Effect of resisted exercise on muscular strength, spasticity and functionality in chronic hemiparetic subjects: a systematic review
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CRD summary
This review concluded that resisted exercise can be an important tool in physical therapy treatment. Such exercise did not promote tonus increase in the trained subjects, but presented beneficial effects in relation to the power of spastic muscles. Concerns about the reporting and methodology of the review mean that the reliability of this conclusion is unclear.

Authors' objectives
To assess the effect of resisted exercise applied to spastic muscles in hemiparetic individuals on muscular force, spasticity and functionality.

Searching
MEDLINE, LILACS, SCIELO, PEDro and EBSCO were searched from 1997 to 2008 for studies published in English or Portuguese. Search terms were reported.

Study selection
Clinical trials of any activity associated with resisted exercise in patients with a diagnosis of stroke for at least six months were eligible for inclusion. Resisted programs were defined as overload to inferior limbs, whether or not this was associated with interventions for the trunk and/or superior limbs. Studies which used functional electrical stimulation were excluded from the review. Also excluded were studies which performed secondary analysis without describing methodology.

Duration of training programmes in the included studies ranged from four to 24 weeks; most involved three sessions per week. Just over half of the studies involved concentric exercises instead of or in addition to eccentric and/or isometric exercises. Most studies also used a warm-up period and a cool-down period that involved passive stretching. Slightly fewer than half the studies used strengthening exercises only; the others used home exercises and/or aerobic and functional training. Studies that evaluated spasticity used the Modified Ashworth Scale (MAS) or the pendulum test. A wide range of measures were used to assess functionality. The most common measure of power was the isokinetic dynamometer. Inclusion criteria for length of time since stroke ranged from six months to more than one year.

It appeared that all six reviewers independently assessed each study for inclusion; decisions were made through discussion.

Assessment of study quality
Two reviewers independently assessed the studies for validity using the five-point Jadad scale of randomisation, blinding and treatment of withdrawals and drop-outs.

Data extraction
Study results were classified as showing: total increase or improvement (statistically significant improvement in at least 75% of assessed parameters); partial increase or improvement (statistically significant improvement in at least 50% and fewer than 75% of assessed parameters); or no improvement (statistically significant improvement in fewer than 50% of assessed parameters).

The authors did not state how data were extracted for the review.

Methods of synthesis
The studies were combined in a narrative synthesis grouped by outcomes reported.
Results of the review
Fourteen studies (n=275) were included in the review. Jadad scores were low: four studies scored zero, eight scored 1, one study scored 2 and one scored 3 points. None of the studies reported a description of withdrawals and dropouts.

None of the studies that evaluated spasticity demonstrated changes in muscle tonus (muscle tone). Most studies assessed power reported increases, including all those that used one maximum repetition (MR) or a manual dynamometer as measurement and 83% of those that used isokinetic dynamometers. Results for assessment of functionality were inconsistent: 50% of studies that used gait speed measurement with a chronometer, 25% of those that used time measurement of functional activities and 66% of those that used the six-minute walk test showed improvement. Other measures of functionality also showed inconsistent results.

Authors' conclusions
Resisted exercise can be an important tool in physical therapy treatment. Such exercise did not promote tonus increase in the trained subjects, but presented beneficial effects in relation to the power of spastic muscles.

CRD commentary
The inclusion criteria were clear but broad. The authors searched several relevant databases. The restriction of the review to published studies reported in English or Portuguese may have led to the omission of relevant studies and increased the chances of publication and language biases in the review. The authors used methods designed to reduce reviewer bias and error for study selection and quality assessment, but did not report that they used such methods during data extraction. Use of the Jadad scale to assess validity may not have been particularly informative in the case of the non-randomised trials included in the review. The decision to present a narrative synthesis was appropriate in view of the high level of clinical heterogeneity between included studies. However, the synthesis presented was brief and, in places, hard to interpret. This, together with concerns about review methodology and the low quality of the included studies, means that the reliability of the conclusions is open to doubt.

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

Research: The authors stated that there was a need for randomised controlled trials with rigorous methodology to evaluate resisted exercise in hemiparetic patients.

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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.