CRD summary
The authors concluded that there was fairly strong evidence that modified constraint-induced movement therapy could reduce disability after stroke and improve upper extremity function and spontaneity during movement time, but evidence on kinematic variables was limited. This was a largely well-conducted review, but the conclusions may overstate the case given the quality and quantity of evidence presented.

Authors' objectives
To compare the effectiveness of modified constraint-induced movement therapy versus traditional rehabilitation for treating upper extremity dysfunction after stroke.

Searching
PubMed, EMBASE, The Cochrane Library, Chinese Journals Full-text Database, Chinese Biomedical Database, CSJD and Chinese Medical Association journals were searched from inception to April 2010. Search terms were reported. The SIGLE database was searched for unpublished trials. Reference lists of relevant articles were checked for further trials. The search was not restricted by language or publication status.

Study selection
Eligible randomised controlled trials (RCTs) assessed modified constraint-induced movement therapy versus traditional rehabilitation (only) in adults (over 18 years) with upper extremity motor dysfunction after clinically diagnosed stroke. Participants had to be eligible (criteria detailed in the review) for modified constraint-induced movement therapy, which was defined as intensive training of the upper extremity for 30 minutes to three hours daily, with restraint of the non-affected arm for up to six hours daily. Eligible trials reported at least one measure of upper-limb function. Measures of interest were listed in the review and could be clinical (such as Wolf Motor Function Test) or kinematic (spatio-temporal outcomes such as peak velocity). Trials of mixed interventions were excluded.

Participants ranged in mean age across trial groups from 52 to 71 years and in mean time since stroke onset from four days to 38 months. Interventions differed but included (in one or both groups) physiotherapy, occupational therapy, neurodevelopmental treatment, neuromuscular facilitation and daily living retraining. Treatment times varied from two weeks to 10 weeks, frequency varied from three to five days a week and the length of each session from half an hour to three hours. The non-paretic arm was restrained for five or six hours daily. Various outcomes measures were used, commonly including the Fugl-Meyer Assessment, Action Research Arm test and/or Motor Activity Log. Trials were conducted in the USA, Taiwan, China, Saudi Arabia and Sweden.

Two reviewers independently selected the trials with disagreements resolved by a third reviewer.

Assessment of study quality
Trial quality was evaluated with the Jadad scale which assessed reported randomisation, double-blinding and withdrawals or drop-outs. Each trial was awarded a score up to a maximum of 5 points. Allocation concealment and baseline comparability of the groups were evaluated. Baseline comparability of groups was assessed from the available data where this was not reported in the trial.

Two reviewers independently assessed trial quality.

Data extraction
All outcomes were continuous. Mean differences (MDs) between the groups were extracted or calculated, with 95% confidence intervals (CIs).

Two reviewers extracted the data. Primary trial authors were contacted for more information if required.
Methods of synthesis
The trials were combined to calculate pooled mean differences and 95% confidence intervals. Heterogeneity was assessed using $X^2$ and $I^2$. Fixed-effect models were used unless there was significant heterogeneity ($X^2 \leq 0.1, I^2 \geq 50\%$), in which case random-effects models were used. A sensitivity analysis was conducted, based on clinical and methodological differences between the trials.

Results of the review
Thirteen RCTs were included (278 participants, range four to 47): nine used adequate methods of sequence generation, one reported allocation concealment, 10 used some form of blinding, three reported withdrawals, eight clearly reported baseline comparability of groups and two reported use of intention-to-treat analysis. Jadad scores ranged from 3 to 5.

There was a significant benefit for the constraint-induced movement therapy group in measures of arm motor impairment (Fugl-Meyer Assessment MD 7.8, 95% CI 4.21 to 11.38; six RCTs, $I^2=12\%$), arm motor function (Action Research Arm Test MD 14.15, 95% CI 10.71 to 17.59; five RCTs, $I^2=20\%$) and perceived arm motor function (Motor Activity Log: amount of use MD 1.09, 95% CI 0.26 to 1.91; six RCTs, $I^2=90\%$ and quality of use MD 1.02, 95% CI 0.55 to 1.49; six RCTs, $I^2=71\%$).

Sensitivity analysis excluded an outlying trial with a longer duration of training. Heterogeneity was reduced and the findings still significantly favoured constraint-induced movement therapy (Motor Activity Log amount of use: MD 0.78, 95% CI 0.37 to 1.19; five RCTs, $I^2=31\%$ and quality of use: MD 0.84, 95% CI 0.42 to 1.25; five RCTs, $I^2=36\%$). There was no significant difference between the groups in focal disability level measured with the Functional Independence Measure (three RCTs) or the Barthel Index (one RCT).

For kinematic variables (three RCTs), the constraint-induced movement therapy group had a significantly shorter reaction time (MD -0.23, 95% CI -0.38 to -0.08; two RCTs, $I^2=0\%$) and a higher percentage of movement time where peak velocity occurs (MD 7.50, 95% CI 1.94 to 13.05; three RCTs, $I^2=36\%$), but did not differ significantly from the traditional rehabilitation group in other kinematic variables measured; detailed data were presented in the review.

Authors’ conclusions
There was fairly strong evidence that, compared with traditional rehabilitation, modified constraint-induced movement therapy could reduce disability after stroke and improve upper extremity function and spontaneity during movement time. There was limited evidence of effect on kinematic variables.

CRD commentary
The objectives and inclusion criteria of the review were clear. Relevant sources were searched without limitation by language or publication status. Steps were taken to minimise the risk of reviewer bias and error by having more than one reviewer select trials, undertake validity assessment and extract the data.

Appropriate statistical techniques were used to combine the data, assess for heterogeneity and explore differences between the trials. Although the authors stated that the trials were clinically homogeneous, there appeared to be marked differences between the trials in a number of areas (such as duration of stroke, intensity and length of intervention). As the authors noted, there were few trials, sample sizes were small, standards of reporting in the primary trials were suboptimal and trial quality was limited.

This was a largely well-conducted review, but the conclusions may overstate the case given the quality and quantity of evidence presented.

Implications of the review for practice and research
Practice: The authors stated that modified constraint-induced movement therapy was feasible for individuals with upper extremity dysfunction after stroke and appeared to reduce disability compared with traditional rehabilitation.

Research: The authors stated that well-designed multicentre RCTs with comprehensive and valid outcome measures were needed to evaluate clinical and kinematic outcomes of modified constraint-induced movement therapy as well as health-related quality of life, safety and compliance.
Funding
No external funding.

Bibliographic details

PubMedID
21621674

DOI
10.1016/j.apmr.2010.12.036

Original Paper URL
http://www.archives-pmr.org/article/S0003-9993(11)00022-0/abstract

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Biomechanical Phenomena; Exercise Therapy /methods; Humans; Occupational Therapy; Outcome Assessment (Health Care); Randomized Controlled Trials as Topic; Recovery of Function; Restraint, Physical; Stroke /rehabilitation; Upper Extremity /physiopathology

AccessionNumber
12011004603

Date bibliographic record published
12/10/2011

Date abstract record published
03/04/2012

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.