
Exercise programs for children with cerebral palsy: a systematic review of the literature

Verschuren O, Ketelaar M, Takken T, Helders P J, Gorter J W

CRD summary

This review assessed the effectiveness of exercise programs for children with cerebral palsy, concluding that programs focusing on lower-extremity muscle strength, cardiovascular fitness or some combination may be of benefit. Given that much of the evidence was non-randomised and of low quality, the authors' conclusions were appropriately cautious and appeared likely to be reliable.

Authors' objectives

To assess the effectiveness of exercise programs for children with cerebral palsy.

Searching

MEDLINE, PubMed, EMBASE, CINAHL, SPORTDiscus, Cochrane Central Register of Controlled Trials and PEDro were searched from inception to September 2006. There was a discrepancy in search dates between the abstract and search strategy section of the paper. Search terms were reported. The reference lists of included papers were searched manually for additional articles. Excluded were doctoral dissertations, reports in books and conference proceedings.

Study selection

Randomised controlled trials (RCTs) and observational studies assessing exercise programs in children and adolescents with cerebral palsy focusing on cardiovascular fitness using aerobic training, anaerobic training, lower-extremity muscle strength and mixed training were eligible for inclusion. Included studies assessed lower-extremity strength training, aerobic training and mixed training. Strength training studies were in children with cerebral palsy varying in age from six to 20 years; exercise interventions varied in duration from six weeks to nine months. Aerobic training studies were in children aged seven to 20 years (one 25 year-old was included); exercise interventions varied in duration from six weeks to 16 months. Mixed-training studies were in children aged four to 20 years; exercise interventions varied in duration from four weeks to six months. Outcomes measuring a change in body function and structure, activity or participation were eligible and were categorised using the International Classification of Function, Disability and Health (ICF) framework. Outcomes reported in the included studies comprised: muscle strength; spasticity and muscle tone; fat mass; fitness measures; range of motion/flexibility; and self-perception plus other measures used to measure activity and participation.

A single author screened abstracts and titles for selection.

Assessment of study quality

The methodological quality of each study was assessed using the PEDro Scale. Study quality was assessed on the basis of: eligibility criteria, random allocation, concealed allocation, baseline comparability, patient blinding, therapist blinding, assessor blinding, at least 85 per cent follow-up, use of intention-to-treat analysis, between-group statistical analysis, point measures and measures of variability. A score from 0 (lowest) to 10 (highest) was obtained using criteria 2 to 11. The authors also used the American Academy for Cerebral Palsy and Developmental Medicine (AAPDM) system to grade study designs according to level of evidence (levels I to V)

Three reviewers conducted the validity assessment with disagreements resolved by consensus.

Data extraction

Three reviewers conducted the data extraction using a standard form with disagreements resolved by consensus. Attempts were made to contact authors for missing data.

Methods of synthesis

Meta-analysis was not undertaken because most of the included studies were observational. A narrative synthesis was undertaken. Studies were grouped by type of exercise programme.

Results of the review

Twenty studies were included in the review (n=336), five of which were RCTs. Study sizes ranged from three to 46 participants. The PEDro score ranged between 0 and 8 (median 3).

Lower-extremity strength training (11 studies)

Two RCTs noted small improvements in performance on tests of muscle strength. One RCT noted a significant change in perception of body image and a more upright posture. Another RCT found no significant differences. Significant improvements in tests of muscle strength were observed in five studies following strength training programmes of six to eight weeks duration. Three studies commented that the gained benefits on muscle strength, gross motor function, scholastic competence and social acceptance, and muscle tone were maintained.

Aerobic training (five studies)

Three studies reported statistically significant improvements of aerobic capacity and two studies (one RCT) found that a significant reduction in aerobic capacity was associated with inactivity during the summer vacation.

Mixed training (four studies)

A significant increase in muscle strength was noted in two studies. A significant increase in vital capacity was found in one study and a significant increase for self-perception of physical appearance observed in another. One study reported a significant increase in stride length. Another found a significant change in walking speed. One study reported that significant changes in muscle strength were maintained 10 weeks following program completion.

Authors' conclusions

Improved exercise programs focusing on lower-extremity muscle strength and cardiovascular fitness, or some combination, may be of benefit to children with cerebral palsy.

CRD commentary

The review question was supported by clear inclusion and exclusion criteria. Several sources were searched to locate relevant studies for inclusion in the review. It was unclear whether the search strategy was restricted by language and the authors did not appear to have searched for unpublished studies, thus there may have been some risk of publication and language biases. Steps were taken to reduce the risk of reviewer error and bias in the study selection and data extraction. An appropriate validity assessment was undertaken. An assessment of the methodological quality of the included studies was undertaken, the results of which were tabulated along with the extracted data. A narrative synthesis appeared appropriate given the high number of non-RCTs included in the review. The authors' conclusions are generally reflective of the evidence included in the review. However, much of the evidence was either non-randomised or low quality, or both; some of the higher-quality evidence was inconclusive or negative. The authors' conclusions were cautious (appropriately so in light of the evidence) and appeared likely to be reliable.

Implications of the review for practice and research

Practice: The authors did not state implications for practice.

Research: The authors stated that further research was required to assess the appropriateness of exercise training where all three components were combined to improve the activity and participation level of children with cerebral palsy.

Funding

Dr. W. M. Phelps Foundation.

Bibliographic details

Verschuren O, Ketelaar M, Takken T, Helders P J, Gorter J W. Exercise programs for children with cerebral palsy: a systematic review of the literature. *American Journal of Physical Medicine and Rehabilitation* 2008; 87(5): 404-417

PubMedID

17993987

DOI

10.1097/PHM.0b013e31815b2675

Indexing Status

Subject indexing assigned by NLM

MeSH

Activities of Daily Living; Adolescent; Cerebral Palsy /rehabilitation; Child; Child, Preschool; Exercise Therapy /methods; Humans; Lower Extremity /physiology; Muscle Strength; Physical Education and Training /methods; Physical Fitness; Severity of Illness Index

AccessionNumber

12008103807

Date bibliographic record published

03/11/2008

Date abstract record published

24/06/2009

Record Status

This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.