The effectiveness of passive stretching in children with cerebral palsy

Pin T, Dyke P, Chan M

CRD summary
The authors concluded that there was limited evidence that manual stretching can increase range of motion, reduce spasticity and improve walking in children with cerebral palsy, and further research is required. Evidence for some outcomes was very limited and a more cautious conclusion might have been more appropriate.

Authors' objectives
To evaluate the effectiveness of passive stretching in children with spastic cerebral palsy (CP).

Searching
MEDLINE, CINAHL, PsycINFO, EMBASE, the Cochrane Library and PEDro were searched from inception to April 2006; the search terms were reported. In addition, the reference lists from relevant studies and reviews were screened.

Study selection
Study designs of evaluations included in the review
Studies reporting expert opinion were excluded. There were no other restrictions on study design other than that they should be published in full in peer-reviewed journals.

Specific interventions included in the review
Studies that evaluated passive stretching were eligible for inclusion. Studies that compared passive stretching with medication, surgery or serial casting were excluded. The included studies evaluated sustained stretching in which the joint is held by mechanical means (generally for 30 minutes at a time) and manual stretching with the joint held generally for up to 60 seconds (up to 20 minutes in 1 study); some studies used both types of stretching.

Participants included in the review
Studies in children (aged younger than 18 years) with spasticity due to CP were eligible for inclusion in the review. The participants in the included studies were aged from 3 to 20 years.

Outcomes assessed in the review
Studies that assessed effectiveness were eligible for inclusion. The review assessed changes in range of motion, spasticity and gait. The included studies assessed changes at the level of impairment, at various locations including hips, knees, ankles, forefeet, triceps surae and tibialis anterior (the measures used in individual studies were reported).

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

Assessment of study quality
Two reviewers independently assessed study validity using the following criteria of the PEDro scale: eligibility criteria specified; random allocation; concealment of allocation; baseline similarity of treatment groups with respect to prognosis; blinding of the patients, therapists and assessors; follow-up greater than 85% for at least one key outcome; intention-to-treat (ITT) analysis; between-group statistical analysis for at least one outcome; and point estimate and variability for at least one key outcome. The maximum possible score was 10 points. The authors did not state how the validity assessment was performed.

In addition, two reviewers independently graded studies using the AACPDM hierarchy of study design described by Butler 1999 (see Other Publications of Related Interest for details of updated version of this manual). Any disagreements between reviewers were resolved by discussion.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Where possible, effect sizes with 95% confidence intervals (CIs) were calculated. For studies with a control group, the 95% CI of the effect size was calculated using the average standard deviation and number of participants in each group.

Methods of synthesis
How were the studies combined?
The studies were grouped by outcome and a narrative synthesis undertaken.

How were differences between studies investigated?
Differences between the studies were noted with respect to study design and type of stretching evaluated.

Results of the review
Seven studies (n=109) were included: 3 randomised controlled trials (RCTs, n=55), 1 crossover RCT (n=13), 1 before-and-after study (n=30) and 2 multiple single-subject studies (n=11).

In terms of study quality, the PEDro scores ranged from 4 to 8 and 4 studies were graded as level I RCTs. None of the studies reported concealed allocation, 2 studies reported blinded outcome assessment in all or 50% of the patients, all studies reported ITT analysis, and the 4 RCTs reported point estimates of variability for one or more outcomes.

Range of motion (5 studies).
Two studies of manual stretching (one level I and one level III) reported an increase in range of motion after stretching. One level II study of manual stretching reported a loss of range of motion after passive stretching ceased in one of four treatment periods. Two studies (one level I study using apparatus and one level V study of manual stretching) reported no difference in range of motion associated with passive stretching.

Spasticity (4 studies).
All 4 studies that measured this outcome (three level I and one level II) reported a reduction in spasticity post-treatment (three used apparatus and one evaluated manual stretching).

Gait (1 study).
This level I study evaluated gait after standing stretches on a tilt table and reported no significant change in gait patterns associated with passive stretching.

Manual and sustained stretching (3 studies).
Two of the 3 level I studies that evaluated sustained stretching reported a significant decrease in spasticity associated with passive stretching; the third study concluded there was no clinically significant treatment effect.

Authors' conclusions
There was limited evidence that manual stretching can increase range of motion, reduce spasticity and improve walking efficiency in children with CP. However, further research is required.

CRD commentary
The review addressed a clear question that was defined in terms of the participants and intervention; inclusion criteria
for the outcomes and study design were broad. Several relevant sources were searched but no attempts to minimise publication or language bias were reported. Study validity was assessed and the results were reported. Methods were used to minimise reviewer errors and bias in the grading of studies, but methods used to select studies, extract data and assess study quality using defined criteria were either not reported or were undertaken by a single reviewer; the authors acknowledged this limitation.

Adequate information about the included studies was provided. Given the diversity amongst the studies, a narrative synthesis that took account of the level of evidence was appropriate. However, several studies assessed multiple outcomes, which raises the potential for significant results arising by chance. In view of the potential for bias in the review methods and the limited evidence from a small number of patients in a small number of studies, a more cautious conclusion might have been appropriate, particularly in relation to waking where a non significant difference was found in only 1 study.

**Implications of the review for practice and research**

Practice: The authors suggested that passive stretching should perhaps only be used as an adjunct to other treatment techniques. Research: The authors stated the need for higher quality, well-controlled studies to evaluate the effects of passive stretching (including sustained stretching) on function/activity and participation in children with CP, and to determine the optimal duration and frequency of passive stretching.

**Funding**

Community Development Services in the Cerebral Palsy Association of Western Australia.

**Bibliographic details**


**PubMedID**

16978468

**DOI**

10.1017/S0012162206001836

**Other publications of related interest**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Cerebral Palsy /complications /physiopathology /rehabilitation; Child; Child, Preschool; Humans; Muscle Spasticity /etiology /rehabilitation; Physical Therapy Modalities; Range of Motion, Articular /physiology

**AccessionNumber**

12006007500

**Date bibliographic record published**

30/11/2007

**Date abstract record published**
30/11/2007

**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.