Systematic literature review of treatment interventions for upper extremity hemiparesis following stroke

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CRD summary
This review concluded that certain interventions are effective for the treatment of upper extremity hemiparesis following stroke, but the recommendations may not be easily generalisable. Given the methodological weaknesses of the study and the sparsity of evidence available on individual interventions, the authors' conclusions should be treated with caution.

Authors' objectives
To investigate the effectiveness of clinical rehabilitative interventions for upper extremity hemiparesis following stroke, published in the literature from 1999 to 2005.

Searching
PubMed, Academic Search Elite, Academic Search Premier, CINAHL and Health Source: Nursing/Academic Edition were searched for English language, peer-reviewed, full-text accessible articles published from 1999 to 2005. The search terms were provided.

Study selection
Study designs of evaluations included in the review
All study designs except case series and case studies were eligible for inclusion.

Specific interventions included in the review
Studies of rehabilitation programmes were eligible for inclusion. The included studies assessed a range of different interventions including electrical stimulation, exercise (goal-directed versus rote), arm-training programmes and constraint-induced therapy.

Participants included in the review
Studies of people who had suffered a cerebrovascular accident (CVA) 10 days to 15 years previously, had unilateral or bilateral lesions resulting in CVA, and were undergoing rehabilitation for unilateral or bilateral mild to severe upper extremity hemiparesis were eligible for inclusion. Studies of patients receiving treatment for upper and lower extremity hemiparesis were excluded. The majority of the included studies were of participants who had suffered a unilateral stroke. The extent of motor dysfunction ranged from mild to severe and the length of time since stroke ranged from 10 days to 175 months.

Outcomes assessed in the review
Inclusion criteria for the outcomes were not specified. The included studies used multiple functional outcome measures including manual dexterity, reaction time, motor function and grip strength.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Studies were assessed as to whether or not they had inclusion or exclusion criteria with definitions for type of stroke and severity of hemiparesis; a replicable treatment protocol; an assessment of reliability and validity of outcome measures; allocation concealment; and all enrolled participants accounted for at follow-up. The authors did not state how the validity assessment was performed.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
Interventions investigated by more than 1 study were discussed in a narrative synthesis. The studies were classified according to Sackett's level of evidence and graded recommendations were made: grade A if supported by a single RCT with 15 or more participants; grade B if supported by an RCT with less than 15 participants; grade C if non-randomised.

How were differences between studies investigated?
Differences between the studies were reported in the tables and discussed in the text.

Results of the review
Eleven studies (n=269) were included: 8 randomised controlled trials (RCTs; n=229) and 3 quasi-experimental studies (n=40).

Two studies met all of the quality criteria and five had a blinded outcome assessment. The authors commented that more than half of the studies were underpowered.

Two studies (1 double-blind RCT and 1 non-randomised study) reported that constraint-induced therapy was effective in the short term, although the positive outcome was not sustained beyond 2 to 3 months. The results of studies evaluating arm-training programmes were contradictory: an RCT reported that the Arm BASIS training programme, when provided in conjunction with standard therapy, improved motor control but not motor function compared with standard therapy, while a non-randomised study reported that the bilateral arm-training programme with rhythmic auditory cueing (BATRAC) improved arm function in right-handed patients with left hemisphere lesions; however, two other studies of arm-training techniques found no improvement.

Authors' conclusions
The authors concluded that certain interventions are effective for the treatment of upper extremity hemiparesis following stroke. However, the clinical recommendations made in the review should be carefully appraised since the degree of hemiparesis, length of time since stroke, location of stroke, the extent of upper limb functional and motor impairment, and severity of stroke varied across the studies.

CRD commentary
The review had a clearly stated review question. Some relevant sources were searched for studies, but there is a risk that relevant studies might have been missed as only English language studies were included and there were no specific attempts to find unpublished studies. Standard methods do not appear to have been used to reduce error and bias in the study selection, data extraction and quality assessment processes.

The narrative synthesis seems appropriate given the clinical heterogeneity of the included studies. In addition, it took the quality and diversity of the included studies into consideration. Recommendations were generally based on only small single studies. While the authors' conclusions are suitably cautious and correctly acknowledge the importance of considering the clinical characteristics of a population before implementing an intervention, weaknesses in the study methodology and the paucity of studies mean that the conclusion regarding the effectiveness of certain treatments might not be reliable.

Implications of the review for practice and research
Practice: The authors stated that it is difficult to make definitive recommendations about the effectiveness of one
intervention over another and the studies have limited generalisability. Therapists should proceed with caution when implementing the findings of the review if a patient does not fall within the parameters of the patients included in the review. Possible useful interventions are electrical stimulation in moderate to severe upper limb dysfunction, use of goal-directed reaching behaviours, reducing compensatory trunk movements when using reach-to-grasp movements, use of Arm BASIS training in addition to regular exercise therapy, and use of random and blocked practice in conjunction with active neuromuscular stimulation.

Research: Large RCTs are required to determine which intervention is most effective at which level of disability. Longitudinal studies investigating the long-term effects of interventions are also needed, as are studies exploring the cognitive aspect of participation in the treatment process.

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