

## Cerebral palsy in adults

**[D3] Interventions that improve function and participation: electronic assistive technology**

*NICE guideline NG119*

*Evidence reviews*

*January 2019*

*Final*

*These evidence reviews were developed by the National Guideline Alliance hosted by the Royal College of Obstetricians and Gynaecologists*



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ISBN: 978-1-4731-3223-8

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# Interventions that improve function and participation for adults over 25 with cerebral palsy

## Review question

D3 What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

## Introduction

Electronic assistive technology can be used by adults with cerebral palsy to improve choice and independence. This is achieved through a wide variety of different methods and devices to facilitate environmental control (for example eye gaze technology, switches and computer access). In this review question the effectiveness and cost of the available technology in promoting independence is assessed.

## PICO table

Please 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)**

<b>Population</b>	Adults aged 25 and over with cerebral palsy <ul style="list-style-type: none"> <li>• Average age in any included study should be 15 years or more.</li> <li>• Included study should include at least 50% people with cerebral palsy.</li> </ul>
<b>Intervention</b>	<ul style="list-style-type: none"> <li>• Electronic assistive technology</li> <li>• Telecare</li> <li>• Environmental controls</li> <li>• Computer access</li> </ul>
<b>Comparison</b>	<ul style="list-style-type: none"> <li>• Usual care</li> <li>• Within intervention category</li> </ul>
<b>Outcome</b>	<p><b>Critical</b></p> <ul style="list-style-type: none"> <li>• Participation</li> <li>• Function</li> <li>• Independence</li> <li>• Health related quality of life</li> </ul> <p><b>Important</b></p> <ul style="list-style-type: none"> <li>• Frequency and duration of healthcare worker / carer contact</li> <li>• Person &amp; carer satisfaction</li> <li>• Admission to long term residential care</li> </ul>

For full 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 guideline: the manual 2014](#). Methods specific to this review question are described in the review protocol in appendix A and for a full description of the methods see supplementary document C.

Declaration of interests were recorded according to NICE's 2014 conflicts of interest policy from May 2016 until April 2018. From April 2018 onwards they were recorded according to NICE's 2018 [conflicts of interest policy](#). Those interests declared until April 2018 were reclassified according to NICE's 2018 conflicts of interest policy (see Interests Register).

## Clinical evidence

### Included studies

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

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

### Excluded studies

Studies not included in this review with reasons for their exclusions are provided in appendix K.

## Summary of clinical studies included in the evidence review

No clinical studies were identified for this review.

## Quality assessment of clinical studies included in the evidence review

No clinical studies were identified for this review.

## Economic evidence

### Included studies

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

### Excluded studies

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

## Summary of studies included in the economic evidence review

No economic evaluations were included in this review.

## Economic model

This question was not prioritised for economic modelling. The committee considered that whilst there was significant uncertainty around the clinical effectiveness and cost

effectiveness of the interventions considered it was unlikely that this could be resolved with the evidence identified.

### **Resource impact**

No unit costs were presented to the committee as these were not prioritised for decision making purposes.

### **Evidence statements**

No evidence was identified.

### **The committee's discussion of the evidence**

#### **Interpreting the evidence**

##### ***The outcomes that matter most***

The critical outcomes for this question were participation, function, independence and health related quality of life because electronic assistive technology is designed to enable people to carry out everyday tasks and enjoy greater independence.

Frequency and duration of healthcare worker or carer contact, person or carer satisfaction and admission to long term residential care were important outcomes. This is because assistive technology may reduce the need for contact with carers or admission to long term care, but this reduced social contact could impact satisfaction.

##### ***The quality of the evidence***

No evidence was identified for this question.

##### ***Benefits and harms***

Based on their knowledge and expertise, the committee agreed that electronic assistive technology can increase a person's independence and reduce the frequency and duration of carer or professional contact to perform daily tasks and routine reviews and therefore allow the adult to lead a more autonomous life. They therefore agreed that the potential need for this should be explored with the adult with cerebral palsy. However, electronic assistive technology should not take the place of regular face-to-face contact where there is the opportunity to ensure safety and well-being of adult with cerebral palsy. The committee highlighted that these recommendations would support government initiatives such as the Independent Living Strategy, which is a key element of the government's disability agenda for the [implementation of the right of disabled people to independent living](#) which is part of [The Human Rights Act 1998](#). The committee agreed that referrals to services providing electronic assistive technology would also be in line with the NHS England [commissioning document on complex disability](#) which describes access to such services.

Due to the lack of evidence the committee were unable to recommend any specific electronic assistive technology because this would be individualised to the person's needs, taking into account their skills, aspirations and cognitive ability. For this reason, the committee made a recommendation to refer adults with cerebral palsy to existing services with expertise in electronic assistive technology where appropriate.

Based on their experience and knowledge the committee highlighted that currently there is variability in the way the use of electronic assistive technology equipment is supplied and

reviewed. They also recognised that needs for the equipment might change over time. This means that potential problems with the equipment are not identified in a timely manner or that the equipment is no longer adequately addressing the adult's needs. This would have a detrimental effect on independence and function. To prevent this from happening, the committee recommended that the use of electronic assistive technology should be discussed at each review.

The committee identified that electronic assistive technology could decrease social contact which may lead to loneliness or isolation and made a recommendation to increase awareness of this. Recognition of this as a potential adverse effect of electronic assistive technology on social interaction for adults with cerebral palsy would help healthcare professionals to initiate discussions about this to explore whether this may be an issue.

The committee agreed, based on their experience, that training needs to be provided on how to use electronic assistive technology, to the adult who will be using this equipment as well as to their family or carers, to make sure that they know how the device can best support their independence and function. Such training may also help in learning to identify any malfunction if it occurs.

### **Cost effectiveness and resource use**

The committee noted that no relevant published economic evaluations had been identified for this topic. They also acknowledged that electronic assistive technology can be costly, but there would be cost savings through reduced professional contact time, residential care and hospital stays.

The committee made a recommendation to refer adults with cerebral palsy to existing services with expertise in electronic assistive technology which would increase both the number of people using these services and the use of this technology. From NHS Reference Costs 2015/16, the cost per consultant-led attendance with an occupational therapist is £142 (Currency Code, WF01B; Non-Admitted Face to Face Attendance; First Attendance; Service Code, 651).

A recommendation was also made to discuss changes in need, as electronic assistive technology would be costly and ineffective if it is no longer meeting a person's needs. As a result, professionals with expertise in this area should reassess electronic assistive technology, to discontinue electronic assistive technology, or enable a change in provision when the electronic assistive technology no longer adequately meets the needs in an individual. Whilst this will increase the number of appointments with specialists it will be offset by a reduction in the ineffective use of equipment.

The committee referred to the NHS England [commissioning document on complex disability for](#) equipment that aims to provide environmental controls and support the people who use them. However, it was noted that such service specifications by NHS England are not evidence based and did not consider the resource impact or cost effectiveness of wider provision where this is not current practise. Therefore, the committee made weak recommendations to reflect the lack of clinical and cost effectiveness evidence. The committee noted that no relevant published economic evaluations had been identified for this topic.

## References

No studies were included in this review.

# Appendices

## Appendix A – Review protocols

Review protocol for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

**Table 2: Review protocol for electronic assistive technology**

Field (based on <a href="#">PRISMA-P</a> )	Content
Review question	What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?
Type of review question	Intervention
Objective of the review	The aim of this review is to determine the effectiveness of electronic assistive technology to promote independence in adults with cerebral palsy.
Eligibility criteria – population/disease/condition/issue/do main	Adults aged 25 and over with cerebral palsy. <ul style="list-style-type: none"> <li>• Average age in any included study should be 15 years or more.</li> <li>• Included study should include at least 50% people with cerebral palsy.</li> </ul>
Eligibility criteria – intervention(s)/exposure(s)/prognostic factor(s)	<ul style="list-style-type: none"> <li>• Electronic assistive technology</li> <li>• Telecare</li> <li>• Environmental controls</li> <li>• Computer access</li> </ul>
Eligibility criteria – comparator(s)/control or reference (gold) standard	<ul style="list-style-type: none"> <li>• Usual care</li> <li>• Within intervention category</li> </ul>
Outcomes and prioritisation	<p><b>Critical</b></p> <ul style="list-style-type: none"> <li>• Participation</li> <li>• Function</li> <li>• Independence</li> <li>• Health related quality of life</li> </ul>

Field (based on <a href="#">PRISMA-P</a> )	Content
	<p><b>Important</b></p> <ul style="list-style-type: none"> <li>• Frequency and duration of healthcare worker / carer contact</li> <li>• Patient &amp; carer satisfaction</li> <li>• Admission to long term residential care</li> </ul> <p>Minimally important differences</p> <ul style="list-style-type: none"> <li>• Goal Attainment Scale: 7 units</li> <li>• Modified Ashworth Scale: 1 unit</li> <li>• ICF - Measure of Participation and Activities Screener: 2 units</li> <li>• Community Balance and Mobility Scale: 10 units</li> <li>• Canadian Occupational Performance Measure: 2 units</li> <li>• Australian Therapy Outcome Measures for Occupational Therapy: 0.5 units</li> <li>• Assessment of Life Habits: use minimal detectable change for each subdomain reported on rehabmeasures.org</li> <li>• Other dichotomous outcomes will use default MIDs [RR thresholds of 0.80 and 1.2]</li> <li>• Other continuous outcomes will use default MIDs [0.5 times the SD of the control group]</li> </ul>
Eligibility criteria – study design	<ul style="list-style-type: none"> <li>• Systematic reviews of RCTs</li> <li>• RCTs</li> <li>• Comparative cohort studies (only if RCTs unavailable or limited data to inform decision making)</li> <li>• Cross sectional studies</li> </ul>
Other inclusion exclusion criteria	Only published full text papers.
Proposed sensitivity/sub-group analysis, or meta-regression	<p>Groups that will be reviewed and analysed separately:</p> <ul style="list-style-type: none"> <li>• None</li> </ul> <p>In the presence of heterogeneity, the following subgroups will be considered for sensitivity analysis:</p> <ul style="list-style-type: none"> <li>• Population subgroups (e.g. age groups, presentation, severity): <ul style="list-style-type: none"> <li>○ Proportion with cerebral palsy (studies should involve at least 50% people with cerebral palsy)</li> <li>○ People with learning difficulties</li> <li>○ GMFCS level I to III</li> <li>○ GMFCS IV to V</li> </ul> </li> </ul>

Field (based on <a href="#">PRISMA-P</a> )	Content
	<ul style="list-style-type: none"> <li>○ MACS (manual ability classification - mild, moderate, severe)</li> <li>● Intervention subgroups</li> <li>○ Type of electronic assistive technology.</li> </ul> <p>Important confounders (when cohort studies are included):</p> <ul style="list-style-type: none"> <li>● Baseline level of independence, physical function and learning disability will be also considered important confounders which ideally should be adjusted for in any included comparative observational studies.</li> </ul>
Selection process – duplicate screening/selection/analysis	A random sample of the references identified in the search will be sifted by a second reviewer. This sample size will be 10% of the total, or 100 studies if the search identifies fewer than 1000 studies. All disagreements in study inclusion will be discussed and resolved between the two reviewers. The senior systematic reviewer or guideline lead will be involved if discrepancies cannot be resolved between the two reviewers
Data management (software)	Pairwise meta-analyses were performed using Cochrane Review Manager (RevMan5). 'GRADEpro' was used to assess the quality of evidence for each outcome.
Information sources – databases and dates	See appendix B for literature search strategy.
Identify if an update	Not an update
Author contacts	For details please see the guideline in development web site.
Highlight if amendment to previous protocol	For details please see section 4.5 of <a href="#">Developing NICE guidelines: the manual 2014</a>
Search strategy – for one database	For details please see appendix B.
Data collection process – forms/duplicate	A standardised evidence table format will be used, and published as appendix D (clinical evidence tables) or H (economic evidence tables).
Data items – define all variables to be collected	For details please see evidence tables in appendix D (clinical evidence tables) or H (economic evidence tables).
Methods for assessing bias at outcome/study level	Standard study checklists were used to critically appraise individual studies. For details please see section 6.2 of <a href="#">Developing NICE guidelines: the manual 2014</a> The risk of bias across all available evidence was 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 <a href="http://www.gradeworkinggroup.org/">http://www.gradeworkinggroup.org/</a> .
Criteria for quantitative synthesis	For details please see section 6.4 of <a href="#">Developing NICE guidelines: the manual 2014</a>

Field (based on <a href="#">PRISMA-P</a> )	Content
Methods for quantitative analysis – combining studies and exploring (in)consistency	For details of methods used in this guideline please see supplementary document C.
Meta-bias assessment – publication bias, selective reporting bias	For details please see section 6.2 of <a href="#">Developing NICE guidelines: the manual 2014</a> .
Confidence in cumulative evidence	For details please see sections 6.4 and 9.1 of <a href="#">Developing NICE guidelines: the manual 2014</a>
Rationale/context – what is known	For details please see the introduction to the evidence review.
Describe contributions of authors and guarantor	A multidisciplinary committee developed the evidence review. The committee was convened by the National Guideline Alliance (NGA) and chaired by Dr Paul Eunson in line with section 3 of <a href="#">Developing NICE guidelines: the manual 2014</a> . Staff from the NGA undertook systematic literature searches, appraised the evidence, conducted meta-analysis and cost effectiveness analysis where appropriate, and drafted the guideline in collaboration with the committee. For details please see the methods in supplementary document C.
Sources of funding/support	The NGA is funded by NICE and hosted by the Royal College of Obstetricians and Gynaecologists.
Name of sponsor	The NGA is funded by NICE and hosted by the Royal College of Obstetricians and Gynaecologists.
Roles of sponsor	NICE funds NGA to develop guidelines for those working in the NHS, public health and social care in England
PROSPERO registration number	Not applicable

*CDSR: Cochrane Database of Systematic Reviews; CENTRAL: Cochrane Central Register of Controlled Trials; DARE: Database of Abstracts of Reviews of Effects; GRADE: Grading of Recommendations Assessment, Development and Evaluation; GMFCS, gross motor function classification system; HTA: Health Technology Assessment; ICF: International Classification of Functioning, Disability and Health; MACS: manual ability classification; MID: minimally important difference; NGA: National Guideline Alliance; NHS: National health service; NICE: National Institute for Health and Care Excellence; RCT: randomised controlled trial; RoB: risk of bias; RR: relative risk; SD: standard deviation*

## Appendix B – Literature search strategies

Literature search strategies for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

This appendix is a combined search strategy and will be the same for all the evidence reviews for the D review questions as listed below:

D1: Which interventions (for example, vocational and independent living skills training) promote participation in adults with cerebral palsy?

D2: Which interventions are effective for maintaining physical function and mobility in adults with cerebral palsy?

- Physical activity
- Strengthening programmes or training
- Orthotics
- Task-oriented upper limb training
- Orthopaedic surgery (including tendon lengthening and orthopaedic bone procedures in adulthood).

D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

D4: Which interventions (for example augmentative and alternative communication systems) are effective in promoting communication for adults with cerebral palsy who have communication difficulties?

### Database: Medlife & Embase (Multifile)

Database(s): Embase 1974 to 2018 March 22, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present

**Table 3: Last searched on 22 March 2018**

#	Searches
1	exp Cerebral Palsy/ use prmz
2	exp cerebral palsy/ use oomezd
3	((cerebral or brain or central) adj2 (pal* or paralys#s or pares#s)).tw.
4	cerebral palsy.ti,ab.
5	little? disease.tw.
6	((hemipleg* or dipleg* or tripleg* or quadripleg* or unilateral*) adj5 spastic*).tw.
7	((hemipleg* or dipleg* or tripleg* or quadripleg* or unilateral*) adj3 ataxi*).tw.
8	or/1-7
9	limit 8 to english language
10	limit 9 to (adult <18 to 64 years> or aged <65+ years>) use oomezd [Limit not valid in Ovid MEDLINE(R),Ovid MEDLINE(R) In-Process; records were retained]
11	limit 9 to "all adult (19 plus years)" [Limit not valid in Embase; records were retained]
12	11 use prmz
13	or/10,12

#	Searches
14	exp Community Participation/ or exp Social Participation/ or exp "Activities of Daily Living"/ or exp Independent Living/ or exp Vocational Education/ or exp "Quality of Life"/ or exp Hearing Aids/ or exp Wheelchairs/ or exp Needs Assessment/ or exp Disability Evaluation/ or exp Self-Help Devices/ or exp Sickness Impact Profile/ or exp Sensory Aids/ or exp "Prostheses and Implants"/ or exp Orthotic Devices/ or exp Equipment Design/ or exp User-Computer Interface/ or exp communication aids for disabled/ or exp speech disorder/rh or exp Exercise/ or exp Rehabilitation/mt or exp Sports/ or exp Exercise Therapy/ or exp Orthopedic Procedures/ or exp Physical Therapy Modalities/
15	14 use pmz
16	social behavior/ or exp social adaptation/ or exp social participation/ or exp social interaction/ or exp community integration/ or exp community living/ or exp daily life activity/ or exp independent living/ or exp vocational education/ or exp "quality of life"/ or exp hearing aid/ or exp wheelchair/ or exp needs assessment/ or exp disability/ or exp self help device/ or exp Sickness Impact Profile/ or exp sensory aid/ or exp "prostheses and orthoses"/ or exp orthosis/ or exp implant/ or exp equipment design/ or exp computer interface/ or exp exercise/ or exp rehabilitation/ or exp self help/ or exp assistive technology/ or exp vocational guidance/ or exp communication aid/ or exp facilitated communication/ or exp eye tracking/ or exp sport/ or exp kinesiotherapy/ or exp orthopedic surgery/ or exp physiotherapy/
17	16 use oomezd
18	(participat* or (daily adj activit*) or (independen* adj5 liv*) or age* or aging or gender or motivat* or preference* or limitation* or restriction* or capacit* or performance* or (handl* adj5 object*) or assistive technolog* or (social adj5 interaction*) or employ* or vocation* or occupat* or educat* or profession* or isolat* or leisure activit* or mobil* or communicat* or eat* or dining or drink* or dress* or interact* or ((assistive or adaptive) adj5 (technolog* or device* or system*)) or home or school or work* or communit* or play* or eye tracking or sporting activit* or swim* or aqua* or upper limb training or bony procedure* or (neuro-developmental adj (treatment* or therap* or training)) or NDT or (muscle adj (tissue or tone)) or ((strength* or endurance) adj5 (program* or training*)) or ((tendon* or muscle*) adj (length* or stretch*)) or treadmill* or weight*).tw.
19	(augmentative or alternative communication or AAC or voice synthesizer* or accommodation* or sign language or gestur* or manual language board* or high?tech or touch screen* or speech?generating* or electronic keyboard* or phone* or iPad* or laptop* or computer* or modificat* or modify* or adapt* or custom* or tailor* or assist* or ((walking or hearing) adj aid*) or (communication adj (device* or system* or board*))).ti,ab.
20	15 or 17 or 18 or 19
21	13 and 20
22	conference abstract.pt. use oomezd
23	letter.pt. or LETTER/ use oomezd
24	Letter/ use pmz
25	EDITORIAL/ use pmz
26	editorial.pt. use oomezd
27	NEWS/ use pmz
28	exp HISTORICAL ARTICLE/ use pmz
29	note.pt. use oomezd
30	ANECDOTES AS TOPIC/ use pmz
31	COMMENT/ use pmz
32	CASE REPORT/ use pmz
33	CASE REPORT/ use oomezd
34	CASE STUDY/ use oomezd
35	(letter or comment* or abstracts).ti.

#	Searches
36	or/22-35
37	RANDOMIZED CONTROLLED TRIAL/ use prmz
38	RANDOMIZED CONTROLLED TRIAL/ use oomezd
39	random*.ti,ab.
40	or/37-39
41	36 not 40
42	ANIMALS/ not HUMANS/ use prmz
43	ANIMAL/ not HUMAN/ use oomezd
44	exp ANIMALS, LABORATORY/ use prmz
45	exp ANIMAL EXPERIMENTATION/ use prmz
46	exp MODELS, ANIMAL/ use prmz
47	exp RODENTIA/ use prmz
48	NONHUMAN/ use oomezd
49	exp ANIMAL EXPERIMENT/ use oomezd
50	exp EXPERIMENTAL ANIMAL/ use oomezd
51	ANIMAL MODEL/ use oomezd
52	exp RODENT/ use oomezd
53	(rat or rats or mouse or mice).ti.
54	or/41-53
55	21 not 54

#### Database: Cochrane Library

**Table 4: Last searched on 22 March 2018**

Hits	Search
#1	MeSH descriptor: [Cerebral Palsy] explode all trees and with qualifier(s): [Physiopathology - PP, Rehabilitation - RH]
#2	((cerebral or brain or central) N2 (pal* or paraly?s or pare?s))
#3	((hemipleg* or dipleg* or tripleg* or quadripleg* or unilateral*) N5 spastic*)
#4	((hemipleg* or dipleg* or tripleg* or quadripleg* or unilateral*) N3 ataxi*)
#5	#1 or #2 or #3 or #4
#6	MeSH descriptor: [Social Behavior] explode all trees
#7	MeSH descriptor: [Social Participation] explode all trees
#8	MeSH descriptor: [Interpersonal Relations] explode all trees
#9	MeSH descriptor: [Community Integration] explode all trees
#10	MeSH descriptor: [Independent Living] explode all trees
#11	MeSH descriptor: [Activities of Daily Living] explode all trees
#12	MeSH descriptor: [Vocational Education] explode all trees
#13	MeSH descriptor: [Quality of Life] explode all trees
#14	MeSH descriptor: [Hearing Aids] explode all trees
#15	MeSH descriptor: [Wheelchairs] explode all trees
#16	MeSH descriptor: [Needs Assessment] explode all trees
#17	MeSH descriptor: [Disability Evaluation] explode all trees
#18	MeSH descriptor: [Self-Help Devices] explode all trees

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Hits	Search
#19	MeSH descriptor: [Sickness Impact Profile] explode all trees
#20	MeSH descriptor: [Sensory Aids] explode all trees
#21	MeSH descriptor: [Prostheses and Implants] explode all trees
#22	MeSH descriptor: [Orthotic Devices] explode all trees
#23	MeSH descriptor: [Equipment Design] explode all trees
#24	MeSH descriptor: [User-Computer Interface] explode all trees
#25	MeSH descriptor: [Exercise] explode all trees
#26	MeSH descriptor: [Rehabilitation] explode all trees
#27	MeSH descriptor: [Vocational Guidance] explode all trees
#28	MeSH descriptor: [Communication Aids for Disabled] explode all trees
#29	MeSH descriptor: [Eye Movements] explode all trees
#30	MeSH descriptor: [Sports] explode all trees
#31	MeSH descriptor: [Exercise Therapy] explode all trees
#32	MeSH descriptor: [Orthopedic Procedures] explode all trees
#33	MeSH descriptor: [Physical Therapy Modalities] explode all trees
#34	sporting activit* or swim* or aqua* or upper limb training or bony procedures or Neuro-developmental near (Treatment* or therap* or training) or NDT or muscle tissue or muscle tone or strength* or endurance or length* or stretch* or treadmill* or weight*
#35	participat* or independent liv* or age or aging or limitation* or restriction* or capacit* or performance* or Assistive technolog* or augmentative communication or alternative communication or AAC or employ* or vocation* or occupat* or educat* or profession* or leisure activit* or interaction* or home or school or work* or communit* or play* or accommodation* or sign language or gestur* or manual language board* or high?tech or touch screen* or speech?generating* or electronic keyboard* or phone* or iPad* or laptop* or computer or eye tracking or modif* or adapt* or custom* or tailor* or assist* or walking aid* or hearing aid*
#36	{or #6-#35}
#37	#5 and #36

## Database: Web of Science

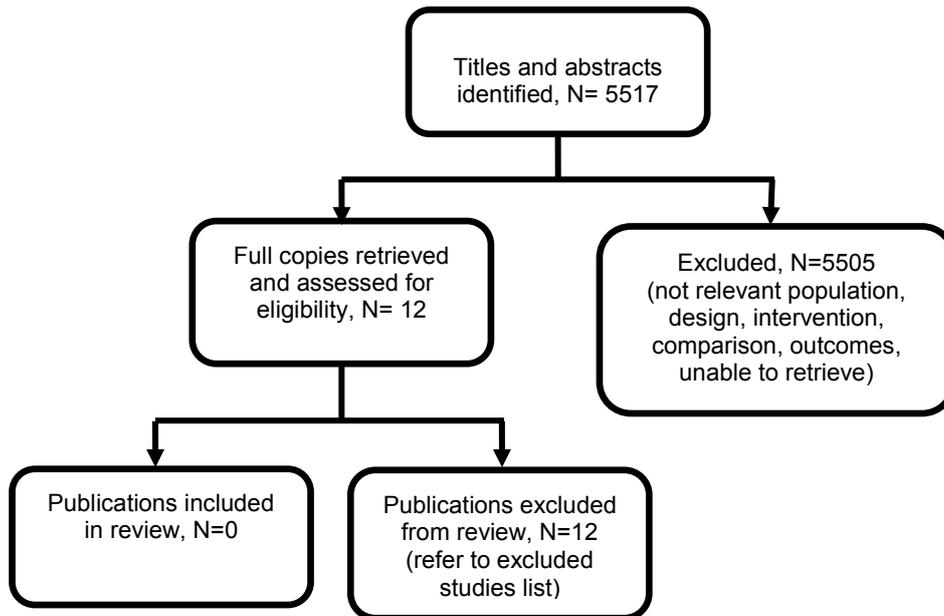
**Table 5: Last searched on 22 March 2018**

#3	#2 AND #1 AND LANGUAGE: (English)
#2	ts=Social Behavior or ts=Social Participation or ts=Interpersonal Relations or ts=Community Integration or ts=Independent Living or ts=Activities of Daily Living or ts=Vocational Education or ts=Quality of Life or ts=Hearing Aid* or ts=Wheelchair* or ts=Disability Evaluation or ts=Needs Assessment or ts=Self-Help Device* or ts=Sensory Aid* or ts=Prostheses or ts=Implant* or ts=Orthotic Device* or ts=Equipment Design or ts=User-Computer Interface or ts=Exercise* or ts=Rehabilitation or ts=Vocational Guidance or ts=Sport* or ts=Exercise Therap* or ts=Orthopedic Surgery or ts=Physiotherapy OR TS=Assistive technolog* or TS=augmentative communication or TS=alternative communication or TS=AAC OR TS>manual language board* or TS=high?tech or TS=touch screen* or TS=speech?generating* or TS=electronic keyboard* or TS=phone* or TS=iPad* or TS=laptop* or TS=eye tracking
#1	ts=Cerebral Palsy

## Appendix C – Clinical evidence study selection

Clinical evidence study selection for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

**Figure 1: Flow diagram of clinical article selection for review on electronic assistive technology**



## **Appendix D – Clinical evidence tables**

Clinical evidence tables for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No clinical studies were identified for this review.

## **Appendix E – Forest plots**

Forest plots for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No forest plots were included in this review.

## **Appendix F – GRADE tables**

GRADE tables for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No GRADE tables were included in this review.

## **Appendix G – Economic evidence study selection**

Economic evidence study selection for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No economic evidence was identified for this review.

## **Appendix H – Economic evidence tables**

Economic evidence tables for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No economic evidence was identified for this review.

## **Appendix I – Health economic evidence profiles**

Health economic evidence profiles for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No economic evidence was identified for this review.

## **Appendix J – Health economic analysis**

Health economic analysis for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No economic analysis was included in this review.

## Appendix K – Excluded studies

Clinical and economic list of excluded studies for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

### Clinical studies

**Table 6: Excluded clinical studies for electronic assistive technology**

Excluded studies – D3 What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?	
Study	Reason for Exclusion
Check, W., New device aids cerebral palsy patients in controlling movements, <i>JAMA : the journal of the American Medical Association</i> , 241, 543-544, 1979	News story about head stabilization device (1979)
Craig,A., Moses,P., Tran,Y., Mclsaac,P., Kirkup,L., The effectiveness of a hands-free environmental control system for the profoundly disabled, <i>Archives of Physical Medicine and Rehabilitation</i> , 83, 1455-1458, 2002	1/10 had CP
de Mello Monteiro, C. B., Massetti, T., da Silva, T. D., van der Kamp, J., de Abreu, L. C., Leone, C., Savelsbergh, G. J. P., Transfer of motor learning from virtual to natural environments in individuals with cerebral palsy, <i>Research in Developmental Disabilities</i> , 35, 2430-2437, 2014	Psychometric motor performance lab study
Fager, S. K., Burnfield, J. M., Speech Recognition for Environmental Control: Effect of Microphone Type, Dysarthria, and Severity on Recognition Results, <i>Assistive Technology</i> , 27, 199-207, 2015	1/10 had CP. Compares effect of dysarthria on voice activated environmental controls
Feasel,J., Whitton,M.C., Kassler,L., Brooks,F.P., Lewek,M.D., The integrated virtual environment rehabilitation treadmill system, <i>IEEE Transactions on Neural Systems and Rehabilitation Engineering</i> , 19, 290-297, 2011	Evaluation of a Virtual reality gait training rehab device. 2/5 had CP.
Gulmans, J., Vollenbroek-Hutten, M. M., Visser, J. J., Nijeweme-d'Hollosy, W. O., van Gemert-Pijnen, J. E., van Harten, W. H., A web-based communication system for integrated care in cerebral palsy: design features, technical feasibility and usability, <i>Journal of Telemedicine and Telecare</i> , 16, 389-393, 2010	EHealth system used by parents of children with CP (aged 4-8 years)
Harmer, J., Bakheit, A. M. O., The benefits of environmental control systems as perceived by disabled users and their carers, <i>British Journal of Occupational Therapy</i> , 62, 394-398, 1999	1/16 had CP
Lohse, K. R., Hilderman, C. G., Cheung, K. L., Tatla, S., Van der Loos, H. F., Virtual reality therapy for adults post-stroke: a systematic review and meta-analysis exploring virtual environments and commercial games in therapy, <i>PLoS ONE [Electronic Resource]</i> , 9, e93318, 2014	Systematic review of computer games for rehabilitation post stroke (not CP).
Melland, H. I., Langemo, D., Hanson, D., Olson, B., Hunter, S., Clinical evaluation of an automated turning bed, <i>Orthopaedic Nursing</i> , 18, 65-70, 1999	1/24 had CP
Santos, A. A. S., Araujo, J. A., Vargas, M. M., Oliveira, C. C. C., The influence of household environment on caregivers' overload of children with cerebral paralysis, <i>Acta Scientiarum - Health Sciences</i> , 34, 315-320, 2012	Not EAT

**Excluded studies – D3 What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?**

<b>Study</b>	<b>Reason for Exclusion</b>
Stirling, L., MacLean, J., Roadmap for the Development of at-Home Telemonitoring Systems to Augment Occupational Therapy, IEEE Transactions on Human-Machine Systems, 46, 569-580, 2016	No participants had CP
Tura, A., Badanai, M., Longo, D., Quareni, L., A multi-functional, portable device with wireless transmission for home monitoring of children with a learning disability, Journal of Telemedicine & Telecare, 10, 298-302, 2004	3/9 had CP - all were children.

*CP: cerebral palsy; EAT: environmental assistive technology.*

### **Economic studies**

No economic evidence was identified for this review.

## **Appendix L – Research recommendations**

Research recommendations for review question D3: What is the effectiveness of electronic assistive technology in promoting independence in adults with cerebral palsy?

No research recommendation was made for this review.