

National Institute for Health and Clinical Excellence
Centre for Public Health Excellence

Review decision

Review of the public health guidance (PH17):

Promoting physical activity, active play and sport for pre-school and school-age children and young people in family, pre-school, school and community settings

1 Background information

Guidance issued: January 2009
Review decision: April 2012

2 Process for updating guidance

Public health guidance is reviewed 3 years after publication to determine whether all or part of it should be updated.

The process for updating NICE public health guidance is as follows:

- NICE convenes an expert group to consider whether any new evidence or significant changes in policy and practice would be likely to lead to substantively different recommendations. The expert group consists of selected members (including cooptees) of the original committee that developed the guidance, the review team that produced the original evidence reviews, and representatives of relevant government departments.

- NICE consults with stakeholders on its proposal for updating the guidance.
- NICE may amend its proposal, in light of feedback from stakeholder consultation.
- NICE determines where any guidance update fits within its work programme, alongside other priorities.

3 Consideration of the evidence and practice

The expert group discussed published and ongoing research of relevance to the current recommendations, informed by several literature searches (see below). The expert group also discussed changes to policy, legislation and organisations that might affect the recommendations.

Literature searches

Literature searches were conducted for papers published between April 2007 and October 2011. The original search strategies for the four effectiveness evidence reviews (active travel, children under eight, adolescent girls and family and community) were re-run in *Medline*, *Medline in process* and *Transport* database. The following new searches were also conducted:

- *Social Policy and Practice*: general search for (i) Physical Activity and Young People, and (ii) Olympics,
- *ASSIA*: searched for physical activity papers,
- *ERIC* and *Medline*: searched for papers on physical activity curricula,
- *The Cochrane database*: searched for physical activity reviews,

In addition, a grey literature search was conducted for papers related to the Olympic legacy. Separate searches for cost–effectiveness were not conducted but health economics papers were identified during the screening process.

The results of the literature searches and feedback from the expert group have been assessed to inform the proposed review decision and are summarised below. All references identified through the searches can be viewed in [Appendix 1](#).

Please note that the new pieces of public health guidance in development referred to below are listed in section 5, along with other related published NICE guidance.

Active travel

Recommendations 5 and 12

Three systematic reviews of active school travel interventions, one systematic review of organisational travel plans and one systematic review of interventions to promote cycling were identified⁽¹⁻⁴⁾. Three trials of active travel interventions⁽⁵⁻⁷⁾ and two papers reporting interventions to promote cycling^(8;9) were identified. The papers covered walking buses, walk to school days, cycle trains and multi-faceted travel active travel initiatives. One cost effectiveness study of a school travel programme was also found⁽¹⁰⁾.

One systematic review⁽¹¹⁾ and three trials of pedometers⁽¹²⁻¹⁴⁾ were identified. The systematic review concluded that pedometers were a useful tool to increase physical activity. The three studies all found positive short-term¹ effects.

The expert panel noted that the Department of Health has recently asked NICE to produce guidance on 'Local measures to promote walking and cycling as forms of travel or recreation.' In addition, the Government's sustainability agenda includes the Smarter Choices programme which aims to change travel modes and the Travelling to School initiative².

¹ Six months and under

² <http://www.dft.gov.uk/topics/sustainable/smarter-choices/>

The expert panel noted the policy change relating to the end of funding for 'Bikeability' and discussed the lack of evaluation about the impact of cycle training on physical activity outcomes. They noted that the evidence base was still limited to travel to and from school, with active travel initiatives to other venues receiving little evaluation.

The expert panel concluded that the new evidence was consistent with the existing recommendations, however the evidence was insufficient to add further details.

Children under eight years of age

Recommendations 6 and 13

The searches identified an increase in the amount of literature focusing on younger children. One systematic review of papers objectively measuring physical activity in preschool children in child care reported low levels of activity⁽¹⁵⁾.

Positive effects on physical activity outcomes were reported by three systematic reviews, the first focused on the effect of structured programmes effect on PA and motor skills⁽¹⁶⁾, the second on childcare policy, playground density, availability and quality of portable play equipment⁽¹⁷⁾ and the third on physically active lessons⁽¹⁸⁾. One systematic review of effectiveness and cost-effectiveness of weight management schemes for the under 5's, which included physical activity interventions, found no cost effectiveness reports⁽¹⁹⁾.

One systematic review⁽¹⁶⁾ and seven studies were found which evaluated interventions to improve core motor skills in young children⁽²⁰⁻²⁶⁾. The review reported that 'all five studies measuring motor skills and eight assessing physical activity-related outcomes demonstrated generally positive findings'⁽¹⁶⁾. The findings across the seven studies were not consistent⁽²⁰⁻²⁶⁾.

A large proportion of studies were focused on the prevention of overweight/obesity, many of these studies had a physical activity component but did not report physical activity outcomes. Of the 17 studies aiming to increase physical activity interventions and settings were varied and outcomes mixed⁽²⁷⁻⁴²⁾.

A number of ongoing trials⁽⁴³⁻⁵¹⁾ were noted (publication date unknown) suggesting that future updates may be better informed.

There was a paucity of evidence relating to babies and toddlers.

The expert panel noted the updated Chief Medical Officer's national recommendations for physical activity³ now include a section for under 5's. Of particular note are the recommendations that children should have three hours of physical activity which is spread throughout the day, as well as reducing time spent being restrained or sitting for extended periods (except when sleeping). The PH17 recommendations currently target early years providers and recommend opportunities for activity throughout the day, a range of activities is recommended on a daily basis, including unstructured spontaneous play.

The expert panel concluded that there was an increased focus on interventions for younger age groups. However, they were uncertain whether very much further specificity could be added to the existing NICE recommendation, given the heterogeneity of the evaluated interventions and settings. They recommended that there should be another search for evidence in this area before the next scheduled 3 year update to ascertain whether there is sufficient evidence to warrant an update. Nevertheless, the expert group recommended that the NICE guidance and related resources (eg *Pathways*) should be amended to refer to the updated CMO

3

http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_128210.pdf

recommendations.

Adolescent girls

Recommendations 11 and 14

Searches found a limited number of papers which focused only on adolescent girls. One systematic review focusing on girl-only interventions was found, which was published after the update searching. Positive outcomes were demonstrated in five of the ten studies which recruited high school girls⁽⁵²⁾. Multi-factorial interventions were found to be effective and peer strategies were considered to be a promising component.

There were a limited number of papers reporting girl-only interventions. Four new intervention papers from two initiatives (GEMS and TAAG) reported in the original review⁽⁵³⁻⁵⁸⁾ and two papers reporting new interventions (Scouting Nutrition & Activity Program (SNAP) and BOUNCE) were identified^(59;60). These studies had mixed results.

Three papers reported sport focused interventions which addressed self-efficacy and body image as well as participation. These also had mixed results⁽⁶¹⁻⁶³⁾.

The expert panel considered that there was insufficient intervention evidence to add further detail to the recommendation.

Multi-component school and community programmes

Recommendation 9

Positive effects of multi-component school and community programmes were reported by seven systematic reviews of multi-component interventions⁽⁶⁴⁻⁷⁰⁾. Eight papers investigating multi-component programmes were also found most of which reported positive effects. Programme components varied between studies, but may have included physical activity information, social

support, environmental changes, physical education, sport, physical activity across the curriculum, after school activities, parental involvement, general health education and obesity prevention^(13;71-78).

The expert panel considered that there was insufficient evidence to add further detail to the existing recommendation, although there might be some new evidence about after-school clubs and activities.

Family and community

Recommendation 15

Searches found six systematic reviews of family and/or community interventions which support the inclusion of parents⁽⁷⁹⁻⁸⁴⁾. Ten studies of diverse interventions targeting parents were also found which had mixed outcomes^(29;39;85-92).

Two systematic reviews focusing on sporting interventions and sport policy, found no papers of sufficient quality to include^(93;94).

Limited evidence was found about computer and web-based interventions. One systematic review found small short lived increases in physical activity⁽⁹⁵⁾ and in one RCT outcomes were variable for different groups based on gender and age⁽⁹⁶⁾.

Very little was found on interventions promoting activities such as dance and yoga^(56;59;97). Papers on dance and yoga rarely focused on increasing physical activity⁽⁹⁸⁻¹⁰⁴⁾.

Three papers were found which reported positive motor skills outcomes and a link between motor skills and energy expenditure^(71;105;106).

The expert panel considered that there was insufficient evidence to add further detail to the recommendation but that what evidence there was supported the recommendation.

Active video/DVD games to increase physical activity were discussed as a recent intervention. A small body of literature was identified by the searches. Two reviews reported outcomes in energy expenditure which were considered variable⁽¹⁰⁷⁾ and equivalent to mild to moderate physical activity⁽¹⁰⁸⁾. Nine papers were identified, these were mainly exploratory investigating energy expenditure and feasibility of the intervention⁽¹⁰⁹⁻¹¹⁶⁾. The expert committee decided there was insufficient evidence and they were also of the opinion that the rate of technological change meant that there was a high risk of obsolescence.

The expert group discussed the increased emphasis in the Chief Medical Officer's national minimum physical activity recommendations on the reduction in sedentary behaviours and the development of an evidence base in this area. Two reviews reported small significant effects^(117;118) and 10 papers were identified in the searches outcomes were mixed^(13;39;92;119-127). The expert group agreed that the evidence base was not yet sufficiently developed to warrant an update in this area. Particular concerns were that studies have focused on reducing screen time alone, with other sedentary behaviours receiving little attention. In particular, the lack of clarity about what replaces screen time, physical activity or another sedentary pastime, makes it unclear whether there is a real benefit.

Planning for physical activity

Recommendations 1, 2, 3, 4, 7, 8 and 10

Six studies were found that evaluated methods of promoting physical activity in this area. Positive outcomes from mass media campaigns were reported by two papers^(128;129), but another paper showed no effect⁽¹²⁰⁾. Positive outcomes

from an initiative raising awareness of the benefits of physical activity were reported by one paper⁽¹³⁰⁾. Mixed outcomes from a social marketing intervention (an increase in participation but not in the amount of physical activity) were reported by one paper⁽¹³¹⁾. A study of text messaging interventions showed positive outcomes for affective messages⁽¹³²⁾.

The expert panel considered that there was limited new evidence but that it was likely to support the existing recommendations.

Research recommendations

The evidence suggests that the quality of the research is improving and that objective measures of physical activity are being used more frequently both to map current activity levels and to evaluate interventions. The expert panel considered that the research recommendations are still relevant.

4 Implementation and post publication feedback

No new evidence was identified through post publication enquiries or implementation feedback that would indicate a need to update the guidance at this time.

5 Related NICE guidance

The following NICE guidance is related to PH17:

Community engagement. NICE public health guidance 9 (2008).

Available from www.nice.org.uk/PH9

Physical activity and the environment. NICE public health guidance 8 (2008). Available from www.nice.org.uk/PH8

Promoting physical activity in the workplace. NICE public health guidance 13 (2008). Available from www.nice.org.uk/PH13

Social and emotional wellbeing in primary education. NICE public health guidance 12 (2008). Available from www.nice.org.uk/PH12

Behaviour change. NICE public health guidance 6 (2007). Available from www.nice.org.uk/PH6

Four commonly used methods to increase physical activity: brief interventions in primary care, exercise referral schemes, pedometers and community-based exercise programmes for walking and cycling. NICE public health guidance 2 (2006). Available from www.nice.org.uk/PH2

Obesity: guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE clinical guideline 43 (2006). Available from www.nice.org.uk/CG43

Depression in children and young people. NICE clinical guideline 28 (2005). Available from www.nice.org.uk/CG28

Preventing unintentional injuries among under-15s in the home. NICE public health guidance 30 (2010). Available from <http://guidance.nice.org.uk/PH30>

Preventing unintentional road injuries among under-15s: road design. NICE public health guidance 31 (2010). Available from <http://guidance.nice.org.uk/PH31>

Strategies to prevent unintentional injuries in the under-15s. NICE public health guidance 29 (2010). Available from <http://guidance.nice.org.uk/PH29>

Walking and cycling. NICE public health guidance in development (due Oct 2012). Available from <http://guidance.nice.org.uk/PHG/Wave20/84>

Physical activity advice in primary care. NICE public health guidance in development (due May 2013). Available from <http://guidance.nice.org.uk/PHG/Wave11/26>

6 Stakeholder consultation

In January 2012, the proposal was made to stakeholders that the guidance should not be updated at this time and that it would be reviewed again in 3 years time.

Twelve organisations commented on the proposal during the two week consultation period. Four stakeholders agreed with the proposal not to update the guidance at this time (one of whom supported an interim update), none disagreed and eight were ambivalent or did not say.

Stakeholders raised the following main points:

- The importance of physical literacy
- The importance of physical activity in obesity prevention
- Proposed changes to the NHS, the draft National Planning Policy Framework, and to planning and local authority structures.

During consultation, areas to consider for review in an update were:

- Reducing sedentary behaviour
- Evidence from the Change4Life campaign.

Several areas were suggested that were out of scope, including:

- Making public transport safer and more accessible to children and young people
- Air pollution
- Nutritional advice.

7 Equality and diversity considerations

There has been no evidence to indicate that the guidance does not comply with anti-discrimination and equalities legislation.

8 Conclusion

In conclusion, no new evidence has been identified which appears to contradict the existing recommendations. Although some new evidence is available that could add nuance to some of the recommendations, it is highly unlikely that this would invalidate or change the direction of the current recommendations.

While the expert group concluded that it may be worth taking another look at the evidence on younger children in one or two year's time – with a view to a partial update of the guidance – NICE was not convinced that this was justified given the resource implications. Therefore, the proposal put to stakeholders was that the guidance should not be updated and should be reviewed again in 3 years time.

Given the feedback from stakeholders, NICE has decided it is not necessary to update the guidance at this time.

However, NICE will make a technical amendment to the guidance so that it refers to the latest CMO recommendations.

9 Review decision

The guidance will not be updated at this time.

The guidance will be reviewed again in 3 years time, according to current processes.

Centre for Public Health Excellence, April 2012

Appendix 1

Reference List

- (1) Chillon P, Evenson KR, Vaughn A, Ward DS. A systematic review of interventions for promoting active transportation to school. [Review]. *International Journal of Behavioral Nutrition & Physical Activity* 2011;8:10.
- (2) Hosking J, Macmillan A, Connor J, Bullen C, Ameratunga S. Organisational travel plans for improving health. [Review] [110 refs]. *Cochrane Database of Systematic Reviews* 2010;(3):CD005575.
- (3) Lee MC, Orenstein MR, Richardson MJ. Systematic review of active commuting to school and childrens physical activity and weight. [Review] [45 refs]. *Journal of Physical Activity & Health* 2008 Nov;5(6):930-49.
- (4) Yang L, Sahlqvist S, McMinn A, Griffin SJ, Ogilvie D. Interventions to promote cycling: systematic review. [Review]. *BMJ* 2010;341:c5293.
- (5) Mendoza JA, Levinger DD, Johnston BD. Pilot evaluation of a walking school bus program in a low-income, urban community. *BMC Public Health* 2009;9:122.
- (6) Naylor PJ, Macdonald HM, Warburton DE, Reed KE, McKay HA. An active school model to promote physical activity in elementary schools: action schools! BC. *British Journal of Sports Medicine* 2008 May;42(5):338-43.
- (7) Wen LM, Fry D, Merom D, Rissel C, Dirkis H, Balafas A. Increasing active travel to school: are we on the right track? A cluster randomised controlled trial from Sydney, Australia. *Preventive Medicine* 2008 Dec;47(6):612-8.
- (8) O'FALLON C. Developing school-based cycle trains in New Zealand. 2008.
- (9) Tal G, Handy S. Children's Bicycling to After-School Activities: The Case of the Davis AYSO Bike-to-Soccer Program. 2008.
- (10) Moodie M, Haby MM, Swinburn B, Carter R. Assessing cost-effectiveness in obesity: active transport program for primary school children--TravelSMART Schools Curriculum program. *Journal of Physical Activity & Health* 2011 May;8(4):503-15.
- (11) Lubans DR, Morgan PJ, Tudor-Locke C. A systematic review of studies using pedometers to promote physical activity among youth. [Review] [39 refs]. *Preventive Medicine* 2009 Apr;48(4):307-15.
- (12) Horne PJ, Hardman CA, Lowe CF, Rowlands AV. Increasing children's physical activity: a peer modelling, rewards and pedometer-based intervention. *European Journal of Clinical Nutrition* 2009 Feb;63(2):191-8.

- (13) Lubans DR, Morgan PJ, Callister R, Collins CE. Effects of integrating pedometers, parental materials, and E-mail support within an extracurricular school sport intervention. *Journal of Adolescent Health* 2009 Feb;44(2):176-83.
- (14) Shimon JM, Petlichkoff LM. Impact of pedometer use and self-regulation strategies on junior high school physical education students daily step counts. *Journal of Physical Activity & Health* 2009 Mar;6(2):178-84.
- (15) Reilly JJ. Low levels of objectively measured physical activity in preschoolers in child care. [Review] [39 refs]. *Medicine & Science in Sports & Exercise* 2010 Mar;42(3):502-7.
- (16) Ward DS, Vaughn A, McWilliams C, Hales D. Interventions for increasing physical activity at child care. [Review] [44 refs]. *Medicine & Science in Sports & Exercise* 2010 Mar;42(3):526-34.
- (17) Trost SG, Ward DS, Senso M. Effects of child care policy and environment on physical activity. [Review] [14 refs]. *Medicine & Science in Sports & Exercise* 2010 Mar;42(3):520-5.
- (18) Bartholomew JB, Jowers EM. Physically active academic lessons in elementary children. [Review]. *Preventive Medicine* 2011 Jun 1;52:Suppl-4.
- (19) Bond M, Wyatt K, Lloyd J, Welch K, Taylor R. Systematic review of the effectiveness and cost-effectiveness of weight management schemes for the under fives: a short report. [Review] [95 refs]. *Health Technology Assessment (Winchester, England)* /20;13(61):1-75.
- (20) Graf C, Koch B, Falkowski G, Jouck S, Christ H, Staudenmaier K, et al. School-based prevention: effects on obesity and physical performance after 4 years. *Journal of Sports Sciences* 2008 Aug;26(10):987-94.
- (21) Matvienko O, Ahrabi-Fard I. The effects of a 4-week after-school program on motor skills and fitness of kindergarten and first-grade students. *American Journal of Health Promotion* 2010 May;24(5):299-303.
- (22) Ratzon NZ, Lahav O, Cohen-Hamsi S, Metzger Y, Efraim D, Bart O. Comparing different short-term service delivery methods of visual-motor treatment for first grade students in mainstream schools. *Research in Developmental Disabilities* 2009 Nov;30(6):1168-76.
- (23) Ratzon NZ, Zabaneh-Tannas K, Ben-Hamo L, Bart O. Efficiency of the home parental programme in visual-motor home activity among first-grade children. *Child: Care, Health & Development* 2010 Mar;36(2):249-54.
- (24) Roth K, Mauer S, Obinger M, Ruf KC, Graf C, Kriemler S, et al. Prevention through Activity in Kindergarten Trial (PAKT): a cluster randomised controlled trial to assess the effects of an activity intervention in preschool children. *BMC Public Health* 2010;10:410.

- (25) Serpentino C. "The moving body": a sustainable project to improve children's physical activity at kindergarten. *International Journal of Pediatric Obesity* 2011 Oct;6:Suppl-2.
- (26) Williams CL, Carter BJ, Kibbe DL, Dennison D. Increasing physical activity in preschool: a pilot study to evaluate animal trackers. *Journal of Nutrition Education & Behavior* 2009 Jan;41(1):47-52.
- (27) Ahamed Y, Macdonald H, Reed K, Naylor PJ, Liu-Ambrose T, McKay H. School-based physical activity does not compromise children's academic performance. *Medicine & Science in Sports & Exercise* 2007 Feb;39(2):371-6.
- (28) Alhassan S, Sirard JR, Robinson TN. The effects of increasing outdoor play time on physical activity in Latino preschool children. *International Journal of Pediatric Obesity* 2007;2(3):153-8.
- (29) Ayala GX, Elder JP, Campbell NR, Arredondo E, Baquero B, Crespo NC, et al. Longitudinal intervention effects on parenting of the Aventuras para Ninos study. *American Journal of Preventive Medicine* 2010 Feb;38(2):154-62.
- (30) Donnelly JE, Greene JL, Gibson CA, Smith BK, Washburn RA, Sullivan DK, et al. Physical Activity Across the Curriculum (PAAC): a randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children. *Preventive Medicine* 2009 Oct;49(4):336-41.
- (31) Eliakim A, Nemet D, Balakirski Y, Epstein Y. The effects of nutritional-physical activity school-based intervention on fatness and fitness in preschool children. *Journal of Pediatric Endocrinology* 2007 Jun;20(6):711-8.
- (32) Gentile DA, Welk G, Eisenmann JC, Reimer RA, Walsh DA, Russell DW, et al. Evaluation of a multiple ecological level child obesity prevention program: Switch what you Do, View, and Chew. *BMC Medicine* 2009;7:49.
- (33) Hannon JC, Brown BB. Increasing preschoolers' physical activity intensities: An activity-friendly preschool playground intervention. *Preventive Medicine* 2008 Jun;46(6):532-6.
- (34) Hardman CA, Horne PJ, Fergus LC. Effects of rewards, peer-modelling and pedometer targets on children's physical activity: a school-based intervention study. *Psychology & Health* 2011 Jan;26(1):3-21.
- (35) Katz DL, Cushman D, Reynolds J, Njike V, Treu JA, Walker J, et al. Putting physical activity where it fits in the school day: preliminary results of the ABC (Activity Bursts in the Classroom) for fitness program. *Preventing Chronic Disease* 2010 Jul;7(4):A82.
- (36) Kiran A, Knights J. Traditional Indigenous Games promoting physical activity and cultural connectedness in primary schools--cluster randomised control trial. *Health Promotion Journal of Australia* 2010 Aug;21(2):149-51.
- (37) Kriemler S, Zahner L, Schindler C, Meyer U, Hartmann T, Hebestreit H, et al. Effect of school based physical activity programme (KISS) on fitness and

adiposity in primary schoolchildren: cluster randomised controlled trial. *BMJ* 2010;340:c785.

- (38) Loucaides CA, Jago R, Charalambous I. Promoting physical activity during school break times: Piloting a simple, low cost intervention. *Preventive Medicine* 2009 Apr;48(4):332-4.
- (39) McCallum Z, Wake M, Gerner B, Baur LA, Gibbons K, Gold L, et al. Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity. *International Journal of Obesity* 2007 Apr;31(4):630-6.
- (40) McNeil DA, Wilson BN, Siever JE, Ronca M, Mah JK. Connecting children to recreational activities: results of a cluster randomized trial. *American Journal of Health Promotion* 2009 Jul;23(6):376-87.
- (41) Nemet D, Geva D, Eliakim A. Health promotion intervention in low socioeconomic kindergarten children. *Journal of Pediatrics* 2011 May;158(5):796-801.
- (42) Trost SG, Fees B, Dzewaltowski D. Feasibility and efficacy of a "move and learn" physical activity curriculum in preschool children. *Journal of Physical Activity & Health* 2008 Jan;5(1):88-103.
- (43) Adams J, Zask A, Dietrich U. Tooty Fruity Veggie in Preschools: an obesity prevention intervention in preschools targeting children's movement skills and eating behaviours. *Health Promotion Journal of Australia* 2009 Aug;20(2):112-9.
- (44) Brambilla P, Bedogni G, Buongiovanni C, Brusoni G, Di MG, Di PM, et al. "Mi voglio bene": a pediatrician-based randomized controlled trial for the prevention of obesity in Italian preschool children. *Italian Journal of Pediatrics* 2010;36:55.
- (45) De BF, Fischer JE, Hoffmann K, Renz-Polster H. A participatory parent-focused intervention promoting physical activity in preschools: design of a cluster-randomized trial. *BMC Public Health* 2010;10:49.
- (46) DuBose KD, Mayo MS, Gibson CA, Green JL, Hill JO, Jacobsen DJ, et al. Physical activity across the curriculum (PAAC): rationale and design. *Contemporary Clinical Trials* 2008 Jan;29(1):83-93.
- (47) Finch M, Wolfenden L, Morgan PJ, Freund M, Wyse R, Wiggers J. A cluster randomised trial to evaluate a physical activity intervention among 3-5 year old children attending long day care services: study protocol. *BMC Public Health* 2010;10:534.
- (48) Giralt M, Albaladejo R, Tarro L, Morina D, Arija V, Sola R. A primary-school-based study to reduce prevalence of childhood obesity in Catalunya (Spain)--EDAL-Educacio en alimentacio: study protocol for a randomised controlled trial. *Trials [Electronic Resource]* 2011;12:54.

- (49) Niederer I, Kriemler S, Zahner L, Burgi F, Ebenegger V, Hartmann T, et al. Influence of a lifestyle intervention in preschool children on physiological and psychological parameters (Ballabeina): study design of a cluster randomized controlled trial. *BMC Public Health* 2009;9:94.
- (50) Nyberg G, Sundblom E, Norman A, Elinder LS. A healthy school start - parental support to promote healthy dietary habits and physical activity in children: design and evaluation of a cluster-randomised intervention. *BMC Public Health* 2011;11:185.
- (51) Wen LM, Baur LA, Rissel C, Wardle K, Alperstein G, Simpson JM. Early intervention of multiple home visits to prevent childhood obesity in a disadvantaged population: a home-based randomised controlled trial (Healthy Beginnings Trial). *BMC Public Health* 2007;7:76.
- (52) Camacho-Minano MJ, LaVoi NM, Barr-Anderson DJ. Interventions to promote physical activity among young and adolescent girls: a systematic review. *Health Education Research* 2011;26(6):1025-49.
- (53) Klesges RC, Obarzanek E, Klesges LM, Stockton MB, Beech BM, Murray DM, et al. Memphis Girls health Enrichment Multi-site Studies (GEMS): Phase 2: design and baseline. *Contemporary Clinical Trials* 2008 Jan;29(1):42-55.
- (54) Klesges RC, Obarzanek E, Kumanyika S, Murray DM, Klesges LM, Relyea GE, et al. The Memphis Girls' health Enrichment Multi-site Studies (GEMS): an evaluation of the efficacy of a 2-year obesity prevention program in African American girls. *Archives of Pediatrics & Adolescent Medicine* 2010 Nov;164(11):1007-14.
- (55) Robinson TN, Kraemer HC, Matheson DM, Obarzanek E, Wilson DM, Haskell WL, et al. Stanford GEMS phase 2 obesity prevention trial for low-income African-American girls: design and sample baseline characteristics. *Contemporary Clinical Trials* 2008 Jan;29(1):56-69.
- (56) Robinson TN, Matheson DM, Kraemer HC, Wilson DM, Obarzanek E, Thompson NS, et al. A randomized controlled trial of culturally tailored dance and reducing screen time to prevent weight gain in low-income African American girls: Stanford GEMS. *Archives of Pediatrics & Adolescent Medicine* 2010 Nov;164(11):995-1004.
- (57) Webber LS, Catellier DJ, Lytle LA, Murray DM, Pratt CA, Young DR, et al. Promoting Physical Activity in Middle School Girls: Trial of Activity for Adolescent Girls. *American Journal of Preventive Medicine* 2008 Mar;34(3):173-84.
- (58) Young DR, Steckler A, Cohen S, Pratt C, Felton G, Moe SG, et al. Process evaluation results from a school- and community-linked intervention: the Trial of Activity for Adolescent Girls (TAAG). *Health Education Research* 2008 Dec;23(6):976-86.
- (59) Olvera N, Bush JA, Sharma SV, Knox BB, Scherer RL, Butte NF. BOUNCE: a community-based mother-daughter healthy lifestyle intervention for low-income Latino families. *Obesity* 2010 Feb;18:Suppl-4.

- (60) Rosenkranz RR, Behrens TK, Dzewaltowski DA. A group-randomized controlled trial for health promotion in Girl Scouts: healthier troops in a SNAP (Scouting Nutrition & Activity Program). *BMC Public Health* 2010;10:81.
- (61) Dudley DA, Okely AD, Pearson P, Peat J. Engaging adolescent girls from linguistically diverse and low income backgrounds in school sport: a pilot randomised controlled trial. *Journal of Science & Medicine in Sport* 2010 Mar;13(2):217-24.
- (62) LUBANS D. Impact of an extra-curricular school sport programme on determinants of objectively measured physical activity among adolescents. *Health Education Journal*, vol 2008;pp305-320.:2008.
- (63) Lubans DR, Morgan PJ, Dewar D, Collins CE, Plotnikoff RC, Okely AD, et al. The Nutrition and Enjoyable Activity for Teen Girls (NEAT girls) randomized controlled trial for adolescent girls from disadvantaged secondary schools: rationale, study protocol, and baseline results. *BMC Public Health* 2010;10:652.
- (64) Beets MW, Beighle A, Erwin HE, Huberty JL. After-school program impact on physical activity and fitness: a meta-analysis. [Review] [50 refs]. *American Journal of Preventive Medicine* 2009 Jun;36(6):527-37.
- (65) Dobbins M, De CK, Robeson P, Husson H, Tirilis D. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18. [Review] [408 refs]. *Cochrane Database of Systematic Reviews* 2009;(1):CD007651.
- (66) Kriemler S, Meyer U, Martin E, van Sluijs EM, Andersen LB, Martin BW. Effect of school-based interventions on physical activity and fitness in children and adolescents: a review of reviews and systematic update. *British Journal of Sports Medicine* 2011 Sep;45(11):923-30.
- (67) Murray NG, Low BJ, Hollis C, Cross AW, Davis SM. Coordinated school health programs and academic achievement: a systematic review of the literature. [Review] [42 refs]. *Journal of School Health* 2007 Nov;77(9):589-600.
- (68) Naylor PJ, McKay HA. Prevention in the first place: schools a setting for action on physical inactivity. [Review] [66 refs]. *British Journal of Sports Medicine* 2009 Jan;43(1):10-3.
- (69) Pate RR, O'Neill JR. After-school interventions to increase physical activity among youth. [Review] [19 refs]. *British Journal of Sports Medicine* 2009 Jan;43(1):14-8.
- (70) van Sluijs EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials.[Reprint of *BMJ*. 2007 Oct 6;335(7622):703; PMID: 17884863]. *British Journal of Sports Medicine* 2008 Aug;42(8):653-7.
- (71) Fowweather L, McWhannell N, Henaghan J, Lees A, Stratton G, Batterham AM. Effect of a 9-wk. after-school multiskills club on fundamental movement

skill proficiency in 8- to 9-yr.-old children: an exploratory trial. *Perceptual & Motor Skills* 2008 Jun;106(3):745-54.

- (72) Francis M, Nichols SS, Dalrymple N. The effects of a school-based intervention programme on dietary intakes and physical activity among primary-school children in Trinidad and Tobago. *Public Health Nutrition* 2010 May;13(5):738-47.
- (73) Gutin B, Yin Z, Johnson M, Barbeau P. Preliminary findings of the effect of a 3-year after-school physical activity intervention on fitness and body fat: the Medical College of Georgia Fitkid Project. *International Journal of Pediatric Obesity* 2008;3:Suppl-9.
- (74) Haerens L, De B, I, Maes L, Cardon G, Deforche B. School-based randomized controlled trial of a physical activity intervention among adolescents. *Journal of Adolescent Health* 2007 Mar;40(3):258-65.
- (75) Lubans DR, Morgan PJ, Aguiar EJ, Callister R. Randomized controlled trial of the Physical Activity Leaders (PALs) program for adolescent boys from disadvantaged secondary schools. *Preventive Medicine* 2011 Mar;52(3-4):239-46.
- (76) Peralta LR, Jones RA, Okely AD. Promoting healthy lifestyles among adolescent boys: the Fitness Improvement and Lifestyle Awareness Program RCT. *Preventive Medicine* 2009 Jun;48(6):537-42.
- (77) Simon C, Schweitzer B, Oujaa M, Wagner A, Arveiler D, Tribby E, et al. Successful overweight prevention in adolescents by increasing physical activity: a 4-year randomized controlled intervention.[Erratum appears in *Int J Obes (Lond)*. 2008 Oct;32(10):1606]. *International Journal of Obesity* 2008 Oct;32(10):1489-98.
- (78) Verstraete SJ, Cardon GM, De Clercq DL, De Bourdeaudhuij IM. A comprehensive physical activity promotion programme at elementary school: the effects on physical activity, physical fitness and psychosocial correlates of physical activity. *Public Health Nutrition* 2007 May;10(5):477-84.
- (79) Baker Philip RA, Francis DP, Soares J, Weightman AL, Foster C. Community wide interventions for increasing physical activity. Baker Philip RA, Francis Daniel P, Soares Jesus, Weightman Alison L, Foster Charles Community wide interventions for increasing physical activity *Cochrane Database of Systematic Reviews: Reviews* 2011 Issue 4 John Wiley & Sons, Ltd Chichester, UK DOI: 10.1002/14651957.CD009874.
- (80) Beets MW, Cardinal BJ, Alderman BL. Parental social support and the physical activity-related behaviors of youth: a review. [Review]. *Health Education & Behavior* 2010 Oct;37(5):621-44.
- (81) De MF, van Lenthe FJ, Spittaels H, Lien N, De B, I. Interventions for promoting physical activity among European teenagers: a systematic review. *International Journal of Behavioral Nutrition & Physical Activity* 2009;6:82.

- (82) Golley RK, Hendrie GA, Slater A, Corsini N. Interventions that involve parents to improve children's weight-related nutrition intake and activity patterns - what nutrition and activity targets and behaviour change techniques are associated with intervention effectiveness?. [Review]. *Obesity Reviews* 2011 Feb;12(2):114-30.
- (83) Kitzman-Ulrich H, Wilson DK, St George SM, Lawman H, Segal M, Fairchild A. The integration of a family systems approach for understanding youth obesity, physical activity, and dietary programs. [Review]. *Clinical Child & Family Psychology Review* 2010 Sep;13(3):231-53.
- (84) van Sluijs EM, Kriemler S, McMinn AM. The effect of community and family interventions on young people's physical activity levels: a review of reviews and updated systematic review. *British Journal of Sports Medicine* 2011 Sep;45(11):914-22.
- (85) Chang MW, Nitzke S, Brown R. Design and outcomes of a Mothers In Motion behavioral intervention pilot study. *Journal of Nutrition Education & Behavior* 2010 May;42(3:Suppl):Suppl-21.
- (86) Hagger M, Chatzisarantis NL, Hein V, Soos I, Karsai I, Lintunen T, et al. Teacher, peer and parent autonomy support in physical education and leisure-time physical activity: A trans-contextual model of motivation in four nations. *Psychology & Health* 2009 Jul;24(6):689-711.
- (87) Heimendinger J, Uyeki T, Andhara A, Marshall JA, Scarbro S, Belansky E, et al. Coaching process outcomes of a family visit nutrition and physical activity intervention. *Health Education & Behavior* 2007 Feb;34(1):71-89.
- (88) Hovell MF, Nichols JF, Irvin VL, Schmitz KE, Rock CL, Hofstetter CR, et al. Parent/Child training to increase preteens' calcium, physical activity, and bone density: a controlled trial. *American Journal of Health Promotion* 2009 Nov;24(2):118-28.
- (89) Klohe-Lehman DM, Freeland-Graves J, Clarke KK, Cai G, Voruganti VS, Milani TJ, et al. Low-income, overweight and obese mothers as agents of change to improve food choices, fat habits, and physical activity in their 1-to-3-year-old children. *Journal of the American College of Nutrition* 2007 Jun;26(3):196-208.
- (90) Neumark-Sztainer D, Haines J, Robinson-O'Brien R, Hannan PJ, Robins M, Morris B, et al. 'Ready. Set. ACTION!' A theater-based obesity prevention program for children: a feasibility study. *Health Education Research* 2009 Jun;24(3):407-20.
- (91) Robertson W, Friede T, Blissett J, Rudolf MC, Wallis M, Stewart-Brown S. Pilot of "Families for Health": community-based family intervention for obesity. *Archives of Disease in Childhood* 2008 Nov;93(11):921-6.
- (92) Hughes AR, Stewart L, Chapple J, McColl JH, Donaldson MD, Kelnar CJ, et al. Randomized, controlled trial of a best-practice individualized behavioral program for treatment of childhood overweight: Scottish Childhood Overweight Treatment Trial (SCOTT). *Pediatrics* 2008 Mar;121(3):e539-e546.

- (93) Priest N, Armstrong R, Doyle J, Waters E. Interventions implemented through sporting organisations for increasing participation in sport. Priest Naomi, Armstrong Rebecca, Doyle Jodie, Waters Elizabeth Interventions implemented through sporting organisations for increasing participation in sport Cochrane Database of Systematic Reviews: Reviews 2008 Issue 3 John Wiley & Sons, Ltd Chichester 2008;(3).
- (94) Priest N, Armstrong R, Doyle J, Waters E. Policy interventions implemented through sporting organisations for promoting healthy behaviour change. Priest Naomi, Armstrong Rebecca, Doyle Jodie, Waters Elizabeth Policy interventions implemented through sporting organisations for promoting healthy behaviour change Cochrane Database of Systematic Reviews: Reviews 2008 Issue 3 John Wiley & Sons, Ltd Ch 2008;(3).
- (95) Hamel LM, Robbins LB, Wilbur J. Computer- and web-based interventions to increase preadolescent and adolescent physical activity: a systematic review. [Review]. *Journal of Advanced Nursing* 2011 Feb;67(2):251-68.
- (96) Slootmaker SM, Chinapaw MJM, Seidell JC, van Mechelen W, Schuit AJ. Accelerometers and Internet for physical activity promotion in youth? Feasibility and effectiveness of a minimal intervention [ISRCTN93896459]. *Preventive Medicine* 2010 Jul;51(1):31-6.
- (97) O'Neill JR, Pate RR, Hooker SP. The contribution of dance to daily physical activity among adolescent girls. *International Journal of Behavioral Nutrition & Physical Activity* 2011;8:87.
- (98) Benavides S, Caballero J. Ashtanga yoga for children and adolescents for weight management and psychological well being: an uncontrolled open pilot study. *Complementary Therapies in Clinical Practice* 2009 May;15(2):110-4.
- (99) Berger DL, Silver EJ, Stein RE. Effects of yoga on inner-city children's well-being: a pilot study. *Alternative Therapies in Health & Medicine* 2009 Sep;15(5):36-42.
- (100) Guidetti L, Gallotta MC, Emerenziani GP, Baldari C. Exercise intensities during a ballet lesson in female adolescents with different technical ability. *International Journal of Sports Medicine* 2007 Sep;28(9):736-42.
- (101) Jago R, Davis L, McNeill J, Sebire SJ, Haase A, Powell J, et al. Adolescent girls' and parents' views on recruiting and retaining girls into an after-school dance intervention: implications for extra-curricular physical activity provision. *International Journal of Behavioral Nutrition & Physical Activity* 2011;8:91.
- (102) Steinberg N, Siev-Ner I, Peleg S, Dar G, Masharawi Y, Hershkovitz I. Growth and development of female dancers aged 8-16 years. *American Journal of Human Biology* 2008 May;20(3):299-307.
- (103) Stivaktaki C, Mountakis C, Bournelli P. The Effect of a Cross-Curricular Study Programme in Physical Education on the Attitudes and Perceptions of Greek Children towards Traditional (Folk) Dance in the First Year of Secondary School. *Research in Dance Education* 2010.

- (104) Zavatto L, Gabbei R. The Real Dance Revolution: How to Make Dance Meaningful for All Students. *Strategies: A Journal for Physical and Sport Educators* 2008.
- (105) Boyle-Holmes T, Grost L, Russell L, Laris BA, Robin L, Haller E, et al. Promoting elementary physical education: results of a school-based evaluation study. *Health Education & Behavior* 2010 Jun;37(3):377-89.
- (106) Harten N, Olds T, Dollman J. The effects of gender, motor skills and play area on the free play activities of 8-11 year old school children. *Health & Place* 2008 Sep;14(3):386-93.
- (107) Biddiss E, Irwin J. Active video games to promote physical activity in children and youth: a systematic review. [Review] [71 refs]. *Archives of Pediatrics & Adolescent Medicine* 2010 Jul;164(7):664-72.
- (108) Foley L, Maddison R. Use of active video games to increase physical activity in children: a (virtual) reality?. [Review] [41 refs]. *Pediatric Exercise Science* 2010 Feb;22(1):7-20.
- (109) Chin APM, Jacobs WM, Vaessen EP, Titze S, van MW. The motivation of children to play an active video game. *Journal of Science & Medicine in Sport* 2008 Apr;11(2):163-6.
- (110) Fogel VA, Miltenberger RG, Graves R, Koehler S. The effects of exergaming on physical activity among inactive children in a physical education classroom. *Journal of Applied Behavior Analysis* 2010;43(4):591-600.
- (111) Graves LE, Ridgers ND, Atkinson G, Stratton G. The effect of active video gaming on children's physical activity, behavior preferences and body composition. *Pediatric Exercise Science* 2010 Nov;22(4):535-46.
- (112) Maddison R, Foley L, Mhurchu CN, Jull A, Jiang Y, Prapavessis H, et al. Feasibility, design and conduct of a pragmatic randomized controlled trial to reduce overweight and obesity in children: The electronic games to aid motivation to exercise (eGAME) study. *BMC Public Health* 2009;9:146.
- (113) Maloney AE, Bethea TC, Kelsey KS, Marks JT, Paez S, Rosenberg AM, et al. A pilot of a video game (DDR) to promote physical activity and decrease sedentary screen time. *Obesity* 2008 Sep;16(9):2074-80.
- (114) Paez S, Maloney A, Kelsey K, Wiesen C, Rosenberg A. Parental and environmental factors associated with physical activity among children participating in an active video game. *Pediatric Physical Therapy* 2009;21(3):245-53.
- (115) Rhodes RE, Warburton DE, Bredin SS. Predicting the effect of interactive video bikes on exercise adherence: An efficacy trial. *Psychology Health & Medicine* 2009 Dec;14(6):631-40.
- (116) White K, Schofield G, Kilding AE. Energy expended by boys playing active video games. *Journal of Science & Medicine in Sport* 2011 Mar;14(2):130-4.

- (117) Biddle SJ, O'Connell S, Braithwaite RE. Sedentary behaviour interventions in young people: a meta-analysis. *British Journal of Sports Medicine* 2011 Sep;45(11):937-42.
- (118) Maniccia DM, Davison KK, Marshall SJ, Manganello JA, Dennison BA. A meta-analysis of interventions that target children's screen time for reduction. *Pediatrics* 2011;128(1):e193-e210.
- (119) Anand SS, Davis AD, Ahmed R, Jacobs R, Xie C, Hill A, et al. A family-based intervention to promote healthy lifestyles in an aboriginal community in Canada. *Canadian Journal of Public Health* 2007 Nov;Revue(6):447-52.
- (120) Atlantis E, Salmon J, Bauman A. Acute effects of advertisements on children's choices, preferences, and ratings of liking for physical activities and sedentary behaviours: a randomised controlled pilot study. *Journal of Science & Medicine in Sport* 2008 Nov;11(6):553-7.
- (121) Cardon G, Labarque V, Smits D, De B, I. Promoting physical activity at the pre-school playground: the effects of providing markings and play equipment. *Preventive Medicine* 2009 Apr;48(4):335-40.
- (122) Epstein LH, Roemmich JN, Robinson JL, Paluch RA, Winiewicz DD, Fuerch JH, et al. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Archives of Pediatrics & Adolescent Medicine* 2008 Mar;162(3):239-45.
- (123) Escobar-Chaves SL, Markham CM, Addy RC, Greisinger A, Murray NG, Brehm B. The Fun Families Study: intervention to reduce children's TV viewing. *Obesity* 2010 Feb;18:Suppl-101.
- (124) Neumark-Sztainer DR, Friend SE, Flattum CF, Hannan PJ, Story MT, Bauer KW, et al. New moves-preventing weight-related problems in adolescent girls a group-randomized study. *American Journal of Preventive Medicine* 2010 Nov;39(5):421-32.
- (125) Ni MC, Roberts V, Maddison R, Dorey E, Jiang Y, Jull A, et al. Effect of electronic time monitors on children's television watching: pilot trial of a home-based intervention. *Preventive Medicine* 2009 Nov;49(5):413-7.
- (126) Sacher PM, Kolotourou M, Chadwick PM, Cole TJ, Lawson MS, Lucas A, et al. Randomized controlled trial of the MEND program: a family-based community intervention for childhood obesity. *Obesity* 2010 Feb;18:Suppl-8.
- (127) Shelton D, Le GK, Norton L, Stanton-Cook S, Morgan J, Masterman P. Randomised controlled trial: A parent-based group education programme for overweight children. *Journal of Paediatrics & Child Health* 2007 Dec;43(12):799-805.
- (128) Linebarger DL, Piotrowski JT. Evaluating the educational potential of health PSAs with preschoolers. *Health Communication* 2008 Nov;23(6):516-25.

- (129) Price SM, Huhman M, Potter LD. Influencing the parents of children aged 9-13 years: findings from the VERB campaign. *American Journal of Preventive Medicine* 2008 Jun;34(6:Suppl):Suppl-74.
- (130) Bryant CA, Courtney AH, McDermott RJ, Alfonso ML, Baldwin JA, Nickelson J, et al. Promoting physical activity among youth through community-based prevention marketing. *Journal of School Health* 2010 May;80(5):214-24.
- (131) Bush L, Laberge S, Laforest S. Physical Activity Promotion Among Underserved Adolescents: "Make It Fun, Easy, and Popular". *Health Promotion Practice* 2010 May;11(supp 1):79S-87S.
- (132) Sirriyeh R, Lawton R, Ward J. Physical activity and adolescents: An exploratory randomized controlled trial investigating the influence of affective and instrumental text messages. *British Journal of Health Psychology* 2010 Nov;15(4):825-40.