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Recruitment settings, delivery contexts, intervention techniques and outcomes of health promotion programmes for young adults with intellectual and developmental disabilities: A systematic review

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Abstract

Background: People with intellectual and developmental disabilities (IDD) are at risk of developing long term health conditions, and a preventative health agenda research is emerging. However, little is known about the recruitment settings, delivery contexts, intervention techniques and outcomes of health promotion programmes for this population. Therefore, the aim of this review was to synthesize and evaluate these characteristics.

Method: A systematic review of studies identified from multiple databases on healthy lifestyle interventions for adolescents and young people with IDD was conducted. Data were synthesized and evaluated using a logic model. Quality of rigour was also assessed.

Results: Sixteen geographically diverse studies were selected and evaluated. Participants were most commonly recruited from schools, with interventions typically taking place in a gym setting and involving physical activity training.

Conclusions: This review indicates that physical activity and dietary interventions in people with IDD may lead to lifestyle changes, however more robust evidence is required. Educational settings are conducive, with settings beyond schools requiring further consideration.

What this paper adds

The review provides a comprehensive overview of the study settings, delivery contexts, intervention techniques and outcomes in health research targeting adolescents and young people with IDD. This has implications for how future studies in this area are conducted, as research with a preventative agenda has hitherto recruited primarily from school settings. The recruitment advantages of these settings are highlighted, such as approaching large participant groups and support from educational professionals. However, it is demonstrated that additional settings, such as further education institutions, would potentially provide similar advantages

yet reach wider and more independent samples in terms of capacity to make autonomous lifestyle choices.

Evidence to date has demonstrated the efficacy of physical activity interventions on lifestyle change in people with IDD. However, whilst many of the intervention techniques necessitated specialist equipment and subsequently gym settings, there were also simpler, effective techniques, which improved physical activity outcomes that could be carried out in any setting. Such techniques could be supported by educational professionals, potentially leading to sustained programme adherence and improved health outcomes.

1. Introduction

Globally poor dietary and exercise habits of adolescents and young people in the typically developing are adding to an increased prevalence of long-term health conditions (Fletcher et al., 2018). The World Health Organisation (WHO, 2017) predicts a 13% global mortality rise between 2002 and 2020 in four of the most prominent chronic diseases: type 2 diabetes (T2D), cardiovascular disease (CVD), cancer and chronic obstructive pulmonary disease (WHO, 2019). Physical activity programmes have demonstrated success in reducing the risk of developing long term health conditions and improving quality of life (QoL) in adolescents and young people (Ekelund et al., 2013; Granger et al. 2017; Gopinath et al. 2012; Yates et al. 2016). In addition, preventing the onset of long term conditions may lead to lower healthcare expenditure, such as reduced patient care and treatment costs. For example, costs associated with type 2 diabetes may be reduced by 40-60% (Gillies et al. 2007).

Poor dietary and exercise habits are also a concern for adolescents and young people with intellectual and developmental disabilities (IDD) as they are at significant risk of developing long-term health conditions such as diabetes, obesity and hypertension and are more likely to experience poorer physical health when compared to young people in the

typically developing population (Krahn and Fox 2015; Truesdale and Brown, 2017; Allerton and Emerson, 2011). Further, genetic conditions such as Prader Willi and Down syndrome are likely to cause obesity at a young age, severely increasing the likelihood of T2D in later life (O'Shea et al., 2018), one of the four most prominent global long term health conditions. In addition, lower socio-economic status has been found to increase the risk of poor health by as much as 20-50% in adolescents and young people with IDD (Emerson and Hatton, 2007), further compounded by transport and membership costs, reduced opportunities for recreational exercise, lower health literacy, less access to healthy diets (Melville et al., 2008), and being over prescribed psychotropic medications (Trollor, Salomon, and Franklin, 2016). It is therefore imperative that people with IDD benefit from the same intervention approaches as those afforded to the typically developing population so that they may be supported to reduce the risk of developing long term health conditions and experience increased QoL, in accordance with the Adults with Incapacity Act (2000) and the Disability Equality Act (2010).

Recent literature reviews of the health of young people and adolescents with IDD have highlighted that whilst there are potentially significant benefits from the development of health intervention programmes, there remain methodological issues around recruitment and study design, which are often impacted upon by recruitment and delivery setting (Bertapelli et al. 2016, Jeng et al., 2017). Research has indicated that physical activity outcomes may be influenced by intervention settings, for example residential communities (Chow et al., 2016), schools (Haerens et al., 2008), and the workplace (Iwasaki et al., 2017). A key component of psychosocial interventions for people with IDD is social support, which is instrumental to a sense of self-efficacy (Maine et al., 2017), for example through facilitating recording and reflection of progress as well as positive feedback and reinforcement of key messages. While the type of support may vary depending on setting, it is important to consider which social settings are selected for intervention programmes, as these may act as mediators to the success

of outcomes. This review therefore aimed to build an understanding of which recruitment and delivery settings are being used, and how these relate to intervention delivery contexts and techniques and healthy lifestyle outcomes, such as increased physical activity, reduced sedentary behaviour, and health literacy. Such an understanding may be used to guide the development of future interventions aimed at supporting adolescents and young people with IDD. Therefore, the aim of this review is to identify the intervention settings, techniques, and healthy lifestyle outcomes of health promotion programmes being provided to adolescents and young people with IDD.

2. Methods

2.1. Search strategy

A systematic search was conducted of PsycINFO, PubMed, CINAHL, ERIC, and the British Education Index electronic databases to identify relevant psychosocial and educational studies. Search terms included Intellectual disab* OR learning disab* OR developmental disab* OR mental retardation AND young people or adolescents or teenagers or college students AND health intervention or health promotion or health prevention. Papers were included if the adolescents and young people were between 10 and 24 years, were written in English and were published over a 20-year period between January 1999 and January 2019. Additional age parameters were selected using the WHO (2013) definition of key terms, with adolescents as 10 to 19 years, and young people as 10 to 24 years.

2.2. Study selection and data extraction

As each search engine differed on age parameter settings, it was necessary to make further selections from abstracts and within methodology sections. A second reviewer repeated this procedure to validate the searches and selections. A third reviewer undertook an independent

secondary evaluation of selected texts, and a final selection was made through consensus, as advocated by the Cochrane systematic review toolbox (2019). The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009) were adhered to through this process. Data extraction criteria was agreed by all reviewers through consensus (Table 1). Extraction was carried out by the first reviewer, and verified by the second, and involved spreadsheet entry of means and standard deviations of participant characteristics, study designs, methodology and outcomes, and key recommendations. The PRISMA diagram (Figure 1) outlines the selection process.

Insert figure 1 here

2.3. Inclusion criteria

Results were included where the following criteria were employed:

- Health promotion programmes that targeted adolescents and/or young people with IDD
- Study designs which included randomized controlled trials (RCTs) and feasibility studies
- Adolescents and young people were between 10 and 24 years of age
- English language only

2.4. Exclusion criteria

- Studies focusing on developmental disabilities only
- Studies outside of specified date range
- Full text not available

2.5. Quality of evidence

Quality of evidence was assessed by the first review using the Effective Public Health Practice Project (2008), a tool comprising a series of component ratings which include the representativeness of samples to populations, study design, control of confounding variables, validity and reliability of measures, and study drop-outs. This process was verified by a second reviewer.

2.6. Synthesis of intervention techniques and outcomes

Adopting guidelines of Kneale, Thomas, and Harris (2015), a logic model was constructed to visually explore interlinking components of the studies. Logic models increasingly play a useful role in the reviewing of interventions (Anderson et al., 2011), and in this review the model helped elucidate the complex relationship between the intervention settings, techniques, and outcomes.

Insert Table 1 here

3. Results

Data extracted from the studies are summarised in Table 1.

3.1. Settings and locations

Of the 16 studies identified, four were conducted in the U.S. (Chen et al., 2015; Curtin et al., 2013; Hubbard et al., 2015; Stanish and Temple, 2011), two each in Australia (Lennox et al., 2016; Shields et al., 2013) and Belgium (Boer et al., 2014; Elmahgoub et al., 2009), and one each in New Zealand (Hinkson et al., 2013), Poland (Jankowicz-Szymanska et al., 2012), Spain (Ordonez et al., 2014), The Netherlands (Kiewik et al., 2016), Taiwan (Wu et al., 2017), South

Korea (Lee, Lee, and Song, 2016), the U.K. (Maine, Brown, Dickson, and Truesdale, 2019) and China (Kong et al., 2019).

3.1. Participant characteristics

The overall mean participant age was 17.7 (SD 2.5) years and ranged from 7 (Hinkson et al. 2013) to 39 (Maine et al. 2019) based on available data.

The mean percentage of female participants in studies was 46.7%, and included an all-female sample (Ordonez et al. 2014); removing this would provide a mean of 42.8%. Ethnicity was not reported in the studies, with the exception of Curtin et al. (2013) who reported a 4.8% Hispanic and 95% White sample. Down syndrome was the most commonly reported disability condition, and was the specific focus of four studies (Chen et al., 2015; Curtin et al., 2013; Ordonez et al., 2014; and Shields et al., 2013), and was further highlighted as a predominant condition amongst participants by Hinkson et al., 2013; Jankowicz-Szymanska et al., 2012; Stanish and Temple, 2011; Wu et al., 2017). This may reflect upon the genetic characteristics associated with Down syndrome, such as overweight and obesity, and cardiovascular conditions which can limit opportunity for physical activity (Emerson and Hatton, 2007). A range of other conditions described across studies as secondary included autism, fragile X syndrome, foetal alcohol syndrome (FAS), Prader-Willi syndrome, hydrocephalus, pervasive developmental disorder, Sotos syndrome, Steinert syndrome, and global developmental delay. However, the sizes of these subgroups were not commonly reported. These may have acted as additional barriers to implementing healthy lifestyles. However, as sizes of these subgroups were not commonly reported, it is difficult to assess the extent of their impact.

3.3. Measured outcomes

Measured outcomes (and significant results) are described below in the logic model (Figure 2). The most commonly measured outcome was body composition ($N=8$), which included

standardised measures of BMI, waist circumference, body fat mass, fat-free mass, skeletal muscle mass and body fat percentage (Boer et al., 2014; Elmaghoub et al. 2009; Kong et al., 2019; Ordonez et al., 2014; Stanish and Temple, 2011; Wu et al., 2017).

This was followed by physical fitness ($N=5$), which encompassed the maximal cardiopulmonary exercise test, and six-minute walk test (Boer et al., 2014; Elmaghoub et al. 2009; Hinkson et al., 2013); the sit-and-reach test, dominant hand grip test, and modified curl-ups (Stanish and Temple, 2011; Kong et al., 2018); and one minute sit-ups (Wu et al., 2017; Kong et al., 2016).

Other notable measured outcomes included balance, which was measured in five studies, and utilized measures including static balance and one-legged standing/unipedal stance test (Jankowicz-Szymanska et al., 2012, Wu et al., 2016, Lee et al., 2016; Kong et al., 2016). Strength ($N=4$) involved the sit-to-stand test, repetition maximum, hand grip strength, and muscle fatigue resistance (Elmaghoub et al, 2009, Lee et al., 2016); dominant hand grip test and modified curl-ups (Stanish and Temple, 2011), and one-repetition maximum tests (Shields et al., 2013).

3.4. Context and content

The logic model (Figure 2) and associated table (Table 2) below, aligns recruitment and delivery context to intervention techniques and to statistically significant outcomes, thus providing a visual outline of the relationship between these study characteristics.

Insert Figure 1 and Table 2 here

The majority of the studies recruited participants from educational classroom-based settings ($n = 11$), yet more interventions took place in a gym setting ($N= 8$), than in classrooms ($N =$

- 5). This reflects on the prevalent intervention approach of using physical activity equipment such as stack weights and treadmills, for which a gym setting was necessary.

Classroom-based interventions took an educational approach, with a focus on diet, physical activity, and the benefits of medical check-ups, additionally enhanced by parental input. Decreased weight and increased physical activity levels were achieved as significant outcomes, as well as an increased likelihood of medical checks. The use of the gym led to significant improvements in body composition, physical fitness, muscular strength, cardiovascular levels, and balance.

A sports laboratory (N=1) was another setting used and revealed that aerobic training led to decreased blood pressure, waist circumference and lipids, together with executive function changes. Additionally, a classroom-based intervention in a university room (N=1) was used for dietary and parental education leading to lower body weight and increased physical activity.

3.5. Recommendations

Most studies made recommendations for future research and practice, with some exceptions (Elmahgoub et al. 2009, Shields et al. 2013). Six recommendations related to intervention modifications such as training for peer support (Stanish and Temple, 2011) and consultation with family and supporters (Curtin et al., 2013; Hinkson et al. 2013; Kiewik et al. 2016). Other recommendations were methodological, focusing on improving rigour through increased sample sizes (Chen et al., 2015; Kong et al., 2019) and longitudinal follow ups (Hubbard et al. 2015; Ordonez et al. 2014). Pertinent to this review, Hinkson et al. (2013) recommended that the schools were appropriate settings for these interventions, while Hubbard et al. (2015) advocated for educational settings beyond schools, a view further supported by Maine et al. (2019) who recommended continued delivery in further education institutions.

3.6. Quality evaluation

Study quality is summarized in Table 3. The assessed quality of the studies was not high, with three received ‘Strong’ global ratings (Boer et al., 2014; Chen et al., 2015; Shields et al., 2013). Individual component ratings are provided in separate tables, in the supplementary materials. The EPHPP tool does not heavily penalize on study design. Small sampled feasibility studies may therefore be awarded a similar overall rating to cluster RCTs. As RCT studies were a minority in the present review (n=5, Lee et al., 2016; Lennox et al., 2016; Kiewik et al., 2016; Kong et al., 2019; Shields et al., 2013), the EPHPP was a suitable tool for providing a balanced comparison across studies. The majority of ‘Weak’ component ratings (n=8) were due to study drop-out rates, highlighting a common issue with participation adherence. The second most common ‘Weak’ component ratings were due to ‘Confounders’ where studies had not reported balancing of baseline demographics. This was noted in five of the 16 studies (Curtin et al., 2013; Hinkson et al., 2013; Hubbard et al., 2015; Stanish and Temple 2012; Wu et al., 2017) (Table 4).

Insert Table 3 here

4. Discussion

This is the first systematic review of the recruitment settings, delivery contexts, and intervention techniques and outcomes of health promotion programmes aimed specifically at adolescents and young people with IDD. The included studies mainly recruited participants from schools (mean age 17.7 years). In recruiting a young age group, the studies steered towards a preventative agenda; reducing the risk of unhealthy lifestyle-related diseases later in later life. This approach is advocated in the typically developing population and is a key

initiative of the Medical Research Council (2019). However, despite recruitment from schools, interventions were typically physical activity-based and took place in settings with sports facilities, such as gyms, where equipment facilitated successful outcomes. These were primarily improved muscle strength, cardiovascular fitness, and balance. However, the long-term impact of gym-based interventions aimed at young people with IDD in schools may be limited given that the school leaving age is usually around 18 years of age, thus negating the possibility of sustaining these health benefits and outcomes. It could be further argued that while the gym settings may be the most appropriate in terms of achieving targeted outcomes, positive health outcomes were achieved irrespective of the setting, which is a significant finding warranting further attention.

Other barriers, including lower socio-economic status and transport and membership costs, significantly reduced opportunities for adolescents and young people with IDD accessing sports facilities (Emerson and Hatton, 2007; Emerson and Baines, 2010). Indeed, Coates et al. (2017) described similar issues leading to low levels of continued adherence to interventions. It is therefore arguable that day-to-day settings, such as vocational or educational placements, may carry fewer barriers and increase the likelihood of long-term adherence, yet improving access to gyms and sports centres has to be part of the preventative global health agenda to ensure that adolescents and young people with IDD can avail of the same opportunities as their peers, thereby sustaining and maintaining positive health outcomes.

This finding may also be true of the three studies which took place in research settings (Boer et al., 2014, Chen et al., 2015, and Curtin et al., 2013), which may be removed from everyday activities. Notably, not all of the physical activity techniques required equipment such as stretching and core strength training. Therefore, it may be possible to research the impact of these techniques in a setting outside of a gym.

Classroom-based interventions mainly targeted diet and physical activity enhanced by social support, and statistically significant outcomes in weight loss and increased physical activity were identified. However, recruitment of participants with IDD has been reported as challenging, due to barriers such as care staff attitudes and organisational policies (Bossink et al., 2017; Cartwright et al., 2017). In such a pragmatic sampling approach, researchers would have approached single gatekeepers in the first instance to gain approval to access large groups, rather than individuals. This setting may therefore be advantageous in terms of numbers, and extend the possibility of recruiting larger samples through multi-centre recruitment.

The majority of the health promotion programmes for adolescents and young people in the general population has been conducted in school settings. A meta-analysis (Sobol, Rabinowitz, and Gross, 2013) of 32 RCTs of intervention programmes which reduced obesity in a school setting found that more recent studies were more effective as these were longer and involved parental contribution. In terms of intervention outcomes, 78% (25/32) of programmes increased physical activity; 62.5% (20/32) reduced sedentary behaviour; 81% (26/32) increased a healthy diet; and 78% (25/32) reduced unhealthy diet, which are similar to the present review. However, these outcomes were primarily achieved through educational sessions, rather than physical activity techniques such as strength and aerobic training, which led to successful outcomes in the present review. A subsequent step would be to explore these techniques in an educational setting and ascertain their applicability to adolescents and young people with IDD.

In addition to settings and techniques, study outcome measures are likely to have influenced the choice of setting and intervention technique, and as such may have played a mediator role. For example, whilst physical fitness and strength outcomes utilised a wide range of measures which were often not context dependent and could be thus be carried out in accessible settings, cardiovascular and metabolic fitness outcomes occasionally required the

use of laboratory equipment. This may be regarded as a limitation in this review as it is not fully clear the extent to which outcome measures rather than settings or techniques are responsible for significant results. However, the logic model and table highlights that the most commonly reported outcomes and significant results are likely to be aligned to intervention techniques.

As this review provides evidence of a significant focus on avoiding unhealthy lifestyles in adolescents and young people, an educational setting beyond school could be considered in future research (Hubbard et al., 2015). With the exception of Maine et al. (2019) who explored a further education college setting, all education setting studies were school-based. In Scotland, for example, 6% of adolescents and young people with IDD (aged 16–34 years) were in further education during 2017 (Scottish Commission of Learning Disabilities, 2017), which is a relatively unexplored area in healthy lifestyle intervention research. As the mean age of further education students ranges from 16-26 years (Association of Colleges, 2018), it is evident that studies focussing on preventing chronic diseases in adolescents and young people with IDD have thus far not adequately addressed their specific health needs. These findings provide a rationale for further research to be conducted in further education colleges supporting people with IDD. A UK Department of Education commissioned review (Carroll et al., 2017) highlighted that the majority of evidence for IDD curriculum approach comes from schools, rather than further education colleges, and that there is a dearth of health research in this area, with focus instead directed at pedagogy and challenging behaviour, despite health being a component of the life skills curriculum. It therefore follows that there is a need to identify what healthy lifestyle messages are currently being delivered, and how these could be enhanced through an evidence base. As with the interventions delivered within a school setting highlighted in this review, components which provide education on diet are also of key

importance. These may also be an aspect of current further education life skills curriculum, and further research is required in this setting.

5. Conclusions

Knowledge acquired from two decades of research on healthy lifestyle intervention programmes for adolescents and young people with IDD is limited, due to poor methodological concerns such as small sample sizes and a lack of robust study designs. However, programmes which focused on increased strength and aerobic training, and dietary education demonstrated some improvements and offered potential pointers for successful lifestyle modification in young people with IDD. This review has highlighted that intervention settings have a close relationship with techniques and should therefore be carefully selected. Physical activity training may not require physical activity settings. Educational settings may provide accessibility and social support, and a research gap in the further education college context has been identified. Therefore, further research might consider physical activity training sessions within further education college settings as part of the preventative health strategy required to support intervention techniques and positive health outcomes for adolescents and young people with IDD.

References

- Allerton, L, Welch, V., & Emerson, E. (2011). Health inequalities experienced by children and young people with intellectual disabilities: A review of literature from the United Kingdom. *Journal of Intellectual Disabilities*, 15, 269-278.
<https://doi.org/10.1177/1744629511430772>
- Anderson, L. M., Petticrew, M., Rehfuss, E., Armstrong, R., Ueffing, E., Baker, P., Francis, D., & Tugwell, D. (2011). Using logic models to capture complexity in systematic reviews. *Research Synthesis Methods*, 2, 33–42.
- Association of Colleges (2018). Research and Stats. Retrieved from: <https://www.aoc.co.uk/about-colleges/research-and-stats>
- Bertapelli, F., Pitetti, K., Agiovlasitis, S., & Guerra-Júnior, G. (2016). Overweight and obesity in children and adolescents with Down syndrome—prevalence, determinants, consequences, and interventions: A literature review. *Research in Developmental Disabilities*, 57, 181-192. 10.1016/j.ridd.2016.06.018.
- Boer, P. H., Meeus, M., Terblanche, E., Rombaut, L., De Wandele, I., Hermans, L., & Calders, P. (2014). The influence of sprint interval training on body composition, physical and metabolic fitness in adolescents and young people with intellectual disability: A randomized controlled trial. *Clinical Rehabilitation*, 28, 221–231.
doi:10.1177/0269215513498609
- Bossink, L.W., van der Putten, A.A., & Vlaskamp, C. (2017). Understanding low levels of physical activity in people with intellectual disabilities: A systematic review to identify barriers and facilitators. *Research in Developmental Disabilities*, 68, 95-110.
- Carroll, J., Bradley, L., Crawford, H., Hannant, P., Johnson, H., & Thompson, A. (2017). SEN support: A rapid evidence assessment. UK Government (Home Office).

- Cartwright, L., Reid, M., Hammersley, R., & Walley, R.M., 2017. Barriers to increasing the physical activity of people with intellectual disabilities. *British Journal of Learning Disabilities*, 45, 47-55.
- Chen, C. C., Ringenbach, S. D. R., Crews, D., Kulinna, P. H., & Amazeen, E. L. (2015). The association between a single bout of moderate physical activity and executive function in young people with Down syndrome: A preliminary study. *Journal of Intellectual Disability Research*, 59, 589–598. doi:10.1111/jir.12163
- Chow, B. C., Huang, W., Choi, P., & Pan, C. Y. (2016). Design and methods of a multi-component physical activity program for adults with intellectual disabilities living in group homes. *Journal of exercise science and fitness*, 14(1), 35–40. doi:10.1016/j.jesf.2016.06.002
- Coates, V., Slevin, M., Carey, M., Slater, P., & Davies, M. (2017). Declining structured diabetes education in those with type 2 diabetes: A plethora of individual and organisational reasons. *Patient Education and Counseling*. <http://doi.org/10.1016/j.pec.2017.10.013>
- Curtin, C., Bandini, L. G., Must, A., Gleason, J., Lividini, K., Phillips, S., ... Fleming, R. K. (2013). Parent support improves weight loss in adolescents and young people with down syndrome. *Journal of Pediatrics*, 163, 1402–1408.e1. doi:10.1016/j.jpeds.2013.06.081
- Cochrane Community (2019) Systematic Review Toolbox. Retrieved from: <https://community.cochrane.org/help/tools-and-software/systematic-review-toolbox>
- Effective Public Health Practice Project. (2007). Quality Assessment Tool for Quantitative Studies. Retrieved from: https://merst.ca/wpcontent/uploads/2018/02/quality-assessment-tool_2010.pdf -

- Ekelund, U., Luan, J., Sherar, L. B., Esliger, D. W., Griew, P., Cooper, A., & the International Children's Accelerometry Database Collaborators. (2012). Moderate to vigorous physical activity and sedentary time and cardiometabolic risk factors in children and adolescents. *Journal of the American Medical Association*, 307, 704-712. doi:10.1001/jama.2012.156.
- Elmahgoub, S. M., Lambers, S., Stegen, S., Van Laethem, C., Cambier, D., & Calders, P. (2009). The influence of combined exercise training on indices of obesity, physical fitness and lipid profile in overweight and obese adolescents with mental retardation. *European Journal of Pediatrics*, 168, 1327–1333. doi:10.1007/s00431-009-0930-3
- Emerson, E., & Baines, S., (2010). Health Inequalities & People with Learning Disabilities in the UK: 2010, Learning Disabilities Observatory Retrieved from <https://www.improvinghealthandlives.org.uk>
- Emerson, E., & Hatton, C. (2007). The contribution of socio-economic position to the health inequalities faced by children and adolescents with intellectual disabilities in Britain. *American Journal on Mental Retardation*, 112, 140-50
- Fletcher, E.A., McNaughton, S.A., Crawford, D., Cleland, V., Della Gatta, J., Hatt, J., Dollman, J. & Timperio, A., (2018). Associations between sedentary behaviours and dietary intakes among adolescents. *Public Health Nutrition*, 21, 1115-1122.
- Gillies, C. L., Abrams, K. R., Lambert, P. C., Cooper, N. J., Sutton, A. J., Hsu, R. T., & Khunti, K. (2007). Pharmacological and lifestyle interventions to prevent or delay type 2 diabetes in people with impaired glucose tolerance: systematic review and meta-analysis. *British Medical Journal*, 334(7588), 299. doi:10.1136/bmj.39063.689375.55
- Gopinath, B., Hardy, L., Baur, L. A., Bulutsky, G., & Mitchell, P. (2012). Physical activity and sedentary behaviors and health-related quality of life in adolescents. *Pediatrics*, 130, e167-e174. doi:10.1542/peds.2011-3637.

- Granger, E., Di Nardo, F., Harrison, A., Patterons, L., Holmes, R., & Verma, A. (2017). A systematic review of the relationship of physical activity and health status in adolescents. *European Journal of Public Health*, 27(Suppl. 2), 100-106. doi:10.1093/eurpub/ckw187.
- Haerens, L., Craeynest, M., Deforche, B., Maes, L., Cardon, G., & De Bourdeaudhuij, I. (2008). The contribution of psychosocial and home environmental factors in explaining eating behaviours in adolescents. *European Journal of Clinical Nutrition*, 62(1), 51–59. <http://doi.org/10.1038/sj.ejcn.1602681>
- Hubbard, K. L., Bandini, L. G., Foltz, S. C., Wansink, B., Eliasziw, M., & Must, A. (2015). Impact of a Smarter Lunchroom intervention on food selection and consumption among adolescents and young people with intellectual and developmental disabilities in a residential school setting. *Public Health Nutrition*, 18, 361–371. doi:10.1017/S1368980014000305
- Hinckson, E. A., Dickinson, A., Water, T., Sands, M., & Penman, L. (2013). Research in Developmental Disabilities Physical activity, dietary habits and overall health in overweight and obese children and youth with intellectual disability or autism. *Research in Developmental Disabilities*, 34, 1170–1178. doi:10.1016/j.ridd.2012.12.006
- Iwasaki, Y., Honda, S., Kaneko, S., Kurishima, K., Honda, A., Kakinuma, A., & Jahng, D. (2017). Exercise Self-Efficacy as a Mediator between Goal-Setting and Physical Activity: Developing the Workplace as a Setting for Promoting Physical Activity. *Safety and Health at Work*, 8(1), 94–98. <http://doi.org/10.1016/j.shaw.2016.08.004>
- Jankowicz-szymanska, A., Mikolajczyk, E., & Wojtanowski, W. (2012). Research in Developmental Disabilities The effect of physical training on static balance in young

- people with intellectual disability. *Research in Developmental Disabilities*, 33, 675–681. doi:10.1016/j.ridd.2011.11.015
- Jeng, S. C., Chang, C. W., Liu, W. Y., Hou, Y. J., & Lin, Y. H. (2017). Exercise training on skill-related physical fitness in adolescents with intellectual disability: A systematic review and meta-analysis. *Disability and Health Journal*, 10, 198–206. doi:10.1016/j.dhjo.2016.12.003
- Kiewik, M., Vandernagel, J. E. L., Kemna, L. E. M., Engels, R. C. M. E., & Dejong, C. A. J. (2016). Substance use prevention program for adolescents with intellectual disabilities on special education schools: A cluster randomised control trial. *Journal of Intellectual Disability Research*, 60, 191–200. doi:10.1111/jir.12235
- Kneale, D., Thomas, J., & Harris, K. (2015). Developing and optimising the use of logic models in systematic reviews: Exploring practice and good practice in the use of programme theory in reviews. *PLoS One*, 10, 1–26. <http://doi.org/10.1371/journal.pone.0142187>
- Kong, Z., Sze, T. M., Yu, J. J., Loprinzi, P. D., Xiao, T., Yeung, A. S., ... Zou, L. (2019). Tai chi as an alternative exercise to improve physical fitness for children and adolescents with intellectual disability. *International Journal of Environmental Research and Public Health*, 16, 1–12. doi:10.3390/ijerph16071152
- Krahn, G. L., & Fox, M. H. (2015). Health Disparities of People with Intellectual Disabilities: *Journal of Applied Research in Intellectual Disabilities*, 27, 431–446. doi:10.1111/jar.12067.Health
- Lee, K., Lee, M., & Song, C. (2016). Balance training improves postural balance, gait, and functional strength in adolescents with intellectual disabilities: Single-blinded, randomized clinical trial. *Disability and Health Journal*, 9, 416–422. doi:10.1016/j.dhjo.2016.01.010

- Lennox, N., McPherson, L., Bain, C., O’Callaghan, M., Carrington, S., & Ware, R. S. (2016). A health advocacy intervention for adolescents with intellectual disability: a cluster randomized controlled trial. *Developmental Medicine and Child Neurology*, 58, 1265–1272. doi:10.1111/dmcn.13174
- Maine, A., Dickson, A., Truesdale, M., & Brown, M. (2017). An application of Bandura’s ‘Four Sources of Self-Efficacy’ to the self-management of type 2 diabetes in people with intellectual disability: An inductive and deductive thematic analysis. *Research in Developmental Disabilities*, 70, 75–84. <http://doi.org/10.1016/j.ridd.2017.09.004>
- Maine, A., Brown, M. J., Dickson, A., & Truesdale, M. (2019). Pilot feasibility study of the Walking Away from Diabetes programme for adults with intellectual disabilities in two further education colleges: Process evaluation findings. *Journal of Applied Research in Intellectual Disabilities*, (September), 1034–1046. <http://doi.org/10.1111/jar.12593>
- Medical Research Council (2019) retrieved from <https://mrc.ukri.org/successes/investing-for-impact/priority-challenges/prevention-research/what-is-prevention-research/>
- Melville, C. A., Cooper, S. A., Morrison, J., Smiley, E., Allan, L., Jackson, A., & Mantry, D. (2008). The prevalence and incidence of mental ill-health in people with autism and intellectual disabilities. *Journal of Autism and Developmental Disorders*, 38, 1676–1688. doi:10.1007/s10803-008-0549-7
- Moher, D., Liberati, A., Tetzlaff, J. & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6 (7) 10.1371/journal.pmed.1000097
- Ordonez, F. J., Rosety, M. A., Camacho, A., Rosety, I., Diaz, A. J., Fornieles, G., ... Rosety-Rodriguez, M. (2014). Aerobic training improved low-grade inflammation in obese women with intellectual disability. *Journal of Intellectual Disability Research*, 5, 583–590. doi:10.1111/jir.12056

- O'Shea, M., O'Shea, C., Gibson, L., Leo, J., & Carty, C. (2018). The prevalence of obesity in children and young people with Down syndrome. *Journal of Applied Research in Intellectual Disabilities*, 31, 1225–1229. <http://doi.org/10.1111/jar.12465>
- Scottish Commission of Learning Disabilities (2017). Retrieved from: <https://www.sclld.org.uk/>
- Shields, N., Taylor, N. F., Wee, E., Wollersheim, D., O'Shea, S. D., & Fernhall, B. (2013). A community-based strength training programme increases muscle strength and physical activity in young people with Down syndrome: A randomised controlled trial. *Research in Developmental Disabilities*, 34, 4385–4394. doi:10.1016/j.ridd.2013.09.022
- Sobol, G. S.; Rabinowitz, J.; Gross, R. (2013). School-based obesity prevention programs: A meta-analysis of randomized controlled trials. *Obesity*, 21, 2422–2428.
- Stanish, H., & Temple, V. (2012). Efficacy of peer-guided exercise programme for adolescents with intellectual disability. *Journal of Applied Research in Intellectual Disabilities*, 25, 319-328
- Trollor, J. N., Salomon, C., & Franklin, C. (2016). Prescribing psychotropic drugs to people with an intellectual disability. *Australian Prescriber*, 39, 126–130. doi:10.18773/austprescr.2016.048
- Truesdale, M., & Brown, M. (2017). People with Learning Disabilities in Scotland: 2017 Health Needs Assessment Update Report. NHS Health Scotland
- Yates, T., Edwardson, C. L., Henson, J., Gray, L. J., Ashra, N. B., Troughton, J., ... Davies, M. J. (2016). Walking Away from Type 2 diabetes : a cluster randomized controlled trial. *Diabetic Medicine*, 34, 698-707. <http://doi.org/10.1111/dme.13254>
- World Health Organisation (2013). Definition of key terms. Retrieved from: <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en/>

World Health Organisation (2017), Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020, World Health Organisation, Geneva.

Retrieved from: <https://apps.who.int/iris/handle/10665/94384>

Wu, W. L., Yang, Y. F., Chu, I. H., Hsu, H. T., Tsai, F. H., & Liang, J. M. (2017). Effectiveness of a cross-circuit exercise training program in improving the fitness of overweight or obese adolescents with intellectual disability enrolled in special education schools. *Research in Developmental Disabilities*, 60, 83–95. doi:10.1016/j.ridd.2016.11.005

Conflict of Interest

The authors have no conflict of interest to declare.

Table 1. Study characteristics

Study	Aims/design	Intervention setting and techniques	Participants	Measures	Results	Recommendations	Global EPHPP rating
Elmahgoub et al. (2009) Belgium	Investigating the effects of combined exercise training on physical health, physical fitness and lipid profile in adolescents with ID Powered: No Randomized: Yes Control: Yes	Gym Strength training using stack weights Aerobic training using cycling and steps	Special education school Adolescents with IDD (N = 30) Age 14-22 years Gender not specified Disability: non-specific: 26.7%; Fragile X 26.7%; Autism 46.7% Ethnicity: Not specified	Height, weight, waist circumference Lipid profile Cardiovascular fitness Sit to stand test Hand grip strength Muscle fatigue test	100% attendance Significant improvements across all outcomes (P = 0.05)	None stated	Moderate
Stanish and Temple (2011) U.S.	Evaluation of efficacy of a peer-guided exercise programme	Gym Strength training using stack weights	YMCA (community setting) Young people and people and adolescents	Attendance and exercise engagement: Programme attendance and monitored by fitness instructors	89.5% attendance All quantitative changes statistically unclear or insignificant	Specific programme improvements: Additional time to complete exercises; extended overall programme; use of heart rate monitors	Weak

	<p>for adolescents with intellectual disability</p> <p>Powered: No Randomized: No Control: No</p>	<p>Aerobic training using machines</p> <p>Physio-guided stretching and core strength training</p> <p>Peer support</p>	<p>with ID ($N = 20$)</p> <p>Age: 15 -21 (mean 17.8, SD 1.6) years</p> <p>Females 50%</p> <p>Disability: Down syndrome, Williams syndrome, cerebral palsy and unspecified (group numbers not provided)</p> <p>Ethnicity: Not specified</p>		<p>Qualitative data included themes of health gains, social gains and programmes which fit</p>	<p>to objectively monitor exercise intensity; training for peer support</p>	
<p>Jankowicz-Szymanska et al. (2012)</p> <p>Poland</p>	<p>Exploring the effects of a three-month sensorimotor training programme on static balance in young people with ID</p> <p>Powered: No</p>	<p>Gym</p> <p>Balance training using rehabilitation balls, air pillows, exercises in balance positions</p>	<p>Special education care centre</p> <p>Young people with mild ID ($N = 40$)</p> <p>Age: 16-18 (mean 16.8) years</p>	<p>Height, weight, BMI</p> <p>Static balance</p>	<p>Attendance rates not reported</p> <p>Improvements in experimental group were noted but not significant</p>	<p>Exercise programmes for persons with IDD should be supplemented by sensorimotor exercises</p>	<p>Moderate</p>

	<p>Randomized: Yes Control: Yes</p> <p>Powered: Yes Randomized: Yes Control: Yes</p>		<p>Females: 50%</p> <p>Disability: Down syndrome was the cause of mild retardation (group numbers not provided)</p> <p>Ethnicity: Not specified</p>				
<p>Curtin et al. (2013)</p> <p>U.S.</p>	<p>Assessing impact of parental education in a weight loss intervention for young people with ID.</p>	<p>Home/research centre</p> <p>Diet plan made in consultation with parents</p> <p>Parents instructed on diet implementation</p> <p>Dietician-led nutrition education sessions</p> <p>Therapeutic recreation-led physical activity education sessions</p>	<p>University</p> <p>Young people with Down syndrome ($N = 21$)</p> <p>Age: 16-18 (mean 20.5, SD 3.2) years</p> <p>Females: 81%</p> <p>Disability: Down syndrome: 100%</p> <p>Ethnicity: White: 95% Hispanic: 4.8%</p>	<p>Mean changes in levels of physical activity, weight and percentage of body fat</p> <p>Dietary behaviours (consumption of fruits and vegetables)</p>	<p>Lower body weight in intervention group; $P = .005$</p> <p>Increases in physical activity in intervention ($P = 0.002$)</p> <p>Dietary changes not significant</p>	<p>Monthly individual counselling</p> <p>Focus on aerobic activities to decrease sedentary behaviour</p> <p>Utilization of common goals across stakeholders</p>	<p>Moderate</p>

Shields et al. (2013) Australia	Investigating the effects of a student-led resistance training programme in adolescents and young people with Down syndrome Powered: No Randomized: Yes Control: Yes	Gym Resistance training using weight machines	Community Gym Adolescents and young people with Down syndrome ($N = 68$) Age: mean 17.9, SD 2.6 years Females: 41% Down syndrome: 100% Ethnicity: Not specified	Work performance (Simulated work test) Muscle strength (one-repetition maximum force generation tests) Physical activity levels (Accelerometer) Social activities (Control group)	92% Attendance Significant increase over social group in muscle strength (95% CI 3–11; SMD 0.8) and physical activity (95% CI 5–112; SMD 0.8) in later weeks No difference in work performance	None stated	Strong
Hinkson et al. (2013) “MEND” (Mind, nutrition, Do it) New Zealand	Evaluating effectiveness of a program managing weight through changes in physical activity and nutrition behaviours in overweight and obese NZ children and youth with IDD	School Classroom based physical activity sessions	Special needs schools Children and youth with IDD ($N = 17$) Aged 7+ years Females 41% Disability:	Diet and nutrition questionnaire Parent nutrition questionnaire Ambulatory activity Height, weight, BMI t -tests for all above	Attendance rates not reported All quantitative changes statistically unclear or insignificant Attendance rates not reported	Programme specifically tailored to the needs of young people with IDD Focus on healthy living rather than obesity management Consultation with family and	Weak

	Pre- and post-measures Powered: No Randomized: No		global developmental delay 23.5%; autism 41.2%; Down syndrome 11.8%; intellectual disability: 17.6% Ethnicity: Not specified	Semi-structured interviews	Qualitative data included themes of health gains, social gains and programmes which fit	community important School is most suitable setting Information should be tailored to individuals and delivered by those with IDD specialist training Appropriate required to determine physical activity, nutrition and health behaviours in young people with IDD Future research should consider qualitative and Quantitative data plus cost analysis	
Ordonez et al. (2014) Spain	Assessing the influence of aerobic training on obesity in women with Down syndrome.	Gym Aerobic training using treadmills	Community support groups Women with Down syndrome ($N = 20$)	Body fat % and distribution Anthropometric measures, including plasmatic levels	Attendance rates not reported Significant reductions in plasmatic levels	Robust, longitudinal studies are required	Moderate

	Powered: No Randomized: Yes Control: No		Age: 18-30 Females: 100% Down syndrome: 100% Ethnicity: Not specified				
Chen et al. (2015) U.S.	Investigating the impact of a single exercise intervention on executive function in young people with Down syndrome Powered: No Randomized: Yes Control: Yes	Laboratory (Aerobic training using treadmills)	Recruited from Special Olympics team (took place in sports lab) Young people with Down syndrome ($N = 20$) Age: mean 23 Females 30% Down syndrome: 100% Ethnicity: Not specified	Measures of executive function-related behaviours	95.2% Attendance Non-significant changes in response times Significant improvements in inhibition	Future studies should use larger sample sizes, controlled exercise intensity, physical fitness, testing time after intervention and the time of the test (e.g. optimal time of day for executive processing).	Strong

Boer et al. (2014) Belgium	Evaluating the effect of sprint interval training on metabolic and physical fitness in adolescents and young people with ID Powered: No Randomized: Yes Control: Yes	Special education schools (in physio lab) Aerobic training using treadmills	Special education schools Adolescents and young people with ID (N = 54) Age: mean 17, SD 3.0 Females 40.7% Disability: fragile x syndrome, foetal alcohol syndrome, Prader-Willi syndrome, hydrocephalus, pervasive developmental disorder, Sotos syndrome, Steinert syndrome (numbers not specified) Ethnicity: Not specified	Height, weight, BMI, waist circumference Physical activity (cardiopulmonary using cyclo-ergometer) Blood pressure and lipid profile 6 minute walk test Sit to stand test Muscle fatigue resistance	85% Attendance Significant reductions in intervention group in waist circumference (P < 0.01); blood pressure; insulin levels (P < 0.01); lipids (LDL only - P < 0.01) Significant increases in cardiopulmonary measures (P < 0.01)	Further research with sprint interval and resistance training should be conducted Similar research could be carried out with homogenous groups such as people with DS or Fragile X	Strong
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Hubbard et al. (2015) U.S. “Smarter Lunchroom”	Assessing impact of a school based diet intervention programme Powered: No Randomized: No Control: No	Residential school Social story preparation Environmental changes (layout of canteen food options)	Specialized residential school (private) Students with IDD ($N = 43$) Age: 11-22 (mean 18.3, SD 2.5) Females 51% Disability: Not specified Ethnicity: Not specified	Digital photography of foods: selection and plate waste	100% Attendance Significant increases in healthy foods, including whole grains ($P = 0.005$) and fruits ($P = 0.008$). Significant decreases in fruit ($P = 0.04$) and vegetables ($P = 0.03$).	Future research should assess long-term dietary change adherence and explore programme in other educational settings	Weak
Kiewik et al. (2016) Netherlands “PREPARED ON TIME”	Evaluating efficacy of an e-learning program for students with ID in secondary special-needs schools and examining tobacco and alcohol use for this population Powered: No Randomized: Yes	Classroom based Educational sessions which focus on attitude–social influence–efficacy mode	Special needs schools Students with mild and borderline ID ($N = 254$) Age: 12-15 (mean 13.6) Females 42.4% Disability: Not specified	Baseline questionnaires on lifestyle behaviours	Attendance rates not reported Respondents had initiated smoking (49%) and drinking (75%) beyond expectations “PREPARED ON TIME” did not affect the behavioural determinants	Intervention should include additional training such as refusal and social skills. Frequent repetition of didactic material Parental involvement	Moderate

	Control: Yes		Ethnicity: Not specified				
<p>Lennox et al. (2016)</p> <p>Australia</p> <p>“Ask health diary” and “Comprehensive Health Assessment Program (CHAP)”</p>	<p>Assessing a health intervention package promoting health and detecting disease in adolescents with ID</p> <p>Powered: Yes Randomized: Yes Control: No (randomization of school selection)</p>	<p>Classroom</p> <p>Health promotion diary with education sessions</p>	<p>Special education schools</p> <p>Adolescents with ID ($N = 592$) Age: mean 15.5, SD 1.6</p> <p>Females: 45.4%</p> <p>Disability: Not specified</p> <p>Ethnicity: Not specified</p>	<p>CHAP compared to previous years GP records, with vision and hearing as primary outcomes</p>	<p>38% Attendance</p> <p>Testing more likely in intervention group for vision (odds ratio [OR] 3.3; 95% confidence interval [CI] 1.8–6.1); hearing (OR 2.7; 95% CI 1.0–7.3); blood pressure change (OR 2.4; 95% CI 1.6–3.7); and weight recorded (OR 4.8; 95% CI 3.1–7.6)</p>	<p>Programme should be delivered to adolescents</p> <p>Long term health risk reduction should be studied</p>	Weak
<p>Wu et al. (2017)</p> <p>Taiwan</p>	<p>Assessing effects of a cross-circuit training intervention program for obese or overweight students with ID</p> <p>Powered: No</p>	<p>Gym</p> <p>Cross-circuit training</p> <p>Treadmill, step machine, cross trainer, and stationary bicycle</p>	<p>Special education school</p> <p>Adolescents with ID ($N = 43$)</p> <p>Age: 13-19 (mean 16.9, SD 1.35)</p>	<p>Height, weight, heart rate, body composition, dynamic balance</p> <p>1-min sit-ups, anaerobic test</p> <p>Cardiorespiratory fitness</p>	<p>Attendance rates not reported</p> <p>Significant differences in weight, BMI, body fat mass, and body fat percentage between normal weight group</p>	<p>Weight training interventions aimed at muscle strength improvement should be provided to adolescents with ID</p> <p>Future studies should include eyes-closed balance training, together</p>	Weak

	Randomized: No Control: Yes		Females 42% Disability: reported as secondary conditions to ID - Down syndrome: 16.3%, vocal dysfunction: 9.3%, autism: 6.9%, mental disorder: 2.3% Ethnicity: Not specified		other groups ($p < 0.05$).	with vestibular and proprioception stimulation to improve the balance performance of people with ID	
Lee et al. (2016) South Korea	Exploring the effects of balance training on postural balance, gait, and functional strength in adolescents with intellectual disabilities Powered: No Randomized: Yes Control: Yes	Not specified Balance training using balls, balloons and foam on balance mats	Special education school Adolescents with ID ($N = 32$) Age: 14-19 (mean 16.9, SD 1.70) Females 43.8% Disability: Not specified	Balance (postural sway and one leg test) Gait Sit-to-stand test	93.8% Attendance Significant improvements in postural balance and functional strength in intervention group ($p < 0.05$)	Longitudinal follow-ups.	Moderate

			Ethnicity: Not specified				
<p>Maine et al. (2019)</p> <p>U.K.</p>	<p>Assessing feasibility of delivering a T2D prevention programme in FE colleges using process evaluation.</p> <p>Powered: No Randomized: No Control: No</p>	<p>Two FE colleges</p> <p>Educational sessions promoting increased ambulatory activity</p>	<p>FE colleges</p> <p>Young people with ID ($N = 48$)</p> <p>Age: Range 18–39 years, Mean 20.9 (SD 5.02)</p> <p>Females: 37.5%</p> <p>Disability: Not specified</p> <p>Ethnicity: Not specified</p>	<p>Focus group feedback (students and educators)</p> <p>Attendance rates</p> <p>Baseline ambulatory and anthropometric measures</p> <p>International physical activity questionnaire</p>	<p>96% participation rate.</p> <p>Educational sessions positively received, and some short-term impact was described</p> <p>62.5% of participants were obese or overweight</p> <p>High levels of physical inactivity</p>	<p>Adapted version of programme to be trialled with FE college educators before wider trial</p>	<p>Moderate</p>
<p>Kong et al. (2019)</p> <p>China</p>	<p>Investigating effects of Tai Chi on physical fitness among children and adolescents with ID.</p> <p>Powered: No Randomized: No Control: Yes</p>	<p>Indoor sports hall</p> <p>Tai chi exercises modified for population</p> <p>One Tai chi (TC) group, one aerobic exercise (AE) and one control</p>	<p>Two local special schools and one integrated school</p> <p>Young people with ID ($N = 66$)</p> <p>Age: Mean 14.9 SD 2.1</p> <p>Females</p>	<p>Heart rate monitoring</p> <p>Pedometer step-count</p> <p>Anthropometric measures (height, weight, skinfold, waist and hips)</p> <p>Flexibility, balance, coordination,</p>	<p>60% Attendance</p> <p>AE group: Significant changes in body mass index ($p = 0.006$, $d = 0.11$); sit-ups ($p = 0.030$ and $d = 0.57$); 6-min walk test ($p = 0.005$, $d = 0.89$);</p>	<p>Further rigorous studies, larger sample sizes to validate findings.</p>	<p>Strong</p>

			<p>4%</p> <p>Disability: Not specified</p> <p>Ethnicity: Not specified</p>	<p>grip strength, leg power, muscular endurance, and cardiorespiratory fitness</p>	<p>Vertical jump ($p = 0.048$, $d = 0.41$); Lower-limb coordination ($p = 0.008$, $d = 0.53$), and upper-limb coordination ($p = 0.048$, $d = 0.36$)</p> <p>TC group: significantly greater improvements on balance compared to the control group ($p = 0.011$)</p>		
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Table 2. Study number matrix

Study number	Authors
1	Elmahgoub et al. (2009)
2	Stanish and Temple (2011)
3	Jankowicz-Szymanska et al. (2012)
4	Curtin et al. (2013)
5	Shields et al. (2013)
6	Hinkson et al. (2013)
7	Ordonez et al. (2014)
8	Chen et al. (2015)
9	Boer et al. (2014)
10	Hubbard et al. (2015)
11	Kiewik et al. (2016)
12	Lennox et al. (2016)
13	Wu et al. (2017)
14	Lee et al. (2016)
15	Maine et al. (2019)
16	Kong et al. (2019)

Table 3. EPHPP global ratings

Study	Representativeness	Design	Confounders	Data Collection method	Drop-outs	Global rating
Elmahgoub et al. (2009)	Moderate	Moderate	Strong	Strong	Weak	Moderate
Stanish and Temple (2012)	Moderate	Moderate	Weak	Strong	Weak	Weak
Jankowicz-Szymanska et al. (2011)	Moderate	Moderate	Strong	Strong	Weak	Moderate
Curtin et al. (2013)	Moderate	Moderate	Weak	Strong	Strong	Moderate
Shields et al. (2013)	Moderate	Strong	Strong	Strong	Strong	Strong
Hinkson et al. (2013)	Moderate	Moderate	Weak	Strong	Weak	Weak
Ordonez et al. (2014)	Moderate	Strong	Strong	Strong	Weak	Moderate
Chen et al. (2015)	Moderate	Strong	Strong	Moderate	Moderate	Strong
Boer et al. (2014)	Moderate	Moderate	Moderate	Strong	Strong	Strong
Hubbard et al. (2015)	Weak	Moderate	Weak	Moderate	Strong	Weak
Kiewik et al. (2016)	Moderate	Strong	Strong	Weak	Strong	Moderate
Lennox et al. (2016)	Weak	Strong	Strong	Strong	Weak	Weak
Wu et al. (2017)	Moderate	Moderate	Weak	Strong	Weak	Weak
Lee et al. (2016)	Moderate	Strong	Strong	Strong	Weak	Moderate
Maine et al. (2019)	Moderate	Moderate	Weak	Strong	Strong	Moderate
Kong et al. (2019)	Moderate	Strong	Strong	Strong	Mod.	Strong