Scally, Jennifer B, Baker, Julien S, Rankin, Jean et al. (2020) Evaluating functional electrical stimulation (FES) cycling on cardiovascular, musculoskeletal and functional outcomes in adults with multiple sclerosis and mobility impairment: A systematic review. Multiple sclerosis and related disorders 37: 101485	- Study design (adults) Systematic review with 2/9 randomised controlled trials, 9/9 non-controlled studies, 1/9 case studies, and 1/9 retrospective study. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Schabrun, Siobhan M; Lamont, Robyn M; Brauer, Sandra G (2016) Transcranial Direct Current Stimulation to Enhance Dual-Task Gait Training in Parkinson's Disease: A Pilot RCT. PloS one 11(6): e0158497	- Outcomes Outcome of interest (gait and balance [TUG]) data either presented graphically so cannot be extracted for analysis or reported under dual-task conditions so no longer a global measure of domain.
Schelhaas, Reslin, Hajibozorgi, Mahdieh, Hortobagyi, Tibor et al. (2022) Conservative interventions to improve foot progression angle and clinical measures in orthopedic and neurological patients - A systematic review and meta-analysis. Journal of biomechanics 130: 110831	- Population Systematic review including participants in protocol (1/41 people with multiple sclerosis, 1/41 people with Parkinson's disease, and 1/41 people with post-cerebral hemispherectomy) and out of protocol (18/41 people with osteoarthritis, 14/41 healthy adults, 4/41 people with cerebral palsy, 1/41 adults with stroke, and 1/41 people with lumbar degenerative kyphosis). Studies including participants with multiple sclerosis, Parkinson's disease, and post-cerebral hemispherectomy were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Schlemmer, Erica and Nicholson, Nannette (2022) Vestibular Rehabilitation Effectiveness for Adults With Mild Traumatic Brain Injury/Concussion: A Mini-Systematic Review. American journal of audiology 31(1): 228-242	- Study design (adults) Systematic review with 1/5 randomised controlled trial, 2/5 non-comparative studies, 1/5 case series, and 1/5 non-randomised controlled trials. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Schlenstedt, Christian, Paschen, Steffen, Seuthe, Jana et al. (2018) Moderate Frequency Resistance and Balance Training Do Not Improve Freezing of Gait in Parkinson's Disease: A Pilot Study. Frontiers in neurology 9: 1084	- Duplicate Sub-analysis of included study (Schlenstedt 2015) with no new data presented.
Schmitt, A, Rall, B, Haase, I et al. (2017) Comparison of a robot-assisted gait training with conventional gait training in patients with advanced idiopathic Parkinson's syndrome. Neurologie und rehabilitation 23(3): 233-242	- Other protocol criteria German language article.
Schneider, Kathryn J, Meeuwisse, Willem H, Nettel-Aguirre, Alberto et al. (2014) Cervicovestibular rehabilitation in sport-related concussion: a randomised controlled trial. British journal of sports medicine 48(17): 1294-8	- Population Participants' condition does not meet the guideline definition of chronic (3 months since diagnosis or injury). Median time since injury reported as 53 days for intervention group and 47 days for control group.
Schuepbach, W M M, Rau, J, Knudsen, K et al. (2013) Neurostimulation for Parkinson's disease with early motor complications. The New England journal of medicine 368(7): 610-22	- Intervention Unclear intervention. Electrical neuromodulation (subthalamic stimulation) to early motor complications of Parkinson's disease and dystonia, with no further information given on which limbs or body areas were affected or targeted.
Schwenk, Michael, Grewal, Gurtej S, Holloway, Dustin et al. (2016) Interactive Sensor-Based Balance Training in Older Cancer Patients with Chemotherapy-Induced Peripheral Neuropathy: A Randomized Controlled Trial. Gerontology 62(5): 553-63	- Country Study conducted in the US.
Sconza, Cristiano, Negrini, Francesco, Di Matteo, Berardo et al. (2021) Robot-Assisted Gait Training in Patients with Multiple Sclerosis: A Randomized Controlled Crossover Trial. Medicina (Kaunas, Lithuania) 57(7)	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
Sedaghati, P., Goudarzian, M., Daneshmandi, H. et al. (2018) Effects of alexander-based corrective techniques on forward flexed posture, risk of fall, and fear of falling in idiopathic parkinson's disease. Archives of Neuroscience 5(2): e61274	- Country Study conducted in Iran.
Sedaghati, Parisa, Daneshmandi, Hassan, Karimi, Noureddin et al. (2016) A Selective Corrective Exercise to Decrease Falling and Improve Functional Balance in	- Country Study conducted in Iran.

Study	Reason for exclusion
Idiopathic Parkinson's Disease. Trauma monthly 21(1): e23573	
Serry, ZMH, Mossa, G, Elhabashy, H et al. (2016) Transcutaneous nerve stimulation versus aerobic exercise in diabetic neuropathy. Egyptian journal of neurology, psychiatry and neurosurgery 53(2): 124-129	- Country Study conducted in Egypt.
Seuthe, Jana, D'Cruz, Nicholas, Ginis, Pieter et al. (2020) The Effect of One Session Split-Belt Treadmill Training on Gait Adaptation in People With Parkinson's Disease and Freezing of Gait. Neurorehabilitation and neural repair 34(10): 954-963	- Outcomes No relevant outcomes reported. Reports non-validated measures of gait adaptation.
Seuthe, Jana, D'Cruz, Nicholas, Ginis, Pieter et al. (2019) Split-belt treadmill walking in patients with Parkinson's disease: A systematic review. Gait & posture 69: 187-194	- Study design (adults) Systematic review including non-randomised studies. No studies checked against protocol criteria as did not include any randomised controlled trials or systematic reviews.
Sevcenko, Ksenija and Lindgren, Ingrid (2022) The effects of virtual reality training in stroke and Parkinson's disease rehabilitation: a systematic review and a perspective on usability. European review of aging and physical activity : official journal of the European Group for Research into Elderly and Physical Activity 19(1): 4	- Population Systematic review including participants in protocol (8/18 people with Parkinson's disease) and out of protocol (10/18 adults with stroke). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Shackleton, C., Samejima, S., Williams, A.M.M. et al. (2023) Motor and autonomic concomitant health improvements with neuromodulation and exercise (MACHINE) training: a randomised controlled trial in individuals with spinal cord injury. BMJ Open 13(7): 070544	- Publication type Study protocol.
Shah, Nehal, Shrivastava, Manisha, Kumar, Sanjeev et al. (2022) Supervised, individualised exercise reduces fatigue and improves strength and quality of life more than unsupervised home exercise in people with chronic Guillain-Barre syndrome: a randomised trial. Journal of physiotherapy 68(2): 123-129	- Country Study conducted in India.
Shahhar, Ahmed Zarie M; Qasheesh, Mohammed; Shaphe, Mohammad Abu (2022) Effectiveness of Nintendo Wii on Balance in People with Parkinson's Disease: A Systematic Review. Journal of lifestyle medicine 12(3): 105-112	- Outcomes Systematic review with no meta-analysis and only a narrative description of results, so no relevant outcomes. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Shahien, Mostafa, Elaraby, Abdelrahman, Gamal, Mohamed et al. (2023) Physical therapy interventions	- Country Systematic review with 1/6 of the included studies conducted in Canada, 1/6 in Denmark, ,1/6 in Slovenia, 2/6

Study	Reason for exclusion
for the management of hand tremors in patients with Parkinson's disease: a systematic review. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology 44(2): 461-470	in Thailand, and 1/6 in Iran. Canadian, Danish, and Slovenian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Sharififar, S.; Shuster, J.J.; Bishop, M.D. (2018) Adding electrical stimulation during standard rehabilitation after stroke to improve motor function. A systematic review and meta-analysis. Annals of Physical and Rehabilitation Medicine 61(5): 339-344	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Shen, Jiabin, Johnson, Sarah, Chen, Cheng et al. (2020) Virtual Reality for Pediatric Traumatic Brain Injury Rehabilitation: A Systematic Review. American journal of lifestyle medicine 14(1): 6-15	- Country Systematic review with 1/3 of the included studies conducted in Canada and 2/3 in the US. Canadian study was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Shen, Xia and Mak, Margaret K Y (2014) Balance and Gait Training With Augmented Feedback Improves Balance Confidence in People With Parkinson's Disease: A Randomized Controlled Trial. Neurorehabilitation and neural repair 28(6): 524-35	- Country Study conducted in China.
Shen, Xia and Mak, Margaret K Y (2015) Technology-assisted balance and gait training reduces falls in patients with Parkinson's disease: a randomized controlled trial with 12-month follow-up. Neurorehabilitation and neural repair 29(2): 103-11	- Country Study conducted in Hong Kong.
Shen, Xia; Wong-Yu, Irene S K; Mak, Margaret K Y (2016) Effects of Exercise on Falls, Balance, and Gait Ability in Parkinson's Disease: A Meta-analysis. Neurorehabilitation and neural repair 30(6): 512-27	- Publication date Systematic review with 15/38 studies published 2013 onwards, and 23/38 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Sherief, A.A.A.; Abdelfattah, A.S.; Elfakharany, M.S. (2021) Electrodiagnostic effect of armeo robotic therapy versus conventional therapy in erb's palsy children. Annals of Clinical and Analytical Medicine 12(supplement1): 35-40	- Country Study conducted in Egypt.
Shih, Meng-Che, Wang, Ray-Yau, Cheng, Shih-Jung et al. (2016) Effects of a balance-based exergaming intervention using the Kinect sensor on posture stability in individuals with Parkinson's disease: a single-blinded randomized controlled trial. Journal of	- Country Study conducted in Taiwan.

Study	Reason for exclusion
neuroengineering and rehabilitation 13(1): 78	
Shin, Ji Cheol, Jeon, Ha Ra, Kim, Dahn et al. (2023) Effects of end-effector robot-assisted gait training on gait ability, muscle strength, and balance in patients with spinal cord injury. NeuroRehabilitation 53(3): 335-346	- Country Study conducted in South Korea.
Shin, Ji Cheol, Kim, Ji Yong, Park, Han Kyul et al. (2014) Effect of robotic-assisted gait training in patients with incomplete spinal cord injury. Annals of rehabilitation medicine 38(6): 719-25	- Country Study conducted in South Korea.
Shuai, Lang, Yu, Guo-Hua, Feng, Zhen et al. (2016) Application of a paraplegic gait orthosis in thoracolumbar spinal cord injury. Neural regeneration research 11(12): 1997-2003	- Country Study conducted in China.
Siew-Pin Leuk, Jessie, Yow, Kai-En, Zi-Xin Tan, Clenyce et al. (2023) A meta-analytical review of transcranial direct current stimulation parameters on upper limb motor learning in healthy older adults and people with Parkinson's disease. Reviews in the neurosciences 34(3): 325-348	- Population Systematic review including participants in protocol (12/32 people with Parkinson's disease) and out of protocol (20/32 older adults). Studies including participants with Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Silva, Adriano Zanardi da and Israel, Vera Lucia (2019) Effects of dual-task aquatic exercises on functional mobility, balance and gait of individuals with Parkinson's disease: A randomized clinical trial with a 3-month follow-up. Complementary therapies in medicine 42: 119-124	- Country Study conducted in Brazil.
Silva, Renata do Nascimento, Afonso, Sabrina Vilela, Felipe, Luana Rosseto et al. (2021) Dual-task intervention based on trail making test: Effects on Parkinson's disease. Journal of bodywork and movement therapies 27: 628-633	- Country Study conducted in Brazil.
Silva-Batista, Carla, Corcos, Daniel M, Kanegusuku, Helcio et al. (2018) Balance and fear of falling in subjects with Parkinson's disease is improved after exercises with motor complexity. Gait & posture 61: 90-97	- Country Study conducted in Brazil.
Silva-Batista, Carla, de Lima-Pardini, Andrea Cristina, Nucci, Mariana Penteado et al. (2020) A Randomized, Controlled Trial of Exercise for Parkinsonian Individuals With Freezing of Gait. Movement	- Country Study conducted in Brazil.

Study	Reason for exclusion
disorders : official journal of the Movement Disorder Society 35(9): 1607-1617	
Simis, M, Ricardo Sato, J, Santos, K et al. (2018) Using functional near infrared spectroscopy (FNIRS) to assess the effect of transcranial direct-current stimulation (TDCS) on spinal cord injury patient, during robot-assisted gait. Annals of physical and rehabilitation medicine	- Publication type Conference abstract.
Simpson, Michael William and Mak, Margaret (2020) The effect of transcranial direct current stimulation on upper limb motor performance in Parkinson's disease: a systematic review. Journal of neurology 267(12): 3479-3488	- Intervention Systematic review investigating electrical neuromodulation to address upper limb function only, and not to address upper limb functioning, stability and mobility together. Included studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Slade, Susan C, Finkelstein, David I, McGinley, Jennifer L et al. (2020) Exercise and physical activity for people with Progressive Supranuclear Palsy: a systematic review. Clinical rehabilitation 34(1): 23-33	- Study design (adults) Systematic review with 3/11 randomised controlled trials, 4/11 case reports, 1/11 case series, 1/11 cohort studies, 1/11 non-controlled studies, and 1/11 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Smaili, S.M., Bueno, M.E.B., Barboza, N.M. et al. (2018) Efficacy of neurofunctional versus resistance training in improving gait and quality of life among patients with Parkinson's disease: A randomized clinical trial. Motriz. Revista de Educacao Fisica 24(2): e1018123	- Country Study conducted in Brazil.
Soberg, Helene L, Andelic, Nada, Langhammer, Birgitta et al. (2021) Effect of vestibular rehabilitation on change in health-related quality of life in patients with dizziness and balance problems after traumatic brain injury: A randomized controlled trial. Journal of rehabilitation medicine 53(4): jrm00181	- Outcomes No relevant outcomes reported. Reports measures of quality of life, post-concussion symptoms (including dizziness), and depressive symptoms.
Soke, Fatih, Aydin, Fatma, Karakoc, Selda et al. (2023) Effects of backward walking training on balance, gait, and functional mobility in people with multiple sclerosis: A randomized controlled study. Multiple sclerosis and related disorders 79: 104961	- Country Study conducted in Turkey.
Soni, S., Lohar, D., Khan, Z. et al. (2023) EFFECTIVENESS OF BALANCE TRAINING INTERVENTIONS IN IMPROVING BALANCE IN INDIVIDUALS WITH PARKINSON'S DISEASE: A SYSTEMATIC REVIEW. International	- Study design (adults) Non-systematic literature review.

Study	Reason for exclusion
Journal of Current Pharmaceutical Research 15(4): 92-95	
Sosnoff, Jacob J, Wajda, Douglas A, Sandroff, Brian M et al. (2017) Dual task training in persons with Multiple Sclerosis: a feasability randomized controlled trial. Clinical rehabilitation 31(10): 1322-1331	- Country Study conducted in the US.
Sousa, Caio Victor, Lee, Kelly, Alon, Dar et al. (2023) A Systematic Review and Meta-analysis of the Effect of Active Video Games on Postural Balance. Archives of physical medicine and rehabilitation 104(4): 631-644	- Country Systematic review with 7/129 of the included studies conducted in Australia, 5/129 in Italy, 5/129 Spain, 4/129 in Germany, 3/129 in Canada, 3/129 in the Netherlands, 3/129 in Greece, 3/129 in the UK, 2/129 in Poland, 2/129 in Portugal, 1/129 in Denmark, 1/129 in Finland, 1/129 in Hungary, 1/129 in Ireland, 1/129 in Slovenia, 1/129 in Sweden, 1/129 in Switzerland, 22/129 in South Korea, 17/129 in Taiwan, 11/129 in the US, 8/129 in Brazil, 8/129 in Turkey, 3/129 in China, 2/129 in Malaysia, 2/129 in Singapore, 2/129 in South Africa, 1/129 in Chile, 1/129 in Egypt, 1/129 in Hong Kong, 1/129 in India, 1/129 in Iran, 1/129 in Israel, 1/129 in Japan, 1/129 in Lebanon, 1/129 in Pakistan, and 1/129 in Saudi Arabia. Australian, Italian, Spanish, German, Canadian, Dutch, Greek, UK, Polish, Portuguese, Danish, Finnish, Hungarian, Irish, Slovenian, Swedish, and Swiss studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Southard, Veronica, DiFrancisco-Donoghue, Joanne, Mackay, James et al. (2016) The Effects of Below Knee Compression Garments on Functional Performance in Individuals with Parkinson Disease. International journal of health sciences 10(3): 373-80	- Country Study conducted in the US.
Sparrer, I., Duong Dinh, T.A., Ilgner, J. et al. (2013) Vestibular rehabilitation using the Nintendo Wii Balance Board - A user-friendly alternative for central nervous compensation. Acta Oto-Laryngologica 133(3): 239-245	- Comparator Two exercises from the intervention programme, and not no intervention, waitlist, standard rehabilitation care alone, or ‘usual care’.
Sparrow, David, DeAngelis, Tamara R, Hendron, Kathryn et al. (2016) Highly Challenging Balance Program Reduces Fall Rate in Parkinson Disease. Journal of neurologic physical therapy : JNPT 40(1): 24-30	- Country Study conducted in the US.
Spina, Stefania, Facciorusso, Salvatore, Cinone, Nicoletta et al. (2021) Effectiveness of robotic balance training on postural instability in patients with mild Parkinson's disease: A pilot, single blind, randomized controlled trial. Journal of	- Intervention Robotic balance training for stability, and not: 1. Robotics and repetitive task training for upper limb functioning. 2. Balance exercises for stability. 3. Lower limb wearables, electrical stimulation and lower-body robotics for mobility.

Study	Reason for exclusion
rehabilitation medicine 53(2): jrm00154	
Staiano, Amanda E and Flynn, Rachel (2014) Therapeutic Uses of Active Videogames: A Systematic Review. Games for health journal 3(6): 351-65	- Publication date Systematic review with 5/64 studies published 2013 onwards, and 59/64 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Stanciu, Liliana Elena, Iliescu, Madalina Gabriela, Vladareanu, Liliana et al. (2023) Evidence of Improvement of Lower Limb Functioning Using Hydrotherapy on Spinal Cord Injury Patients. Biomedicines 11(2)	- Study design (adults) Systematic review with 2/4 systematic reviews, 1/4 non-randomised controlled trials, and 1/4 qualitative studies. Systematic reviews were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Steib, Simon, Klamroth, Sarah, Gasner, Heiko et al. (2019) Exploring gait adaptations to perturbed and conventional treadmill training in Parkinson's disease: Time-course, sustainability, and transfer. Human movement science 64: 123-132	- Outcomes No relevant outcomes reported. Reports measures of gait parametrics (measurement data such as stride length, swing time, and gait asymmetry, not measured using validated scales).
Stozek, Joanna, Rudzinska, Monika, Pustulka-Piwnik, Urszula et al. (2016) The effect of the rehabilitation program on balance, gait, physical performance and trunk rotation in Parkinson's disease. Aging clinical and experimental research 28(6): 1169-1177	- Intervention Standardised rehabilitation programme and not an individualised exercise programme.
Straudi, Sofia, Severini, Giacomo, Sabbagh Charabati, Amira et al. (2017) The effects of video game therapy on balance and attention in chronic ambulatory traumatic brain injury: an exploratory study. BMC neurology 17(1): 86	- Comparator Balance platform therapy, and not no intervention, waitlist, standard rehabilitation care alone, or 'usual care'.
Streckmann, Fiona, Balke, Maryam, Cavaletti, Guido et al. (2022) Exercise and Neuropathy: Systematic Review with Meta-Analysis. Sports medicine (Auckland, N.Z.) 52(5): 1043-1065	- Country Systematic review with 5/41 of the included studies conducted in Germany, 3/41 in the Netherlands, 1/41 in Canada, 1/41 in Italy, 8/41 in Iran, 6/41 in India, 6/41 in the US, 2/41 in South Africa, 2/41 in South Korea, 1/41 in Brazil, 1/41 in China, 1/41 in Egypt, 1/41 in Myanmar, 1/41 in Rwanda, 1/41 in Taiwan, and 1/41 in Thailand. German, Dutch, Canadian, and Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Streckmann, Fiona, Lehmann, H C, Balke, M et al. (2019) Sensorimotor training and whole-body vibration training have the potential to reduce motor and sensory symptoms of chemotherapy-induced peripheral neuropathy-a randomized controlled pilot trial. Supportive care in cancer : official journal of the Multinational	- Outcomes No relevant outcomes reported. Reports measures of chemotherapy-induced peripheral neuropathy symptoms (measurement data such as tendon reflexes, peripheral deep sensitivity, light-touch perception, sense of position, and lower leg strength, not measured using validated scales), nerve conduction velocity and amplitude, quality of life, and pain.

Study	Reason for exclusion
Association of Supportive Care in Cancer 27(7): 2471-2478	
Streckmann, Fiona, Zopf, Eva M, Lehmann, Helmar C et al. (2014) Exercise intervention studies in patients with peripheral neuropathy: a systematic review. Sports medicine (Auckland, N.Z.) 44(9): 1289-304	- Publication date Systematic review with 5/18 studies published 2013 onwards, and 13/18 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Strouwen, Carolien, Molenaar, Esther A L M, Munks, Liesbeth et al. (2019) Determinants of Dual-Task Training Effect Size in Parkinson Disease: Who Will Benefit Most?. Journal of neurologic physical therapy : JNPT 43(1): 3-11	- Intervention Dual-task training to address mobility only, and not to address upper limb functioning, stability, and mobility together.
Strouwen, Carolien, Molenaar, Esther A L M, Munks, Liesbeth et al. (2017) Training dual tasks together or apart in Parkinson's disease: Results from the DUALITY trial. Movement disorders : official journal of the Movement Disorder Society 32(8): 1201-1210	- Outcomes No relevant outcomes reported. Reports measures of gait (velocity during dual-task conditions, not measured using validated scale), reaction time, and falls.
Subramanian, Sandeep K, Fountain, Melinda K, Hood, Ashley F et al. (2022) Upper Limb Motor Improvement after Traumatic Brain Injury: Systematic Review of Interventions. Neurorehabilitation and neural repair 36(1): 17-37	- Publication date Systematic review with 7/23 studies published 2013 onwards, and 16/23 published pre-2013. Studies published 2013 onwards were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Suganthirababu, P., Prathap, L., Kumaresan, A. et al. (2023) Recent trends in applying functional electrical stimulation in the management of spastic paraplegia induced by spinal cord injury: a systematic review. Physiotherapy Quarterly 31(1): 58-64	- Country Systematic review with 2/5 of the included studies conducted in Canada, 1/5 in Australia, 1/5 in India, and 1/5 in Turkey. Canadian and Australian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Sultana, Munira, Bryant, Dianne, Orange, J B et al. (2020) Effect of Wii Fit© Exercise on Balance of Older Adults with Neurocognitive Disorders: A Meta-Analysis. Journal of Alzheimer's disease : JAD 75(3): 817-826	- Population Systematic review including participants out of protocol (2/5 older adults with Alzheimer's disease, 2/5 older adults with cognitive impairment, and 1/5 older adults with dementia). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Sumec, Rastislav, Filip, Pavel, Sheardova, Katerina et al. (2015) Psychological Benefits of Nonpharmacological Methods Aimed for Improving Balance in Parkinson's Disease: A Systematic Review. Behavioural neurology 2015: 620674	- Publication date Systematic review with 31/64 studies published 2013 onwards, and 33/64 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Sung, Eun Jung, Chun, Min Ho, Hong, Ja Young et al. (2016) Effects of a Resting Foot Splint in Early Brain	- Country Study conducted in South Korea.

Study	Reason for exclusion
Injury Patients. Annals of rehabilitation medicine 40(1): 135-41	
Tabacof, Laura, Braren, Stephen, Patterson, Taylor et al. (2021) Safety and Tolerability of a Wearable, Vibrotactile Stimulation Device for Parkinson's Disease. Frontiers in human neuroscience 15: 712621	- Country Study conducted in the US.
Tak, S.; Choi, W.; Lee, S. (2015) Game-based virtual reality training improves sitting balance after spinal cord injury: A single-blinded, randomized controlled trial. Medical Science Technology 56: 53-59	- Country Study conducted in South Korea.
Tamburella, Federica, Lorusso, Matteo, Tramontano, Marco et al. (2022) Overground robotic training effects on walking and secondary health conditions in individuals with spinal cord injury: systematic review. Journal of neuroengineering and rehabilitation 19(1): 27	- Study design (adults) Systematic review with 1/41 randomised controlled trials, 39/41 non-controlled studies, and 1/41 non-randomised controlled trials. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Tamburin, Stefano, Park, Susanna B, Schenone, Angelo et al. (2022) Rehabilitation, exercise, and related non-pharmacological interventions for chemotherapy-induced peripheral neurotoxicity: Systematic review and evidence-based recommendations. Critical reviews in oncology/hematology 171: 103575	- Intervention Systematic review with mix of unclear interventions (20/41 interventions to treat chemotherapy-induced peripheral neurotoxicity) and interventions out (21/41 interventions to prevent chemotherapy-induced peripheral neurotoxicity) of protocol. Studies investigating interventions to treat chemotherapy-induced peripheral neurotoxicity were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Tao, Yanmin, Luo, Jingsong, Tian, Jing et al. (2023) The role of robot-assisted training on rehabilitation outcomes in Parkinson's disease: a systematic review and meta-analysis. Disability and rehabilitation: 1-19	- Country Systematic review with 8/21 of the included studies conducted in Italy, 1/21 in Australia, 1/21 in Canada, 1/21 in Slovenia, 1/21 in Switzerland, 7/21 in China, 1/21 in Japan, and 1/21 in South Korea. Italian, Australian, Canadian, Slovenian, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Tariq, H. (2016) Effect of balance exercises for person with Multiple Sclerosis using Wii game: A systematic review of randomized and non-randomized control trials. Acta Medica International 3(1): 196-201	- Publication date Systematic review with 3/5 studies published 2013 onwards, and 2/5 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Tariq, M., Hassan, A., Hashmi, G.M. et al. (2024) EFFECTS OF NEUROMUSCULAR ELECTRICAL STIMULATION WITH AND WITHOUT CONSTRAINT INDUCED MOVEMENT THERAPY ON UPPER LIMB FUNCTION IN CHILDREN WITH ERB'S PALSY. Journal of	- Country Study conducted in Pakistan.

Study	Reason for exclusion
Population Therapeutics and Clinical Pharmacology 31(3): 1071-1078	
Taveggia, Giovanni, Villafane, Jorge H, Vavassori, Francesca et al. (2014) Multimodal treatment of distal sensorimotor polyneuropathy in diabetic patients: a randomized clinical trial. Journal of manipulative and physiological therapeutics 37(4): 242-52	- Intervention Mixed intervention including components in protocol (treadmill-based gait training and balance exercises) and out of protocol (strengthening exercises for ankle).
Tedeschi, Roberto (2023) Automated mechanical peripheral stimulation for gait rehabilitation in Parkinson's disease: A comprehensive review. Clinical parkinsonism & related disorders 9: 100219	- Study design (adults) Non-systematic literature review.
Tefertiller, Candace, Hays, Kaitlin, Natale, Audrey et al. (2019) Results From a Randomized Controlled Trial to Address Balance Deficits After Traumatic Brain Injury. Archives of physical medicine and rehabilitation 100(8): 1409-1416	- Country Study conducted in the US.
Tefertiller, Candace, Ketchum, Jessica M, Bartelt, Patricia et al. (2022) Feasibility of virtual reality and treadmill training in traumatic brain injury: a randomized controlled pilot trial. Brain injury 36(7): 898-908	- Country Study conducted in the US.
Terrens, Aan Fleur; Soh, Sze-Ee; Morgan, Prue Elizabeth (2018) The efficacy and feasibility of aquatic physiotherapy for people with Parkinson's disease: a systematic review. Disability and rehabilitation 40(24): 2847-2856	- Study design (adults) Systematic review with 2/10 randomised controlled trials and 8/10 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Thibaut, Aurore, Deltombe, Thierry, Wannez, Sarah et al. (2015) Impact of soft splints on upper limb spasticity in chronic patients with disorders of consciousness: A randomized, single-blind, controlled trial. Brain injury 29(78): 830-6	- Study design (adults) Non-randomised controlled trial.
Thibaut, Aurore, Piarulli, Andrea, Martens, Geraldine et al. (2019) Effect of multichannel transcranial direct current stimulation to reduce hypertonia in individuals with prolonged disorders of consciousness: A randomized controlled pilot study. Annals of physical and rehabilitation medicine 62(6): 418-425	- Population Mixed population including participants in protocol (6/14 people with traumatic brain injury) and out of protocol (5/14 adults with stroke and 3/14 people with cardiac arrest). Results not presented separately for target population.
Thomas, Sarah, Fazakarley, Louise, Thomas, Peter W et al. (2017) Mii-vitaliSe: a pilot randomised controlled	- Intervention Home gaming intervention to encourage participants to increase physical activity levels, and not to address upper

Study	Reason for exclusion
trial of a home gaming system (Nintendo Wii) to increase activity levels, vitality and well-being in people with multiple sclerosis. BMJ open 7(9): e016966	limb functioning, stability and mobility together. On the basis of the full text, the study seems more directly relevant to evidence review O regarding access to physical activity, and has been further screened for that question.
Thukral, Neerja; Kaur, Jaspreet; Malik, Manoj (2021) A Systematic Review and Meta-analysis on Efficacy of Exercise on Posture and Balance in Patients Suffering from Diabetic Neuropathy. Current diabetes reviews 17(3): 332-344	- Country Systematic review with 1/18 of the included studies conducted in Australia, 1/18 in Spain, 1/18 in Switzerland, 3/18 in South Korea, 2/18 in Egypt, 2/18 in Iran, 2/18 in the US, 1/18 in China, 1/18 in India, 1/18 in Malaysia, 1/18 in Pakistan, 1/18 in Saudi Arabia, and 1/18 in Thailand. Australian, Spanish, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Tobar, Andrea, Jaramillo, Arturo P, Costa, Stefany C et al. (2023) A Physical Rehabilitation Approach for Parkinson's Disease: A Systematic Literature Review. Cureus 15(9): e44739	- Country Systematic review with 2/9 of the included studies conducted in the UK, 1/9 in Italy, 1/9 in Slovenia, 1/9 in Spain, 1/9 in Sweden, 1/9 in China, 1/9 in Hong Kong, 1/9 in Taiwan, and 1/9 in the US. UK, Italian, Slovenian, Spanish, and Swedish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Tollár, Jozsef, Nagy, Ferenc, Kovacs, Norbert et al. (2019) Two-Year Agility Maintenance Training Slows the Progression of Parkinsonian Symptoms. Medicine and science in sports and exercise 51(2): 237-245	- Intervention Standardised high-intensity sensorimotor agility exercise programme with exergame component to address stability and mobility only, and not: 1. Sensorimotor exercises to address upper limb functioning, stability and mobility together. 2. Exergaming to address upper limb functioning, stability and mobility together. 3. Individualised exercise programme.
Tomlinson, C.L., Patel, S., Meek, C. et al. (2013) Physiotherapy versus placebo or no intervention in Parkinson's disease. Cochrane Database of Systematic Reviews 2013(9): cd002817	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Tomo, CK, Pereira, VS, Anti Pompeu, SMA et al. (2014) Effects of upper limb functional training in the dual task condition in Parkinson's disease. Revista neurociencias 22(3): 344-350	- Other protocol criteria Portuguese language article.
Tonkin, Paige G, Miller, Timothy D, Hartmann, Tegan E et al. (2023) The effects of exercise on non-motor experiences of daily living experienced in Parkinson's Disease: A systematic review and network meta-analysis. Clinical parkinsonism & related disorders 9: 100203	- Publication date Systematic review with 4/5 studies published 2013 onwards, and 1/5 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: 1/5 only 20.0%. A further 1 paper can be excluded as being conducted in countries outside of protocol (that is,not high-income European, Canada, Australia, or New Zealand), which means systematic review is excluded.
Tramontano, M, Bonni, S, Martino Cinnera, A et al. (2016) Blindfolded	- Outcomes

Study	Reason for exclusion
Balance Training in Patients with Parkinson's Disease: A Sensory-Motor Strategy to Improve the Gait. Parkinson's disease 2016: 7536862	No relevant outcomes reported. Reports measures of gait (measurement data such as stance percentage, swing percentage, and double stance percentage, not measured using validated scale).
Tramontano, Marco, Argento, Ornella, Orejel Bustos, Amaranta S et al. (2024) Cognitive-motor dual-task training improves dynamic stability during straight and curved gait in patients with multiple sclerosis: a randomized controlled trial. European journal of physical and rehabilitation medicine 60(1): 27-36	- Intervention Dual-task training to address mobility and stability only, and not to address upper limb functioning, stability, and mobility together.
Tramontano, Marco, Grasso, Maria Grazia, Soldi, Silvia et al. (2020) Cerebellar Intermittent Theta-Burst Stimulation Combined with Vestibular Rehabilitation Improves Gait and Balance in Patients with Multiple Sclerosis: a Preliminary Double-Blind Randomized Controlled Trial. Cerebellum (London, England) 19(6): 897-901	- Intervention Transcranial magnetic stimulation, and not electrical or vibratory stimulation.
Tramontano, Marco, Russo, Valentina, Spitoni, Grazia Fernanda et al. (2021) Efficacy of Vestibular Rehabilitation in Patients With Neurologic Disorders: A Systematic Review. Archives of physical medicine and rehabilitation 102(7): 1379-1389	- Country Systematic review with 2/12 of the included studies conducted in Italy, 1/12 in Norway, 1/12 in Spain, 1/12 in UK, 3/13 in Turkey, 3/12 in the US, and 1/12 in Japan. Italian, Norwegian, Spanish and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Triegaardt, Joseph, Han, Thang S, Sada, Charif et al. (2020) The role of virtual reality on outcomes in rehabilitation of Parkinson's disease: meta-analysis and systematic review in 1031 participants. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology 41(3): 529-536	- Study design (adults) Systematic review with 10/37 randomised controlled trials and 27/37 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Trigueiro, Larissa Coutinho de Lucena, Gama, Gabriela Lopes, Ribeiro, Tatiana Souza et al. (2017) Influence of treadmill gait training with additional load on motor function, postural instability and history of falls for individuals with Parkinson's disease: A randomized clinical trial. Journal of bodywork and movement therapies 21(1): 93-100	- Country Study conducted in Brazil.
Trigueiro, Larissa Coutinho de Lucena, Gama, Gabriela Lopes, Simao, Camila Rocha et al. (2015) Effects of Treadmill Training with Load on Gait in Parkinson Disease: A	- Country Study conducted in Brazil.

Study	Reason for exclusion
Randomized Controlled Clinical Trial. American journal of physical medicine & rehabilitation 94(10suppl1): 830-7	
Truijen, Steven, Abdullahi, Auwal, Bijsterbosch, Danique et al. (2022) Effect of home-based virtual reality training and telerehabilitation on balance in individuals with Parkinson disease, multiple sclerosis, and stroke: a systematic review and meta-analysis. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology 43(5): 2995-3006	- Population Systematic review including participants in protocol (2/7 people with multiple sclerosis and 2/7 people with Parkinson's disease), and out of protocol (3/7 adults with stroke). Studies including participants with multiple sclerosis and Parkinson's disease were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Turkmen, Ceyhun, Kose, Nezire, Bal, Ercan et al. (2023) Effects of two exercise regimes on patients with Chiari malformation type 1: A randomized controlled trial. The Cerebellum 22(2): 305-315	- Country Study conducted in Turkey.
Tyler, Mitchell E, Kaczmarek, Kurt A, Rust, Kathy L et al. (2014) Non-invasive neuromodulation to improve gait in chronic multiple sclerosis: a randomized double blind controlled pilot trial. Journal of neuroengineering and rehabilitation 11: 79	- Country Study conducted in the US.
Unger, Janelle, Chan, Katherine, Lee, Jae W et al. (2021) The Effect of Perturbation-Based Balance Training and Conventional Intensive Balance Training on Reactive Stepping Ability in Individuals With Incomplete Spinal Cord Injury or Disease: A Randomized Clinical Trial. Frontiers in neurology 12: 620367	- Outcomes Outcomes of interest (muscle function [Manual Muscle Test] and balance [Mini-BESTest, Community Balance and Mobility Scale, and Activities-specific Balance Confidence] data presented graphically and cannot be extracted for analysis or reported narratively with insufficient information to conduct analysis.
Uygur-Kucukseymen, Elif, Pacheco-Barrios, Kevin, Yuksel, Burcu et al. (2023) Non-invasive brain stimulation on clinical symptoms in multiple sclerosis patients: A systematic review and meta-analysis. Multiple sclerosis and related disorders 78: 104927	- Intervention Systematic review with mix of interventions in (33/44 transcranial direct current stimulation) and interventions out (9/44 transcranial magnetic stimulation and 2/44 transcranial random noise stimulation) of protocol. Studies investigating transcranial direct current stimulation were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: 11/44 only 25.0%. A further 11 papers can be excluded as being conducted in countries outside of protocol (that is, not high-income European, Canada, Australia, or New Zealand), which means systematic review is excluded.
Valimaki, Maritta, Mishina, Kaisa, Kaakinen, Johanna K et al. (2018) Digital Gaming for Improving the Functioning of People With Traumatic Brain Injury: Randomized Clinical	- Intervention Exergame for cognitive rehabilitation, and not to address upper limb functioning, stability and mobility together.

Study	Reason for exclusion
Feasibility Study. Journal of medical Internet research 20(3): e77	
van de Venis, Lotte, van de Warrenburg, Bart, Weerdesteyn, Vivian et al. (2023) Gait-Adaptability Training in People With Hereditary Spastic Paraplegia: A Randomized Clinical Trial. Neurorehabilitation and neural repair 37(1): 27-36	- Study design (adults) Crossover randomised controlled trial with outcome data not presented at the end of the first intervention period.
van de Wetering-van Dongen, Veerle A, Kalf, Johanna G, van der Wees, Philip J et al. (2020) The Effects of Respiratory Training in Parkinson's Disease: A Systematic Review. Journal of Parkinson's disease 10(4): 1315-1333	- Study design (adults) Systematic review with 6/10 randomised controlled trials and 4/10 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
van den Berg, Maayken, Sherrington, Catherine, Killington, Maggie et al. (2016) Video and computer-based interactive exercises are safe and improve task-specific balance in geriatric and neurological rehabilitation: a randomised trial. Journal of physiotherapy 62(1): 20-8	- Population Mix of participants in protocol (3/58 people with neurological conditions excluding stroke) and out of protocol (3/58 adults with stroke, 21/58 people with fractures and other orthopaedic conditions, 5/58 people with cardiac or pulmonary conditions, 4/58 people with infections, 8/58 people with functional medical decline, 6/58 people with falls, and 6/58 other conditions [no further details reported]). Results not presented separately for target population.
van der Kolk, Nicolien M, de Vries, Nienke M, Penko, Amanda L et al. (2018) A remotely supervised home-based aerobic exercise programme is feasible for patients with Parkinson's disease: results of a small randomised feasibility trial. Journal of neurology, neurosurgery, and psychiatry 89(9): 1003-1005	- Intervention Standardised aerobic exercise programme, and not an individualised exercise programme.
Vander Vegt, Christina B, Hill-Pearson, Candace A, Hershaw, Jamie N et al. (2022) A Comparison of Generalized and Individualized Vestibular Rehabilitation Therapy in a Military TBI Sample. The Journal of head trauma rehabilitation 37(6): 380-389	- Country Study conducted in the US.
Varalta, Valentina, Poiese, Paola, Recchia, Serena et al. (2021) Physiotherapy versus Consecutive Physiotherapy and Cognitive Treatment in People with Parkinson's Disease: A Pilot Randomized Cross-Over Study. Journal of personalized medicine 11(8)	- Intervention Standardised physiotherapy programme, and not an individualised physiotherapy programme.
Varma, Ashish, Naqvi, Waqar M, Mulla, Salima et al. (2022) A Systematic Review of Randomized Controlled Trials on Virtual Reality	- Country Systematic review with 1/15 of the included studies conducted in Canada, 1/15 in Italy, 1/15 in the Netherlands, 5/15 in the US, 4/15 in South Korea, 2/15 in Saudi Arabia, and 1/15 in China. Canadian, Italian, and

Study	Reason for exclusion
Application in Pediatric Patients. Cureus 14(10): e30543	Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Vasconcellos, Liliane S de, Silva, Raquel S, Pacheco, Thaiana Bf et al. (2023) Telerehabilitation-based trunk exercise training for motor symptoms of individuals with Parkinson's disease: A randomized controlled clinical trial. Journal of telemedicine and telecare 29(9): 698-706	- Country Study conducted in Brazil.
Veena Kirthika, S., Padmanabhan, K., Sudhakar, S. et al. (2018) A single blind, single center, two group pretest-posttest randomized controlled trial to determine the efficacy of vestibular rehabilitation and conventional balance training programmes in the management of diabetic peripheral neuropathy. Biomedicine (India) 38(1): 132-136	- Paper unavailable
Veldkamp, Renee, Baert, Ilse, Kalron, Alon et al. (2019) Structured Cognitive-Motor Dual Task Training Compared to Single Mobility Training in Persons with Multiple Sclerosis, a Multicenter RCT. Journal of clinical medicine 8(12)	- Intervention Dual-task training to address stability and mobility only, and not to address upper limb functioning, stability and mobility together.
Vibhuti; Kumar, Neelesh; Kataria, Chitra (2023) Efficacy assessment of virtual reality therapy for neuromotor rehabilitation in home environment: a systematic review. Disability and rehabilitation. Assistive technology 18(7): 1200-1220	- Population Systematic review including participants in protocol (3/45 people with Parkinson's disease, 2/45 people with spinal cord injury, and 1/45 people with acquired brain injury) and out of protocol (31/45 adults with stroke, 3/45 healthy participants, 3/45 people with cerebral palsy, 1/45 older adults, and 1/45 people with frozen shoulder). Studies including participants with Parkinson's disease, spinal cord injury, and acquired brain injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Vieira, Catarina, Ferreira da Silva Pais-Vieira, Carla, Novais, Joao et al. (2021) Serious Game Design and Clinical Improvement in Physical Rehabilitation: Systematic Review. JMIR serious games 9(3): e20066	- Population Systematic review including participants in protocol (2/12 people with multiple sclerosis) and out of protocol (8/12 adults with stroke, 1/12 people with cerebral palsy, and 1/12 older adults). Studies including participants with multiple sclerosis were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Vieira-Yano, Bianca, Martini, Douglas N, Horak, Fay B et al. (2021) The Adapted Resistance Training with Instability Randomized Controlled Trial for Gait Automaticity. Movement disorders : official journal of the Movement Disorder Society 36(1): 152-163	- Country Study conducted in Brazil.

Study	Reason for exclusion
Vinolo Gil, Maria Jesus, Gonzalez-Medina, Gloria, Lucena-Anton, David et al. (2021) Augmented Reality in Physical Therapy: Systematic Review and Meta-analysis. JMIR serious games 9(4): e30985	- Population Systematic review including participants in protocol (1/11 people with Parkinson's disease) and out of protocol (4/11 adults with stroke, 4/11 older adults, and 2/11 people with amputations). Study including participants with Parkinson's disease was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Voinescu, Alexandra; Sui, Jie; Stanton Fraser, Danae (2021) Virtual Reality in Neurorehabilitation: An Umbrella Review of Meta-Analyses. Journal of clinical medicine 10(7)	- Population Systematic review of systematic reviews including participants in protocol (3/41 people with acquired brain injury) and out of protocol (32/41 adults with stroke and 6/41 people with cerebral palsy). Systematic reviews including participants with acquired brain injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Vollmers, Paul Lennart, Mundhenke, Christoph, Maass, Nicolai et al. (2018) Evaluation of the effects of sensorimotor exercise on physical and psychological parameters in breast cancer patients undergoing neurotoxic chemotherapy. Journal of cancer research and clinical oncology 144(9): 1785-1792	- Intervention Sensorimotor exercises to prevent chemotherapy induced peripheral neuropathy, and not for rehabilitation of chemotherapy induced peripheral neuropathy.
Volpe, Daniele; Giantin, Maria Giulia; Fasano, Alfonso (2014) A wearable proprioceptive stabilizer (Equistasi R) for rehabilitation of postural instability in Parkinson's disease: a phase II randomized double-blind, double-dummy, controlled study. PloS one 9(11): e112065	- Intervention Vibratory neuromodulation (wearable proprioceptive stabiliser) to address mobility and stability only, and not to address upper limb functioning, stability, and mobility together.
Volpe, Daniele, Giantin, Maria Giulia, Maestri, Roberto et al. (2014) Comparing the effects of hydrotherapy and land-based therapy on balance in patients with Parkinson's disease: a randomized controlled pilot study. Clinical rehabilitation 28(12): 1210-7	- Intervention Hydrotherapy to address upper limb function and stability only, and not to address upper limb functioning, stability and mobility together.
Volpe, Daniele, Pelosin, Elisa, Bakdounes, Leila et al. (2017) Effects of a sensory-motor orthotic on postural instability rehabilitation in Parkinson's disease: a pilot study. Journal of clinical movement disorders 4: 11	- Intervention Sensory-motor in-shoe orthosis to address postural instability, and not: 1. Lower limb wearables, electrical stimulation and lower-body robotics to address mobility. 2. Wearable garments, technology and exoskeletons to address upper limb functioning, stability and mobility together.
Volpe, Daniele, Giantin, Maria Giulia, Manuela, Pilleri et al. (2017) Water-based vs. non-water-based physiotherapy for rehabilitation of postural deformities in Parkinson's disease: a randomized controlled pilot	- Intervention Water-based physiotherapy intervention for postural deformities, and not upper limb functioning, stability, and mobility together.

Study	Reason for exclusion
study. Clinical rehabilitation 31(8): 1107-1115	
Voorn, Eric L, Koopman, Fieke S, Nollet, Frans et al. (2021) Individualized Aerobic Exercise in Neuromuscular Diseases: A Pilot Study on the Feasibility and Preliminary Effectiveness to Improve Physical Fitness. Physical therapy 101(3)	- Study design (adults) No comparator group, so not a randomised controlled trial.
Vural, Pelin, Zenginler Yazgan, Yonca, Tarakci, Ela et al. (2023) The effects of online exercise training on physical functions and quality of life in patients with pediatric-onset multiple sclerosis. Multiple sclerosis and related disorders 74: 104710	- Country Study conducted in Turkey.
Vuu, Sally, Barr, Christopher J, Killington, Maggie et al. (2022) Physical exercise for people with mild traumatic brain injury: A systematic review of randomized controlled trials. NeuroRehabilitation 51(2): 185-200	- Population Systematic review including participants who are in protocol (1/11 people with mild traumatic brain injury sustained 3 months ago or longer) and out of protocol (10/11 people with mild traumatic brain injury sustained less than 3 months ago) of protocol. Study including participants with mild traumatic brain injury sustained 3 months ago or longer was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Wagle Shukla, Aparna, Shuster, Jonathan J, Chung, Jae Woo et al. (2016) Repetitive Transcranial Magnetic Stimulation (rTMS) Therapy in Parkinson Disease: A Meta-Analysis. PM & R : the journal of injury, function, and rehabilitation 8(4): 356-366	- Publication date Systematic review with 1/21 studies published 2013 onwards, and 20/21 published pre-2013. Study published 2013 onwards was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Waibel, Sarah, Wehrle, Anja, Muller, Jana et al. (2021) Type of exercise may influence postural adaptations in chemotherapy-induced peripheral neuropathy. Annals of clinical and translational neurology 8(8): 1680-1694	- Outcomes No relevant outcomes reported. Reports measures of spontaneous sway, transfer functions during perturbation, chemotherapy-induced peripheral neuropathy symptoms, quality of life, and functional performance (measurement data such as seconds spent in 1 leg stance and jump height, not measured using validated scales).
Walia, Shefali; Kumar, Pragya; Kataria, Chitra (2023) Interventions to Improve Standing Balance in Individuals With Incomplete Spinal Cord Injury: A Systematic Review and Meta-Analysis. Topics in spinal cord injury rehabilitation 29(2): 56-83	- Study design (adults) Systematic review with 10/25 randomised controlled trials, 14/25 non-controlled studies, and 1/25 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wall, Anneli; Borg, Jorgen; Palmcrantz, Susanne (2015) Clinical application of the Hybrid Assistive Limb (HAL) for gait training-a systematic review. Frontiers in systems neuroscience 9: 48	- Study design (adults) Systematic review with 1/7 randomised controlled trials and 6/7 non-controlled studies. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
Wan, Chunli, Huang, Sisi, Wang, Xue et al. (2024) Effects of robot-assisted gait training on cardiopulmonary function and lower extremity strength in individuals with spinal cord injury: A systematic review and meta-analysis. The journal of spinal cord medicine 47(1): 6-14	- Country Systematic review with 1/11 of the included studies conducted in Norway, 1/11 in Spain, 1/11 in Switzerland, 4/11 in China, 3/11 in the US, and 1/11 in Turkey. Norwegian, Spanish, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wang, Bo, Shen, Min, Wang, Yan-Xue et al. (2019) Effect of virtual reality on balance and gait ability in patients with Parkinson's disease: a systematic review and meta-analysis. Clinical rehabilitation 33(7): 1130-1138	- Country Systematic review with 1/12 of the included studies conducted in Italy, 1/12 in the Netherlands, 3/12 in Brazil, 3/12 in Taiwan, 1/12 in Hong Kong, 1/12 in South Korea. Italian and Dutch studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wang, Di, Cui, Wen J, Hou, Zhen H et al. (2023) Effectiveness of different exercises in improving postural balance among Parkinson's disease patients: a systematic review and network meta-analysis. Frontiers in aging neuroscience 15: 1215495	- Other protocol criteria Systematic review with insufficient information and references to check characteristics of all 60 included studies. Studies with characteristics and references provided were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wang, E.J., Berninger, L.E., Komargodski, O. et al. (2022) Painful Diabetic Neuropathy - Spinal Cord Stimulation, Peripheral Nerve Stimulation, Transcutaneous Electrical Nerve Stimulation, and Scrambler Therapy: A Narrative Review. Pain physician 25(8): e1161-e1171	- Publication date Systematic review with 8/17 studies published 2013 onwards, and 9/17 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wang, J., Zhao, L., Gao, Y. et al. (2022) The difference between the effectiveness of body-weight-supported treadmill training combined with functional electrical stimulation and sole body-weight-supported treadmill training for improving gait parameters in stroke patients: A systematic review and meta-analysis. Frontiers in Neurology 13: 1003723	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Wang, M.; Pei, Z.; Molassiotis, A. (2022) Recent advances in managing chemotherapy-induced peripheral neuropathy: A systematic review. European journal of oncology nursing : the official journal of European Oncology Nursing Society 58: 102134	- Country Systematic review with 5/42 of the included studies conducted in Germany, 2/24 in Canada, 1/42 in Sweden, 13/42 in the US, 5/42 in Iran, 4/42 in China, 3/42 in Turkey, 2/42 in Brazil, 2/42 in South Korea, 1/42 in Hong Kong, 1/42 in India, 1/42 in Iran and China, 1/42 in Japan and 1/42 in Taiwan. German, Canadian, and Swedish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wang, M., Yin, Y., Yang, H. et al. (2022) Evaluating the safety, feasibility, and efficacy of non-invasive neuromodulation techniques in chemotherapy-induced peripheral	- Study design (adults) Systematic review with 9/18 randomised controlled trials and 9/18 non-comparative studies. Randomised controlled trials were checked against protocol criteria and were

Study	Reason for exclusion
neuropathy: A systematic review. European journal of oncology nursing : the official journal of European Oncology Nursing Society 58: 102124	either not relevant or had been separately located by the literature search and screened.
Wang, Wei-Cheng, Yeh, Chia-Yi, Huang, Jian-Jia et al. (2023) Synergic Effect of Robot-Assisted Rehabilitation and Antispasticity Therapy: A Narrative Review. Life (Basel, Switzerland) 13(2)	- Population Systematic review including participants in protocol (1/5 people with spinal cord injury) and out of protocol (4/5 adults with stroke). Study including participants with spinal cord injury was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Wang, Y-Z, Zhao, H, Feng, S-C et al. (2017) Effect of water-based exercise on motor function, balance function and walking ability in patients with Parkinson's disease. Chinese journal of contemporary neurology and neurosurgery 17(5): 346-351	- Other protocol criteria Chinese language article.
Wardhana, Dewa Putu Wisnu, Maliawan, Sri, Mahadewa, Tjokorda Gde Bagus et al. (2023) The Impact of Machine Learning and Robot-Assisted Gait Training on Spinal Cord Injury: A Systematic Review and Meta-Analysis. Journal of clinical medicine 12(23)	- Country Systematic review with 2/19 of the included studies conducted in Canada, 2/19 in Italy, 2/19 in Switzerland, 1/19 in Germany, 1/19 in Spain, 9/19 in the US, 1/19 in Japan, and 1/19 in South Korea. Canadian, Italian, Swiss, German, and Spanish studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Welman, K and Atterbury, E (2018) //Therapist-supervised compared to home-based balance training encourages a 'posture first' strategy during turn-to-sit transitions in individuals with Parkinson's disease. Annals of physical and rehabilitation medicine	- Publication type Conference abstract.
Widuch-Spodyniuk, A., Tarnacka, B., Korczynski, B. et al. (2023) Impact of Robotic-Assisted Gait Therapy on Depression and Anxiety Symptoms in Patients with Subacute Spinal Cord Injuries (SCIs)-A Prospective Clinical Study. Journal of Clinical Medicine 12(22): 7153	- Outcomes Outcomes of interest (gait [WISCI] and functioning [SCIM]) only reported as correlations with mental health changes and not association effect estimates.
Wilkinson, David, Podlewska, Aleksandra, Banducci, Sarah E et al. (2019) Caloric vestibular stimulation for the management of motor and non-motor symptoms in parkinson's disease: Intention-to-treat data. Data in brief 25: 104228	- Intervention Thermal vestibular stimulation to address stability, and not: 1. Vestibular exercises to address stability. 2. Neuromodulation (electrical/vibratory) to address upper limb functioning, stability, and mobility together.
Wilkinson, David, Podlewska, Aleksandra, Banducci, Sarah E et al. (2019) Caloric vestibular stimulation for the management of motor and non-motor symptoms in Parkinson's disease. Parkinsonism & related disorders 65: 261-266	- Intervention Thermal vestibular stimulation to address stability, and not: 1. Vestibular exercises to address stability. 2. Neuromodulation (electrical/vibratory) to address upper limb functioning, stability, and mobility together.

Study	Reason for exclusion
Williams, Gavin, Hassett, Leanne, Clark, Ross et al. (2022) Ballistic resistance training has a similar or better effect on mobility than non-ballistic exercise rehabilitation in people with a traumatic brain injury: a randomised trial. Journal of physiotherapy 68(4): 262-268	- Intervention Standardised ballistic resistance training programme and not an individualised exercise programme.
Williams, Katrina Louise; Low Choy, Nancy Louise; Brauer, Sandra Gail (2021) Center-Based Group and Home-Based Individual Exercise Programs Have Similar Impacts on Gait and Balance in People With Multiple Sclerosis: A Randomized Trial. PM & R : the journal of injury, function, and rehabilitation 13(1): 9-18	- Intervention Individualised exercise programme to address gait speed, endurance and balance, and not upper limb functioning, stability, and mobility together.
Williamson, Elizabeth, Pederson, Natalie, Rawson, Hannah et al. (2019) The Effect of Inspiratory Muscle Training on Duchenne Muscular Dystrophy: A Meta-analysis. Pediatric physical therapy : the official publication of the Section on Pediatrics of the American Physical Therapy Association 31(4): 323-330	- Publication date Systematic review with studies published pre-2013. No studies checked against protocol criteria as did not include any studies published 2013 onwards.
Winter, Leoni, Huang, Qiyin, Sertic, Jacquelyn V L et al. (2022) The Effectiveness of Proprioceptive Training for Improving Motor Performance and Motor Dysfunction: A Systematic Review. Frontiers in rehabilitation sciences 3: 830166	- Population Systematic review including participants in protocol (4/70 people with Parkinson's disease, 2/70 people with multiple sclerosis, and 1/70 people with spinal cord injury) and out of protocol (24/70 healthy participants, 20/70 people with joint disorders, injuries or replacements, 4/70 adults with stroke, 4/70 people with cerebral palsy, 4/70 people with osteoarthritis, 2/70 people with hypermobility syndrome, 1/70 people with hearing loss, 1/50 people with diabetes, 1/70 people with infraspinatus muscle atrophy, 1/70 people with neck pain, and 1/70 people with plantar fasciitis). Studies including participants with Parkinson's disease, multiple sclerosis, and spinal cord injury were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wong, Pei-Ling, Cheng, Shih-Jung, Yang, Yea-Ru et al. (2023) Effects of Dual Task Training on Dual Task Gait Performance and Cognitive Function in Individuals With Parkinson Disease: A Meta-analysis and Meta-regression. Archives of physical medicine and rehabilitation 104(6): 950-964	- Outcomes Systematic review reporting no relevant outcomes. Reports measures of gait parametrics (measurement data such as stride length, speed, cadence, not measured using validated scales), dual-cost of speed, and cognitive functioning. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wong, Pei-Ling, Yang, Yea-Ru, Huang, Shih-Fong et al. (2022) Transcranial Direct Current Stimulation on Different Targets to Modulate Cortical Activity and Dual-Task Walking in Individuals With Parkinson's Disease: A Double	- Country Study conducted in Taiwan.

Study	Reason for exclusion
Blinded Randomized Controlled Trial. Frontiers in aging neuroscience 14: 807151	
Wong-Yu, Irene S K and Mak, Margaret K Y (2019) Multisystem Balance Training Reduces Injurious Fall Risk in Parkinson Disease: A Randomized Trial. American journal of physical medicine & rehabilitation 98(3): 239-244	- Country Study conducted in China.
Wong-Yu, Irene S K and Mak, Margaret K Y (2015) Multi-dimensional balance training programme improves balance and gait performance in people with Parkinson's disease: A pragmatic randomized controlled trial with 12-month follow-up. Parkinsonism & related disorders 21(6): 615-21	- Country Study conducted in China.
Wong-Yu, Irene S and Mak, Margaret K (2015) Task- and Context-Specific Balance Training Program Enhances Dynamic Balance and Functional Performance in Parkinsonian Nonfallers: A Randomized Controlled Trial With Six-Month Follow-Up. Archives of physical medicine and rehabilitation 96(12): 2103-11	- Country Study conducted in China.
Woods, Alyson, Gustafson, Owen, Williams, Mark et al. (2023) The effects of inspiratory muscle training on inspiratory muscle strength, lung function and quality of life in adults with spinal cord injuries: a systematic review and Meta-analysis. Disability and rehabilitation 45(17): 2703-2714	- Intervention Systematic review investigating inspiratory muscle training to address respiratory function, and not to address upper limb functioning, stability, and mobility together. Studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Workman, Craig D; Kamholz, John; Rudroff, Thorsten (2019) Transcranial Direct Current Stimulation (tDCS) to Improve Gait in Multiple Sclerosis: A Timing Window Comparison. Frontiers in human neuroscience 13: 420	- Country Study conducted in the US.
Wu, Jinlong, Zhang, Hui, Chen, Ziyan et al. (2022) Benefits of Virtual Reality Balance Training for Patients With Parkinson Disease: Systematic Review, Meta-analysis, and Meta-Regression of a Randomized Controlled Trial. JMIR serious games 10(1): e30882	- Country Systematic review with 1/16 of the included studies conducted in Hungary, 1/16 in Italy, 1/16 in the UK, 6/16 in China, 2/16 in Brazil, 2/16 in Taiwan, 1/16 in South Korea, 1/16 in Turkey, and 1/16 in the US. Hungarian, Italian, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Wu, Ming; Kim, Janis; Wei, Feng (2018) Facilitating Weight Shifting During Treadmill Training Improves Walking Function in Humans With Spinal Cord Injury: A Randomized	- Country Study conducted in the US.

Study	Reason for exclusion
Controlled Pilot Study. American journal of physical medicine & rehabilitation 97(8): 585-592	
Wu, Ming, Landry, Jill M, Kim, Janis et al. (2016) Repeat Exposure to Leg Swing Perturbations During Treadmill Training Induces Long-Term Retention of Increased Step Length in Human SCI: A Pilot Randomized Controlled Study. American journal of physical medicine & rehabilitation 95(12): 911-920	- Country Study conducted in the US.
Xia, M, Zhan, Z, Cai, G et al. (2018) Three-dimensional gait analysis of Lokomat automatic robot in patients with Parkinson's disease. Chinese journal of neurology 51(7): 504-509	- Other protocol criteria Chinese language article.
Xiang, Xiao-Na, Zhang, Li-Ming, Zong, Hui-Yan et al. (2023) Exoskeleton-Assisted Walking for Pulmonary and Exercise Performances of SCI Individuals. IEEE transactions on neural systems and rehabilitation engineering : a publication of the IEEE Engineering in Medicine and Biology Society 31: 39-47	- Country Study conducted in China.
Xiang, Xiao-Na, Zong, Hui-Yan, Ou, Yi et al. (2021) Exoskeleton-assisted walking improves pulmonary function and walking parameters among individuals with spinal cord injury: a randomized controlled pilot study. Journal of neuroengineering and rehabilitation 18(1): 86	- Country Study conducted in China.
Xie, Shan, Zhang, Yuqian, Li, Jing et al. (2024) Contralaterally Controlled Functional Electrical Stimulation for Improving Motor Function after Acquired Brain Injury: a Systematic Review and Meta-analysis. Archives of physical medicine and rehabilitation	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Xie, Xiao, Sun, Hao, Zeng, Qing et al. (2017) Do Patients with Multiple Sclerosis Derive More Benefit from Robot-Assisted Gait Training Compared with Conventional Walking Therapy on Motor Function? A Meta-analysis. Frontiers in neurology 8: 260	- Publication date Systematic review with 3/7 studies published 2013 onwards, and 4/7 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Xu, Gang, Hao, Fuchun, Zhao, Weiwei et al. (2022) The influential factors and non-pharmacological interventions of cognitive impairment in children with ischemic stroke. Frontiers in neurology 13: 1072388	- Study design (CYP) Non-systematic literature review.

Study	Reason for exclusion
Xue, Xiali; Yang, Xinwei; Deng, Zhongyi (2023) Efficacy of rehabilitation robot-assisted gait training on lower extremity dyskinesia in patients with Parkinson's disease: A systematic review and meta-analysis. Ageing research reviews 85: 101837	- Country Systematic review with 8/14 of the included studies conducted in Italy, 4/14 in China, 1/14 in Japan, and 1/14 in South Korea. Italian studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Yahia, M.; Al-Harbi, T.M.; Bashir, S. (2018) The potential rehabilitation role of transcranial direct current stimulation (tDCS) in multiple sclerosis. Neurology Psychiatry and Brain Research 30: 9-11	- Study design (adults) Non-systematic literature review.
Yang, Fu-An, Chen, Shih-Ching, Chiu, Jing-Fang et al. (2022) Body weight-supported gait training for patients with spinal cord injury: a network meta-analysis of randomised controlled trials. Scientific reports 12(1): 19262	- Country Systematic review with 2/15 of the included studies conducted in Spain, 1/15 in Norway, 1/15 in Switzerland, 4/15 in the US, 3/15 in China, 2/15 in Turkey, and 1/15 in India. Spanish, Norwegian, and Swiss studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Yang, Fu-An, Lin, Chien-Lin, Huang, Wan-Chien et al. (2023) Effect of Robot-Assisted Gait Training on Multiple Sclerosis: A Systematic Review and Meta-analysis of Randomized Controlled Trials. Neurorehabilitation and neural repair 37(4): 228-239	- Publication date Systematic review with 11/16 studies published 2013 onwards, and 5/16 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: 5/16 only 31.3%. A further 2 papers can be excluded as being conducted in countries outside of protocol (that is, not high-income European, Canada, Australia, or New Zealand), which means systematic review is excluded.
Yang, Mingliang, Li, Jianjun, Guan, Xinyu et al. (2017) Effectiveness of an innovative hip energy storage walking orthosis for improving paraplegic walking: A pilot randomized controlled study. Gait & posture 57: 91-96	- Country Study conducted in China.
Yang, S.; Yi, Y.G.; Chang, M.C. (2023) The effect of transcranial alternating current stimulation on functional recovery in patients with stroke: a narrative review. Frontiers in Neurology 14: 1327383	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Yang, Wen-Chieh, Wang, Hsing-Kuo, Wu, Ruey-Meei et al. (2016) Home-based virtual reality balance training and conventional balance training in Parkinson's disease: A randomized controlled trial. Journal of the Formosan Medical Association = Taiwan yi zhi 115(9): 734-43	- Country Study conducted in Taiwan.
Yang, Xiaoxia and Wang, Zhiyun (2023) Effectiveness of Progressive Resistance Training in Parkinson's Disease: A Systematic Review and	- Country Systematic review with 3/14 of the included studies conducted in Australia, 1/14 in Spain, 4.14 in Brazil, 1/14 in the US, and 2/14 in China. Australian and Spanish studies were checked against protocol criteria and were either not

Study	Reason for exclusion
Meta-Analysis. European neurology 86(1): 25-33	relevant or had been separately located by the literature search and screened. Note: Studies noted as being conducted in China were not explicitly stated as such, but were published in Chinese language journals and could not be located using an English-language search engine.
Yang, Yajie, Wang, Yang, Gao, Tianzi et al. (2023) Effect of Physiotherapy Interventions on Motor Symptoms in People With Parkinson's Disease: A Systematic Review and Meta-Analysis. Biological research for nursing 25(4): 586-605	- Country Systematic review with 3/42 of the included studies conducted in Australia, 2/42 in Italy, 2/42 in Sweden, 1/42 in the Netherlands, 1/42 in Spain, 1/42 in the UK, 14/42 in the US, 6/42 in China, 4/42 in Brazil, 2/42 in South Korea, 1/42 in Egypt, 1/42 in India, 1/42 in Iran, 1/42 in Israel, and 1/42 in Japan. Australian, Italian, Swedish, Dutch, Spanish, and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened. Note: Studies add up to 43 but correct as reported in article.
Yang, Yea-Ru, Cheng, Shih-Jung, Lee, Yu-Ju et al. (2019) Cognitive and motor dual task gait training exerted specific training effects on dual task gait performance in individuals with Parkinson's disease: A randomized controlled pilot study. PloS one 14(6): e0218180	- Country Study conducted in Taiwan.
Yang, Yea-Ru, Tseng, Chin-Yen, Chiou, Shin-Yi et al. (2013) Combination of rTMS and treadmill training modulates corticomotor inhibition and improves walking in Parkinson disease: a randomized trial. Neurorehabilitation and neural repair 27(1): 79-86	- Country Study conducted in Taiwan.
Yang, Yong, Wang, Guotuan, Zhang, Shikun et al. (2022) Efficacy and evaluation of therapeutic exercises on adults with Parkinson's disease: a systematic review and network meta-analysis. BMC geriatrics 22(1): 813	- Intervention Systematic review with mix of interventions in protocol (34/250 gait training, 21/250 virtual reality interventions, 20/250 dual-task training, 17/250 balance and gait training, and 13/250 hydrotherapy), unclear (45/250 multi-component interventions and 16/250 conventional physiotherapy) and out of protocol (32/250 resistance training, 31/250 Pilates/qigong/tai chi/yoga, 29/250 cueing or attention training, 16/250 aerobic exercise, 15/250 dance interventions, 4/250 power training, and 3/250 whole-body vibration). Studies investigating gait training, virtual reality, dual-task training, balance and gait training, hydrotherapy, multi-component interventions, and conventional physiotherapy were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening. Note: Adds up to 296 as some included studies were multi-arm trials that investigated multiple interventions.
Yasa, Mustafa Ertugrul, Ozkan, Taskin, Unluer, Nezehat Ozgul et al. (2022) Core stability-based balance training and kinesio taping for	- Country Study conducted in Turkey.

Study	Reason for exclusion
balance, trunk control, fear of falling and walking capacity in patients with multiple sclerosis: A randomized single-blinded study. Multiple sclerosis and related disorders 68: 104178	
Yaseri, Aram, Roozbeh, Mehrdad, Kazemi, Reza et al. (2024) Brain stimulation for patients with multiple sclerosis: an umbrella review of therapeutic efficacy. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology	- Study design (adults) Systematic review with 9/14 quantitative meta-analyses and 5/14 narrative reviews. Quantitative meta-analyses were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Yazgan, Yonca Zenginler, Tarakci, Ela, Tarakci, Devrim et al. (2020) Comparison of the effects of two different exergaming systems on balance, functionality, fatigue, and quality of life in people with multiple sclerosis: A randomized controlled trial. Multiple sclerosis and related disorders 39: 101902	- Country Study conducted in Turkey.
Ye, Gongkai, Grabke, Emerson Paul, Pakosh, Maureen et al. (2021) Clinical Benefits and System Design of FES-Rowing Exercise for Rehabilitation of Individuals with Spinal Cord Injury: A Systematic Review. Archives of physical medicine and rehabilitation 102(8): 1595-1605	- Publication date Systematic review with 14/24 studies published 2013 onwards, and 10/24 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Yeh, Shu-Wei, Lin, Li-Fong, Tam, Ka-Wai et al. (2020) Efficacy of robot-assisted gait training in multiple sclerosis: A systematic review and meta-analysis. Multiple sclerosis and related disorders 41: 102034	- Publication date Systematic review with 5/10 studies published 2013 onwards, and 5/10 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Yeo, Elizabeth, Chau, Brian, Chi, Bradley et al. (2019) Virtual Reality Neurorehabilitation for Mobility in Spinal Cord Injury: A Structured Review. Innovations in clinical neuroscience 16(12): 13-20	- Study design (adults) Non-systematic literature review.
Yildirim, Mustafa Aziz; Ones, Kadriye; Goksenoglu, Goksen (2019) Early term effects of robotic assisted gait training on ambulation and functional capacity in patients with spinal cord injury. Turkish journal of medical sciences 49(3): 838-843	- Country Study conducted in Turkey.
Yitayeh, Asmare and Teshome, Amare (2016) The effectiveness of physiotherapy treatment on balance dysfunction and postural instability in persons with Parkinson's disease: a systematic review and meta-analysis.	- Publication date Systematic review with 3/8 studies published 2013 onwards, and 5/8 published pre-2013. Studies published 2013 onwards were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.

Study	Reason for exclusion
BMC sports science, medicine & rehabilitation 8: 17	
Yoshida, T., Masani, K., Sayenko, D.G. et al. (2013) Cardiovascular response of individuals with spinal cord injury to dynamic functional electrical stimulation under orthostatic stress. IEEE transactions on neural systems and rehabilitation engineering : a publication of the IEEE Engineering in Medicine and Biology Society 21(1): 37-46	- Outcomes No relevant outcomes reported. Reports measures of cardiovascular responses (measurement data such as blood pressure, heart rate, and systemic vascular resistance, not measured using validated scales), electromyography recordings of leg muscles and imaging of blood vessels.
Yozbatiran, Nuray, Keser, Zafer, Davis, Matthew et al. (2016) Transcranial direct current stimulation (tDCS) of the primary motor cortex and robot-assisted arm training in chronic incomplete cervical spinal cord injury: A proof of concept sham-randomized clinical study. NeuroRehabilitation 39(3): 401-11	- Country Study conducted in the US.
Yuan, Rey-Yue, Chen, Shih-Ching, Peng, Chih-Wei et al. (2020) Effects of interactive video-game-based exercise on balance in older adults with mild-to-moderate Parkinson's disease. Journal of neuroengineering and rehabilitation 17(1): 91	- Country Study conducted in Taiwan.
Zanatta, Francesco, Farhane-Medina, Naima Z, Adorni, Roberta et al. (2023) Combining robot-assisted therapy with virtual reality or using it alone? A systematic review on health-related quality of life in neurological patients. Health and quality of life outcomes 21(1): 18	- Study design (adults) Systematic review with 44/70 randomised controlled trials, 22/70 non-controlled studies, and 4/70 non-randomised controlled trials. Randomised controlled trials were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Zasadzka, Ewa, Trzmiel, Tomasz, Pieczynska, Anna et al. (2021) Modern Technologies in the Rehabilitation of Patients with Multiple Sclerosis and Their Potential Application in Times of COVID-19. Medicina (Kaunas, Lithuania) 57(6)	- Country Systematic review with 4/17 of the included studies conducted in Spain, 2/17 in Italy, 1/17 in Czech Republic, 1/17 in Germany, 1/17 in Poland, 1/17 in the UK, 2/17 in Iran, 2/17 in Turkey, and 2/17 in the US. Spanish, Italian, Czech, German, Polish and UK studies were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Zhang, Chaoyang, Li, Ning, Xue, Xiali et al. (2023) Effects of lower limb exoskeleton gait orthosis compared to mechanical gait orthosis on rehabilitation of patients with spinal cord injury: A systematic review and future perspectives. Gait & posture 102: 64-71	- Study design (adults) Systematic review with 1/11 randomised controlled trial, 9/11 case-control studies, and 1/11 case series. Randomised controlled trial was checked against protocol criteria and was either not relevant or had been separately located by the literature search and screened.
Zhang, Fan, Carnahan, Janelle, Ravi, Manikandan et al. (2023) Combining Spinal Cord Transcutaneous	- Country Study conducted in the US.

Study	Reason for exclusion
Stimulation with Activity-based Training to Improve Upper Extremity Function Following Cervical Spinal Cord Injury. Annual International Conference of the IEEE Engineering in Medicine and Biology Society. IEEE Engineering in Medicine and Biology Society. Annual International Conference 2023: 1-4	
Zhang, Jiaxin, Luximon, Yan, Pang, Marco Y C et al. (2022) Effectiveness of exergaming-based interventions for mobility and balance performance in older adults with Parkinson's disease: systematic review and meta-analysis of randomised controlled trials. Age and ageing 51(8)	- Country Systematic review with 2/21 of the included studies conducted in Italy, 1/21 in Australia, 1/21 in Hungary, 1/12 in the Netherlands, 1/12 in Israel and the Netherlands, 6/21 in Taiwan, 5/21 in Brazil, 1/21 in China, 1/21 in Hong Kong, 1/21 in India, and 1/21 in South Korea. Italian, Australian, Hungarian, and Dutch studies were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Zhang, Lingjie, Lin, Fabin, Sun, Lei et al. (2022) Comparison of Efficacy of Lokomat and Wearable Exoskeleton-Assisted Gait Training in People With Spinal Cord Injury: A Systematic Review and Network Meta-Analysis. Frontiers in neurology 13: 772660	- Study design (adults) Systematic review including non-randomised studies. No studies checked against protocol criteria as did not include any randomised controlled trials or systematic reviews.
Zhang, Meiqi, Li, Fang, Wang, Dongyu et al. (2023) Exercise sustains motor function in Parkinson's disease: Evidence from 109 randomized controlled trials on over 4,600 patients. Frontiers in aging neuroscience 15: 1071803	- Publication date Systematic review with 84/109 studies published 2013 onwards, and 25/109 published pre-2013. Studies published 2013 onwards were checked against protocol criteria - 3 were identified as potentially relevant and retrieved for further screening. Note: 25/109 only 22.9%. A further 11 papers can be excluded as being conducted in countries outside of protocol (that is, not high-income European, Canada, Australia, or New Zealand), which means systematic review is excluded.
Zhang, Meng, Liang, Zhide, Li, Yali et al. (2023) The effect of balance and gait training on specific balance abilities of survivors with stroke: a systematic review and network meta-analysis. Frontiers in neurology 14: 1234017	- Population Systematic review including participants out of protocol (adults with stroke). No studies checked against protocol criteria as did not include any participants with chronic neurological disorders included in protocol.
Zhang, Shi-Kun, Gu, Mei-Ling, Xu, Hong et al. (2023) Effects of Different Exercise Modes on Gait Performance of Parkinson's Disease Patients: A Systematic Review and Network Meta-Analysis. Perceptual and motor skills 130(4): 1524-1561	- Other protocol criteria Systematic review with insufficient information and references to check characteristics of all 159 included studies. Studies with characteristics and references provided were checked against protocol criteria and were either not relevant or had been separately located by the literature search and screened.
Zhang, Xia, Wang, Ao, Wang, Miaowei et al. (2023) Non-pharmacological therapy for chemotherapy-induced peripheral neurotoxicity: a network meta-analysis	- Country Systematic review with 8/46 of the included studies conducted in Germany, 3/46 in Canada, 1/46 in Australia, 1/46 in Belgium, 1/46 in the UK, 12/46 in the US, 5/46 in China, 4/46 in South Korea, 3/46 in Japan, 3/46 in Turkey, 2/46 in Thailand, 1/46 in Brazil, 1/46 in China and Iran, and

Study	Reason for exclusion
of randomized controlled trials. BMC neurology 23(1): 433	1/46 in Iran. German, Canadian, Australian, Belgian, and UK were checked against protocol criteria - 1 was identified as potentially relevant and retrieved for further screening.
Zhu, Shasha, An, Di, Yan, Tao et al. (2023) Combined Effects of Transcranial Magnetic Stimulation and Argatroban on Balance Function and Daily Living Activities in Hemiplegic Patients Following Cerebral Infarction. Alternative therapies in health and medicine 29(7): 41-45	- Country Study conducted in China.
Zhu, Zhizhong, Yin, Miaomiao, Cui, Liling et al. (2018) Aquatic obstacle training improves freezing of gait in Parkinson's disease patients: a randomized controlled trial. Clinical rehabilitation 32(1): 29-36	- Country Study conducted in China.
Zimmer, Philipp, Trebing, Sina, Timmers-Trebing, Ursula et al. (2018) Eight-week, multimodal exercise counteracts a progress of chemotherapy-induced peripheral neuropathy and improves balance and strength in metastasized colorectal cancer patients: a randomized controlled trial. Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer 26(2): 615-624	- Population Unclear presence of chemotherapy-induced peripheral neuropathy at beginning of trial.
Zollo, L, Zaccheddu, N, Ciancio, A L et al. (2015) Comparative analysis and quantitative evaluation of ankle-foot orthoses for foot drop in chronic hemiparetic patients. European journal of physical and rehabilitation medicine 51(2): 185-96	- Population Adult stroke survivors. Not relevant according to protocol population criteria.

Excluded economic studies

See Supplement 2 for the list of excluded studies across all reviews.

Appendix K Research recommendations – full details

Research recommendations for review question: What is the effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders?

K.1.1 Research recommendation

What is the effectiveness and cost effectiveness of interventions and approaches for improving and sustaining stability, mobility and upper limb functioning for children and young people with chronic neurological disorders?

K.1.2 Why this is important

Rehabilitation programmes often include provision of interventions aimed at improving and sustaining stability, mobility and upper limb functioning for people with chronic neurological disorders. Whilst there is limited evidence of the effectiveness of these interventions in adults with chronic neurological disorders there is a paucity of evidence for the effectiveness of these interventions in children and young people with chronic neurological disorders. There is also a lack of cost-effectiveness evidence.Therefore, research is required to investigate which interventions are effective and cost effective in children and young people with chronic neurological disorders.

K.1.3 Rationale for research recommendation

Table 42: Research recommendation rationale

Importance to 'patients' or the population	Chronic neurological disorders can significantly impair daily functioning and lead to disability. Effective interventions to improve and sustain stability, mobility and upper limb functioning can help children and young people to regain independence in everyday tasks, reduce the impact of their symptoms, and improve social, educational, and personal functioning.
Relevance to NICE guidance	Within this guideline there are evidence-based recommendations for these interventions in adults. Further research is required to support this for children and young people.
Relevance to the NHS	By identifying effective and cost-effective interventions and approaches for improving or sustaining stability, mobility and upper limb function, rehabilitation therapists will be able to select and deliver the most appropriate intervention for their patients. This will enable effective and efficient delivery of rehabilitation, potentially improving patient outcomes and reducing length of stay or rehabilitation episode.
National priorities	High – The physical health of children and young people is a key priority in the NHS Five year forward plan
Current evidence base	This evidence review showed a paucity of evidence in the area of interventions to improve or sutstain stability, mobility and upper limb functioning in children and young people with

	chronic neurological disorders. Only one study was identified, which did not show any difference between groups at post-intervention and did not report follow-up data.
Equality considerations	This evidence review identified several populations with no trials reporting data for interventions to improve or sutstain stability, mobility and upper limb functioning: children and young people with an acquired brain injury; children and young people with an acquired spinal cord injury; children and young people with acquired peripheral nerve disorder; and children and young people with functional neurological disorder.

K.1.4 Modified PICO table

Table 43: Research recommendation modified PICO table

Population	Children and young people with rehabilitation needs due to the following chronic neurological disorders: • Acquired brain injury • Acquired spinal cord injury • Acquired peripheral nerve disorders • Progressive neurological diseases • Functional neurological disorders
Intervention	Rehabilitation interventions to address: • Upper limb functioning • Stability • Mobility • Upper limb functioning, stability and mobility together

Comparator	Interventions compared with others in the same group or:
	• Placebo (placebo or sham)
	• Control (no intervention, waitlist, standard rehabilitation care alone, or 'usual care')
	• The same intervention (as listed under 'intervention') but varied in terms of:
	  ○ Frequency
	  ○ Intensity
	  ○ Timing
	  ○ Setting

Outcome	• Gait and balance • Exercise capacity • Limb/joint/muscle function • Respiratory function • Functioning • Cost-effectiveness (including resource use measurements and QALY estimations using a validated preference-based measure such as the EQ-5D or SF-6D)

Study design	• Experimental study with random assignment to intervention and control groups. • Experimental study with non-random assignment to intervention and control groups (quasi-randomised controlled trials, non-randomised controlled trials and prospective and retrospective cohort studies)
Timeframe	Long term
Additional information	Due to the heterogeneity of the chronic neurological disorder population, if multiple conditions or disorders are recruited, researchers should ensure analysis is stratified by sub-group (that is, acquired brain injury, acquired spinal cord injury, acquired peripheral nerve disorders, progressive neurological diseases, and functional neurological disorders).

EQ-5D: EuroQol 5-dimensions; SF-6D: short-form 6-dimension; QALY: quality-adjusted life years