Effectiveness of static weight-bearing exercises in children with cerebral palsy

Pin T W

CRD summary
This review concluded that there was limited evidence in this area, but there were some positive effects of weight-bearing exercise in children with cerebral palsy. Methodological weaknesses in the review process, combined with small sample sizes, mean that these conclusions should be treated with caution.

Authors' objectives
To assess the effectiveness of static weight-bearing exercises for children with cerebral palsy.

Searching
MEDLINE, CINAHL, PsycINFO, EMBASE, the Cochrane Library and PEDro were searched from inception to October 2006; the search terms were reported. The reference lists of relevant studies and review articles were screened. Only studies published in English in peer-reviewed journals were eligible for inclusion.

Study selection
Study designs of evaluations included in the review
Inclusion criteria were not specified in terms of the study design. It appears that studies of any design were eligible for inclusion in the review.

Specific interventions included in the review
Studies of static weight-bearing exercise, for upper or lower extremities, compared with no exercise were eligible for inclusion. Studies comparing static weight-bearing exercises with serial casting, medication or surgery were excluded. Where reported, the interventions in the included studies ranged from 4 weeks to 9 months in duration.

Participants included in the review
Studies of children (younger than 18 years) with a diagnosis of cerebral palsy, regardless of type, severity or ambulatory status, were eligible for inclusion. The children in the included studies had hemiplegic, diplegic or quadriplegic cerebral palsy and were aged from 17 months to 14 years.

Outcomes assessed in the review
The author did not report any specific inclusion criteria relating to the outcomes. Studies reporting the following outcomes were included in the review: bone mineral density; prevention or reduction of hip dysplasia; passive joint range of movement; spasticity; bowel and urinary functions; self-esteem; communication; hand function; feeding. The included studies generally reported functional limitations, activity or impairment-related outcomes.

How were decisions on the relevance of primary studies made?
One reviewer selected studies for inclusion in the review.

Assessment of study quality
The PEDro scale was used to assess validity, based on the following criteria: reporting of eligibility; randomisation; allocation concealment; baseline comparability of the groups; blinding of the participants, therapists and assessors; more than 85% follow-up for at least one key outcome; intention-to-treat analysis; between-group statistical analysis of at least one key outcome; point estimate of at least one key outcome. A score out of 10 was allocated. Each study was also assigned a level of evidence according to evidence table of the American Academy of Cerebral Palsy and Developmental Medicine. Only one reviewer performed the validity assessment.

Data extraction
The author did not state how many reviewers performed the data extraction. Effect sizes with 95% confidence intervals were calculated, based on the difference between means in the treatment and control groups. If there was no separate control group, the effect size was based on the difference between pre- and post-treatment means.
Methods of synthesis
How were the studies combined?
Study findings were tabulated and summarised in a narrative, grouped as upper extremity and lower extremity studies.

How were differences between studies investigated?
Some differences between the included studies were discussed in the text.

Results of the review
Ten studies (n=122) were included: 5 parallel-group randomised controlled trials (RCTs), 2 crossover RCTs, 2 single-case studies and a single-group before-and-after study.

The median score for validity was 5 (interquartile range: 3 to 6), with 4 studies scoring 6 or more out of 10. Most of the studies did not have concealed allocation or blinding.

Upper extremity (5 studies).
Two case studies reported an increase in hand contact area after weight-bearing exercise, but this was not sustained. A single-group before-and-after study found no overall effect. Three studies showed positive outcomes in hand function after weight-bearing exercise (or negative outcomes after stopping weight-bearing exercise). The studies with positive outcomes were of poor validity or a low level of evidence.

Lower extremity (5 studies).
Two RCTs reported significant increases in bone mineral density after weight-bearing exercise. A third RCT reported positive findings but did not analyse the results statistically. One of 2 studies measuring muscle spasticity after weight-bearing exercise reported a significant improvement.

Authors’ conclusions
The evidence to support the effectiveness of static weight-bearing exercises in children with cerebral palsy remains limited, with the exception of increased bone density and a temporary reduction in spasticity. Limitations were due to an inadequate number of studies carried out, lack of rigour in the research designs and small numbers of participants.

CRD commentary
This review addressed a clear question using well-defined inclusion criteria, although the criteria for study design were unrestricted and this led to the inclusion of 2 single-case studies within the 10 included studies. Only English language studies published in peer-reviewed journals were eligible for inclusion, thus some relevant studies could have been missed. In addition, only one reviewer was involved in selecting studies for inclusion and assessing validity, and it was unclear how many reviewers were involved in the data extraction process; this could have led to bias or error being introduced at any of these stages. Validity was assessed using accepted criteria for RCTs, although not for studies of other designs, and the findings reported. The analysis did not differentiate clearly between studies of rigorous and less rigorous design, and it was difficult to make comparisons between findings in the tables and the text as reference numbers were different. All of the included studies were very small, therefore the author’s first two conclusions are too strong and should be treated with caution.

Implications of the review for practice and research
Practice: The author stated that it is clinically worthwhile to use standing frames for children with cerebral palsy, particularly those children with poor mobility.

Research: The author stated that larger studies of more rigorous methodology are needed to assess the effects of static weight-bearing exercise in the upper and lower extremities, especially in terms of functional limits, activity and participation level. Studies to investigate the optimal forms, duration and frequency of static weight-bearing exercise are also required.
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Other publications of related interest
PEDro. The Physiotherapy Evidence Database (PEDro) frequently asked questions: how are trials rated? [Accessed 30 Dec 2006.]

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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.