Effects of exercise training programs on walking competency after stroke: a systematic review

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CRD summary
This review assessed training programs that focused on lower limb strengthening, cardiorespiratory fitness or gait-oriented tasks for improving gait, gait-related activities and health-related quality of life after stroke and concluded that gait-oriented training was effective in improving walking competency after stroke. This conclusion may be reliable, but clinical differences between studies should be noted.

Authors' objectives
To assess the effectiveness of training programmes that focused on lower limb strengthening, cardiorespiratory fitness or gait-oriented tasks in improving gait, gait-related activities and health-related quality of life after stroke.

Searching
PubMed, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, DARE, PEDro, EMBASE, CINAHL and the Database of the Dutch Institute of Allied Health Care were searched from 1980 to November 2005. Search terms were reported. References of review articles and conference abstracts were checked. Studies published in English, German or Dutch were eligible for inclusion.

Study selection
Randomised controlled trials (RCTs) that evaluated training programs focused on lower limb strengthening, cardiorespiratory fitness or gait-oriented tasks for people aged at least 18 years with stroke were eligible for inclusion in the review. Eligible studies also had to focus on gait-related activity for one outcome. Studies that evaluated specific devices such as body weight-supported training, virtual reality or electrical stimulation were excluded. Detailed definitions for included training regimes were reported in the paper. A wide range of comparator treatments were used; the most common was conventional physiotherapy or usual care. The duration of interventions ranged from three to 19 weeks. Intensity ranged from three to 10 times weekly for between eight and 90 minutes per session. Time between stroke onset and start of intervention ranged from eight days to a mean of eight years. A range of outcome measures related to balance and mobility were reported.

It appeared that two reviewers independently assessed the studies for inclusion.

Assessment of study quality
Study validity was assessed independently by two reviewers using the PEDro scale. Studies were classified as high quality if they scored at least 4 points on the scale and as low quality if they scored 3 or fewer points. A third reviewer resolved disagreements following discussion.

Data extraction
Data on mean differences in change scores and their standard deviations were extracted into an Excel spreadsheet. Where necessary, data were extrapolated from graphs. Corrected (unbiased) effect sizes (Hedges’ g) were calculated for each study. Data from crossover RCTs were extracted only for the first intervention phase. Study authors were contacted for additional information. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Effect sizes from studies that assessed comparable interventions and constructs were combined to give a weighted summarised effect size (SES) with 95% confidence interval (CI) using a fixed-effect meta-analysis; if statistically significant heterogeneity was detected using the I² statistic a random-effects analysis was employed. The Q statistic was used to assess heterogeneity. Where pooling was not possible, a best-evidence synthesis approach was adopted with studies grouped by the nature of the intervention.
Results of the review
Twenty-one RCTs (n = 904) were included in the review. The median PEDro score was 7 out of a maximum 11 (range 4 to 8).

Gait speed (17 RCTs, n = 692). A pooled analysis of 12 RCTs of gait-oriented training showed a significant effect of intervention (summarised effect size 0.45, 95% CI: 0.27 to 0.63, p<0.01).

Walking distance (13 RCTs, n = 743). A pooled analysis of nine RCTs of gait-oriented training showed a significant effect of intervention (summarised effect size 0.62, 95% CI: 0.30 to 0.95, p<0.01). There was no significant effect in studies which targeted lower limb strengthening (three RCTs).

Significant heterogeneity was found for a number of the analyses.

Results of a best-evidence synthesis were also reported; no significant differences were reported in studies of limb strengthening (two RCTs), improved stair climbing ability was found with cardiorespiratory training (one RCT) and improved functional ambulation with gait-oriented training (two RCTs). A number of non-significant results were also reported for this last group of trials.

Authors' conclusions
Gait-oriented training was effective in improving walking competency after stroke.

CRD commentary
The review question and the inclusion criteria were clear. The authors searched a number of relevant databases and other sources. The decision to limit the review to studies published in English, German or Dutch may have introduced language bias to the review and increased the possibility that some relevant studies were not included in the review. The authors reported using methods designed to reduce reviewer bias and error in the selection of studies and the assessment of validity, but not in the extraction of data. A comprehensive validity assessment was performed. The use of meta-analysis combined with a narrative synthesis where pooling was not possible may have been appropriate; however, use of a heterogeneity assessment to determine the type of meta-analysis performed was probably not appropriate.

Substantial heterogeneity was found in a number of instances; this was not further investigated and may have resulted from the clinical heterogeneity in study populations. The authors' conclusions accurately reflected the results of one of the analyses conducted and may be reliable. However, the clinical differences between studies should be borne in mind when interpreting the conclusions.

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

Research: The authors stated that further research should investigate functional training programs for walking competency in patients susceptible to a decline in mobility. The clinical relevance of the improvements achieved, the programme variables associated with efficacy, and the long-term impact of such programmes also require investigation.

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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.