**Effect of exercise training on walking mobility in multiple sclerosis: a meta-analysis**

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**CRD summary**

This review concluded that exercise training intervention was associated with a small improvement in walking mobility for patients with multiple sclerosis. This conclusion reflected the evidence presented, but a degree of caution might be required in interpreting these conclusions given the limited quality of included studies and concerns about the conduct of the review process.

**Authors' objectives**

To assess the effect of exercise training interventions on walking mobility in patients with multiple sclerosis.

**Searching**

MEDLINE, PsycINFO, CINAHL and Current Contents Plus were searched from 1960 to November 2007. Search terms were reported. Reference lists of retrieved publications were screened. Study authors were contacted for additional publications. Only studies published in English were considered.

**Study selection**

Studies which measured walking mobility before and after an intervention that included exercise training in patients with multiple sclerosis were eligible for inclusion. Studies that evaluated an exercise training intervention with or without a control condition were eligible for inclusion. Only studies that used recognised instruments to measure patients' walking mobility were included. Studies in which exercise training was only a small part of a physiotherapy programme were excluded. Abstracts were excluded.

Included studies evaluated the following exercise training programmes: aerobic; non aerobic; resistance; and a combination of aerobic and resistance. Almost half of the studies included a control condition, but there was a lack of detail about the controlled conditions in the review. In more than half of the studies, durations of interventions were less than three months. Most of the included patients had a score of less than 4.5 on the Expanded Disability Status Scale. Most patients had the disease for less than 10 years and had either relapsing/remitting or progressive multiple sclerosis. Use of walking aid for patients varied between studies. Most of the exercise training interventions were conducted in a supervised setting with exercise facilities. The number of sessions of exercise per week and the amount of exercise per session varied between studies.

The authors did not state how many reviewers performed the study selection.

**Assessment of study quality**

The quality of studies was assessed using an 11-item scoring list scale that evaluated concealment of allocation, withdrawal, blinding, baseline comparability, and intention to treat analysis. All items were scored as clearly yes (2 points), clearly no (0 point) or not sure (1 point). An equal weight was applied to all items. Scores of individual items were summed to obtain an overall score that ranged from 0 to 22 points.

The authors did not state how many reviewers performed the validity assessment.

**Data extraction**

Data were extracted to enable the calculation of the effect size (Cohen's d) and 95% confidence intervals (CIs) for each study.

The authors stated neither how data were extracted for the review nor how many reviewers performed the data extraction.
Methods of synthesis
Studies were combined in meta-analyses using a random-effects model. The weighted mean effect size (ES), with 95% CI, was calculated. Statistical heterogeneity was assessed using the Q statistic. Publication bias was visualised using a funnel plot and assessed using the fail-safe N analysis. Subgroup analyses were conducted to examine the influence of categorical moderator variables (such as type of disease, setting and duration of exercise training and type of study design).

Results of the review
Twenty-two studies (n=600) were included the meta-analysis. Ten studies had a control condition. Sample sizes varied from six to 111. The included studies were generally of poor to moderate quality (quality score ranged from 9 to 15).

When the studies were pooled, exercise training intervention was associated with a significant improvement in walking mobility in patients with multiple sclerosis (weighted mean ES 0.19, 95% CI 0.09 to 0.28; 22 studies). No evidence of heterogeneity was observed for this outcome.

For subgroup analyses, there were larger effects associated with supervised exercise training (weighted mean ES 0.32, 95% CI 0.19 to 0.44; 17 studies), exercise programmes with a duration of less than three months (weighted mean ES 0.28, 95% CI 0.15 to 0.41; 14 studies) and a mixed group of patients with relapsing/remitting and progressive multiple sclerosis (weighted mean ES 0.52, 95% CI 0.08 to 0.96; three studies). The type of study design (with or without a control condition) did not influence the overall effect of exercise training on walking mobility.

No evidence of publication bias was found according to the visual scanning of the funnel plot and the fail-safe N analysis.

Authors' conclusions
Exercise training intervention was associated with a small improvement in walking mobility for patients with multiple sclerosis.

CRD commentary
The review addressed a clear question and was supported by appropriately broad inclusion criteria. A number of relevant databases were searched. The decision to restrict the review to published studies reported in English may have increased the chances of language and publication biases. Publication bias was evaluated and little evidence of it was found. Methods to minimise bias in the review process were not reported. Relevant criteria were used to examine study quality; the authors acknowledged that there were limitations in the quality of included studies with respect to randomisation, compliance and blinding. Statistical heterogeneity was assessed and appropriate methods were used to pool the results. The authors’ conclusions reflected the evidence presented. However, a degree of caution might be required in interpreting these conclusions given the limited quality of included studies and the methodological concerns outlined above.

Implications of the review for practice and research
Practice: The authors stated that patients with multiple sclerosis should be encouraged to engage in exercise training as an adjuvant treatment for mitigating decrements in walking mobility.

Research: The authors stated that future studies should use an experimental design with an appropriate control group and provide more complete information about participant characteristics; these would help understanding of how exercise training may benefit specific subgroups of patients with multiple sclerosis (such as type or duration of disease, baseline impairment). Studies should target home-based exercise training programmes, assess the effect of exercise training on walking mobility in only males and evaluate the effect of exercise training programmes on patients’ walking mobility in the long term. Future research should also examine the effect of resistance exercise and resistance plus aerobic exercise on walking mobility for patients with multiple sclerosis.

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