Effects of physical exercise therapy on mobility, physical functioning, physical activity and quality of life in community-dwelling older adults with impaired mobility, physical disability and/or multi-morbidity: a meta-analysis

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CRD summary
This review found that mobility- or disability-limited older adults with or without multi-morbidity benefited from physical exercise therapy. Methodological and reporting limitations mean that the results should be interpreted with some caution and make the reliability of the authors’ conclusions unclear.

Authors’ objectives
To evaluate the effect of physical exercise therapy on mobility, physical functioning, physical activity and quality of life in elderly patients with mobility problems, physical disability and/or multi-morbidity.

Searching
PubMed, CINAHL, EMBASE, PEDro and The Cochrane Library were searched for relevant studies to May 2011; search terms were reported. It was unclear whether language restrictions were applied to the search.

Study selection
Randomised controlled trials (RCT) of physical exercise therapy interventions in community-dwelling adults aged at least 60 years were eligible for inclusion. Patients had to be physically frail as defined by the study authors using specific criteria on the presentation of mobility problems and/or physical disability and/or multi-morbidity. Studies needed to report data on at least one of the outcomes of mobility, physical functioning, physical activity levels and quality of life. Studies of particular patient populations, institutionalised older adults, combined interventions of exercise and other therapies and non-specified movement interventions and studies with a PEDro quality score of less than 6 out of a maximum 11 were excluded from the review.

The age of the study population ranged between 60 and 85 years. The intervention goals included fall reduction, improved physiological, psychological and functional risk factors for disability and improved health-related quality of life, strength, physical performance, gait, balance and endurance. Half of the included studies used multicomponent training programmes that comprised strength, balance and endurance training. Some studies evaluated specific strength or balance training and other studies used functional training programmes. Supervision of the exercise programmes were by physical therapists or exercise leaders. Intervention duration ranged from five weeks to 18 months.

Initial screening of titles was performed by one author. Two reviewers selected the studies by evaluation of abstracts and full texts of each article. Any discrepancies between the reviewers were resolved by discussion.

Assessment of study quality
Two independent reviewers assessed methodological quality using the PEDro 11-item scale of randomisation, allocation concealment, baseline similarities, blinding of patients, therapists and assessors, proportion of drop-outs, use of intention-to-treat analyses, use of between-intervention statistical comparisons and presentation of point measures and measures of variability. Any disagreements between the reviewers were resolved by discussion and a third reviewer.

Data extraction
Data were extracted to calculate standardised mean differences (SMD) and 95% confidence intervals for the outcomes. Where more than one instrument was used to measure outcomes in any study, the reviewers selected the results from one instrument for use in the analysis. Study authors were contacted for missing data.

Methods of synthesis
Pooled standardised mean differences and 95% CIs were calculated using a fixed-effect model. Statistical heterogeneity between the trials was evaluated with $I^2$. Where statistical heterogeneity was present, the results were combined using a random-effects model.
Subgroup analyses compared low intensity exercise therapy with higher intensity exercise therapy and long interventions (more than three months) with short interventions (less than three months). The reviewers assessed potential for publication bias by visual appraisal of funnel plots.

Results of the review

Eighteen RCTs (2,580 participants) were included in the review. Fifteen other studies were excluded because of a PEDro quality score of less than 6. The included studies scored from 6 to 8 points. All the included studies reported randomisation. Allocation concealment was reported in 11 studies. Assessors were blinded in 15 studies. Thirteen studies reported drop-outs of less than 15%. Intention-to-treat analyses were used in 13 studies. Follow-up periods ranged from five weeks to 36 months.

Physical exercise therapy compared to no exercise: There were statistically significant benefits with physical exercise therapy compared to no exercise in mobility based on final values (SMD 0.18, 95% CI 0.05 to 0.30, I²=9%; six RCTs, 956 participants) and change scores (SMD 0.82, 95% CI 0.54 to 1.10; one RCT, 215 participants) and physical functioning based on final values (SMD 0.27, 95% CI 0.08 to 0.46; one RCT, 424 participants) and change values (SMD 2.93, 95% CI 2.50 to 3.36; two RCTs, 287 participants).

No significant differences were found for physical activity (three RCTs) and quality of life (four studies). There were no differences in effectiveness between groups that used short interventions compared to longer interventions.

High intensity physical exercise therapy compared to low intensity exercise therapy: Statistically significant benefits were observed in quality of life with higher intensity exercise (SMD 0.30, 95% CI 0.04 to 0.56, I²=12%; two RCTs, 232 participants). No significant differences were observed for mobility (six studies) and physical activity (one RCT). There were trends towards improvements in physical functioning but the pooled estimate from four RCTs did not reach statistical significance.

Individual interventions compared to group interventions: When physical therapy was compared with no exercise, individual interventions were associated with a non-significant effect on mobility in one study (SMD 0.22, 95% CI -0.24 to 0.68 based on final values) and a significant effect in another study (SMD 0.82, 95% CI 0.54 to 1.10 based on change values). Group interventions were associated with no significant differences (SMD 0.18, 95% CI 0.01 to 0.35, I²=27%). Significant differences between groups were found for individual interventions on physical functioning (SMD 2.93, 95% CI 2.50 to 3.36, I²=27%) and group interventions (SMD 0.27, 95% CI 0.08 to 0.46). There was insufficient data for analyses of physical activity and quality of life.

Intervention type: The authors reported that the interventions with the largest effect sizes used strength training components as part of the exercise therapy programmes.

Long-term effects: Five studies used follow-up measures post intervention and one study found significant benefits of individualised exercise therapy six months after conclusion of the intervention.

There was no evidence of publication bias in the funnel plots.

Authors' conclusions

Elderly patients with mobility limitations or physical disability with or without multi-morbidity experience benefits in mobility and physical functioning with physical exercise therapy. High-intensity exercise appeared to be more effective than low-intensity exercise.

CRD commentary

The review addressed a clear question. Inclusion criteria were defined and reproducible. Appropriate databases were searched for relevant studies. It was unclear whether any language restrictions were applied to the search so there was potential for language bias. The reviewers used validated methods to evaluate potential for publication biases given that there were no attempts to identify unpublished studies. Steps were taken to minimise errors and biases for study selection and the assessment of methodological quality but were not reported for data extraction. Studies that did not meet a particular quality level were excluded from the review. Most studies appeared likely to have been subject to particular biases, which highlighted some of the limitations of using only scores to assess quality and as an eligibility criterion.
Few studies provided adequate data for use in the meta-analysis. The number of patients summarised in the meta-analyses was small. No definitions were provided for high-intensity exercise and low-intensity exercise. The authors presented standardised mean differences and summarised results by stating the size of the effect, but sometimes did not consider the confidence intervals around the summary estimates. The presentation of the results in this way made it difficult to evaluate their clinical significance. The authors correctly acknowledged the limitations of the review from small sample sizes, the small number of trials and differences in the instruments used to measure outcomes.

Methodological and reporting limitations mean that the results should be interpreted with some caution and make the reliability of the authors' conclusions unclear.

Implications of the review for practice and research

Practice: The authors stated that adults with mobility problems and/or disability with or without multi-morbidity should be encouraged to engage in high-intensity exercise and perform strength training. Revisions and updated specifications (published in 2007) of the American College of Sports Medicine guidelines for physical activity might apply to these particular patient groups.

Research: The authors stated a need for more high quality research aimed specifically at improving physical activity levels and using specific intervention and evaluation techniques. In particular the authors advocated development of a generic core set of measurement instruments in physical exercise research and presentation of data in such a way that comparisons using meta-analyses would be feasible.

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