Bound for success: a systematic review of constraint-induced movement therapy in children with cerebral palsy supports improved arm and hand use

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CRD summary
This review found that more rigorous studies demonstrated an increased frequency of use of the upper extremity following constraint-induced movement therapy for children with hemiplegic cerebral palsy. Given uncertainties around the review methodologies, potential that relevant studies were missed and paucity and variability in the evidence presented, the authors conclusions are unlikely to be reliable.

Authors' objectives
To investigate the effectiveness of constraint-induced movement therapy (CIMT) in children with cerebral palsy.

Searching
MEDLINE, EMBASE, CINAHL, PsycINFO and Web of Science were searched from inception to March 2009 for studies published in English. Search terms were reported. Reference lists were searched for additional studies.

Study selection
Studies of children (younger than 18 years) with hemiplegic cerebral palsy that used CIMT or forced-use and reported outcome measures related to use of CIMT or forced-use therapy were eligible for inclusion. Included studies were of children aged between one month and 18 years old who used a cast, sling, splint, mitt or were held by an adult as the type of constraint. Duration of constraint varied between one hour per week to 24 hours per day. Frequency and duration of sessions varied between studies. Most interventions involved occupational therapy alone or with other therapies. Other therapies in the included studies were physiotherapy, functional and/or play activities and recreational activities. A variety of outcome measures were reported and were grouped by the authors into two outcome types: body function and structure (included grasp strength and Modified Ashworth Scale) and Activity (included Jebsen-Taylor Test of Hand Function and Caregiver Functional Use Survey).

The authors did not state how many reviewers selected studies.

Assessment of study quality
Methodological quality was assessed by two reviewers and disagreements resolved through discussion. Randomised controlled trials and nonequivalent pretest post-test designs were assessed with published criteria that scored studies in terms of randomisation, blinding, drop-outs and intention-to-treat (ITT) analysis, measurement instruments, cointerventions, comparability of groups and control for dose to a maximum possible score of 16. One-group pretest post-test designs were evaluated with the same criteria except dropouts and ITT and comparability at baseline to give a quality score out of 11. The kappa statistic was used to measure agreement between reviewers. Single-subject research designs and case studies were not assessed for quality.

Data extraction
Means and standard deviations (SDs) were extracted (where possible) and effect size (ES) was calculated using Cohen's d statistic (d<0.2 was defined as no effect, 0.2≤d<0.5 as a small effect, 0.5≤d<0.8 as a medium effect and d≥0.8 as a large effect). Where number or percentage improved in each group was available, treatment effects were calculated (control event rate, experimental event rate, number needed to treat, absolute benefit increase and relative benefit increase).

The authors did not state how many reviewers performed data extraction.

Methods of synthesis
The studies were combined in a narrative synthesis.
Results of the review
Twenty-one studies were included in the review (n 168, range one to 41): five RCTs (n=114); two pretest post-test design with control group (n=16); three one-group pretest post-test designs (n=27); three single-subject studies (n=11); and eight case report designs (n=11).

The RCTs and pretest post-test study designs had validity scores between 7 and 11 out of 16. The two one group designs that were assessed had scores of 5 and 7 out of 11. Study duration ranged from one week to 18 months.

Four studies allowed computation of effect size and one additional study provided effect size (eta values) within the paper. One of these studies reported five outcome measures at the body functions and structure level of which one (Modified Ashworth Scale – shoulder) was statistically significant (p<0.05). These five studies reported a total of 14 different activity level outcomes of which five were statistically significant (p<0.05): Caregiver Functional Use Survey – How frequently (one study); Assisting Hand Assessment (one study); Emerging Behaviour Scale (one study); Pediatric Motor Activity Log – Amount of use (one study); and WeeFIM Self-Care (one study). All significant effect size values were medium to large (d=0.6 to 1.16).

The other 16 studies reported positive outcomes in fine motor and functional activities post treatment and up to 12 months follow-up.

Authors' conclusions
Evidence from more rigorous studies demonstrated an increased frequency of use of the upper extremity following CIMT for children with hemiplegic cerebral palsy. The critical threshold for intensity that constituted an adequate dose could not be determined from the available research.

CRD commentary
The research question was supported by inclusion criteria for participants, intervention and outcomes. Several relevant databases were searched, but only for studies published in English and no efforts were made to identify unpublished studies; therefore, publication and language biases could not be ruled out. Study quality was assessed in duplicate, which reduced risks of reviewer error and bias; it was not reported whether similar steps were taken for study selection and data extraction. Study quality was assessed using appropriate criteria and the assessment was taken into account in the analysis. Narrative synthesis appeared appropriate given the clinical differences between studies. The authors provided a reasonable level of information about included studies within tables and in the text. However, at times the reporting within the text was difficult to follow or link up with tabular information. Primary study sizes were small and the conclusions were based on a small number of good-quality studies. Given the uncertainties around the review methodologies used, potential that relevant studies were missed and paucity and variability in the evidence presented, the authors conclusions are unlikely to be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that good-quality research with a priori power calculations to examine the different features of CIMT (including effectiveness of the restraint and frequency and duration of the intervention sessions) was needed. Measures at the participation level of International Classification of Functioning, Disability and Health (ICF) should be included and elucidation of the relationships among ICF levels was required. Outcome measures should incorporate outcome measures of the effects on the developing brain to guide best physical therapist practice.

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Bibliographic details
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.