The effects of exercise-based rehabilitation on balance and gait for stroke patients: a systematic review

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CRD summary
Specific gait, balance or aerobic exercises improved balance and walking capacity for stroke patients. Due to limitations in the conduct and reporting of the review, the limited size of the trials, and the lack of a significant effect in several trials, the conclusions may not be reliable.

Authors' objectives
To evaluate the effects of exercise interventions on balance and gait for stroke patients, and to summarise the available evidence.

Searching
PubMed and CINAHL were searched for studies published in English between January 2001 and January 2010. Search terms were reported.

Study selection
Randomised controlled trials (RCTs) of adults who were recovering from stroke, were eligible for inclusion. At least one outcome had to focus on balance or gait, such as walking distance or walking speed. Trials of robotic devices or virtual reality therapy were excluded.

In the included trials, most participants were aged 60 years or older (range 27 to 87) and they had at least minimal gait impairment from stroke. The interval between the stroke and the start of the intervention ranged from less than 10 days to over a year; most were six months or more (chronic stage), some were between one and six months (subacute stage), and some were within one month (acute stage). Where reported, most patients had limited community ambulation.

The interventions to improve balance were aerobic, comprehensive and multisensory exercises. Balance was generally assessed using the Berg Balance Scale, which ranges from 0 to 56, with higher scores indicating better balance. The interventions to improve walking ability were treadmill walking with or without body weight support. Walking ability was mostly assessed using the timed six-minute or 10-metre walk tests. The various comparators included physical therapy, overground walking training, and usual care.

The authors did not state how many reviewers selected the studies for inclusion.

Assessment of study quality
Trial quality was assessed using the PEDro 11-item scale, covering randomisation, allocation concealment, baseline similarities, blinding, proportion of drop-outs, and use of intention-to-treat analysis, with a maximum score of 10 (one item excluded from scoring). Scores between 6 and 10 points indicated high quality, below 5 indicated lower quality, and trials with a score below 4 were excluded.

The authors did not state how many reviewers assessed the quality of the trials.

Data extraction
Balance and walking ability outcomes were extracted and reported, along with probabilities. The authors did not state how many reviewers extracted the data.

Methods of synthesis
Studies were synthesised in a narrative. Results were grouped by outcome (balance or gait) and intervention type.

Results of the review
Seventeen RCTs were included, with 1,105 patients (range 14 to 136, median 60). Ten examined the effects of
interventions on balance, and 10 examined walking ability. Quality scores ranged from 4 to 8 out of 10. Most trials reported random allocation and blinding of the assessor. Only eight reported concealed allocation and/or intention-to-treat analysis, and 10 reported less than 15% drop-out.

**Balance**: Compared with control, three out of four RCTs showed a statistically significant improvement in balance, following aerobic exercises, for patients in the subacute to chronic stage of stroke recovery. Three trials evaluated the effect of comprehensive exercise sessions, and one showed a statistically significant difference in balance, which favoured the intervention group compared with usual care. Three trials showed no statistically significant difference between multisensory training interventions and control, for patients at the chronic stage.

**Walking ability**: Eight trials evaluated the effect of combining gait-oriented exercises, using treadmills, with conventional therapy, and three reported a statistically significant difference compared with control. One trial showed that intensive exercise resulted in greater improvements in walking ability than usual care plus physical therapy or occupational therapy, for patients at the subacute stage; the statistical significance of this difference was not reported. One trial showed significant improvement in walking speed following dual-task exercise compared with control.

**Authors’ conclusions**
Specific gait, balance or aerobic exercises improved balance and walking capacity for stroke patients.

**CRD commentary**
The review question and selection criteria were clear. Date and language restrictions were applied to the searches, so some trials may have been missed. The authors acknowledged the language limitations. Appropriate measures to minimise error and bias in the review were not reported. The trials varied in quality and had several limitations. A narrative synthesis was appropriate given the differences between interventions and outcome measures. The lack of detail on the trials and patient characteristics make the interpretation of the reliability of the conclusions difficult. Several trials showed no statistically significant difference between the intervention and control, but most of them were small and might have lacked the power to detect any effect.

Due to limitations in the conduct and reporting of the review, the limited size of the trials, and the lack of a significant effect in several trials, the conclusions may not be reliable.

**Implications of the review for practice and research**
**Practice**: The authors stated that the ideal exercise interventions for stroke survivors were a combination of gait, balance and aerobic exercises. They should be adapted to individual patients for their level of impairment. Sessions of one hour, three to five times per week, for at least six weeks could improve balance. Gait-oriented exercises of 20 to 30 minutes, three to five times per week, for at least four weeks could improve balance and walking.

**Research**: The authors stated that future research should focus on long-term follow-up for exercise interventions to assess whether improvements were maintained over time. It should examine the impact of exercise interventions on the range of neurological deficit profiles, and assess the safety of home-based rehabilitation for balance and walking, compared with hospital-based programmes. Strategies to motivate chronic stroke patients to adapt and maintain exercise behaviour should be tested and evaluated.

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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.