The effects of exercise training in institutionalized elderly people: a systematic review
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Authors' objectives
To evaluate the effects of exercise interventions on measures related to falls and mobility in institutionalised elderly people.

Searching
MEDLINE (1966 to 1999), EMBASE (dates not reported) and the Cochrane Database of Systematic Reviews (issue 4, 1999) were searched without language restrictions; the search terms were reported. Reference lists were screened and the journal 'Physiotherapy' was handsearched.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Studies that evaluated an intervention that included some form of exercise were eligible for inclusion. The review classified interventions as short-term (less than 6 months) and longer term (6 months or longer). In all of the included studies, exercise programmes comprised one or more components of strength, endurance, balance and flexibility; one study used a combination of exercise and nutrition as the experimental intervention. The control interventions were a variety of non-exercise interventions including social group, usual care, reminiscence therapy, nutritional supplements, friendly visits and health education. The duration of the interventions ranged from 8 weeks to 15 months; their frequency was three times a week in half of the studies.

Participants included in the review
Studies involving men or women aged 50 years or older who were living in institutional care settings were eligible for inclusion. In the included studies, the participants lived in mental institutions, nursing homes, long-term care facilities, residential homes and sheltered accommodation. The mean age of the participants ranged from 69 to 90 years. Most of the studies included both male and female participants; one study included only men, while another included only women.

Outcomes assessed in the review
Studies that assessed any of the following outcomes were eligible for inclusion: muscle strength, chair-rise time, balance, gait or gait speed, falls, mobility, functional ability, endurance and flexibility. The included studies measured strength in different muscles (mainly leg and handgrip 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
The internal validity of the studies was assessed using the following criteria described by Van Tulder et al.: random allocation; concealment of allocation; blinding of the care provider, patients and outcome assessor; cointerventions comparable or avoided; acceptable compliance in all treatment groups; withdrawals described and rates acceptable (<20% for studies lasting 12 months or less and <30% for studies lasting more than 12 months); and analysis on an intention-to-treat basis. The maximum possible score was 10 points.

Two reviewers independently assessed validity. Any disagreements were resolved at a consensus meeting, with the aid of a third reviewer where required.
Data extraction
The data were extracted according to Cochrane Collaboration methodology. The authors did not state how many reviewers performed the data extraction. It appeared that mean values with standard deviations were extracted for each study where possible. Studies that compared two exercise groups with the control group were treated as two separate studies.

Methods of synthesis
How were the studies combined?
The studies were grouped by outcomes and duration of the intervention (short or long term). Pooled weighted standardised mean differences (WSMDs) with 95% confidence intervals (CIs) were calculated for continuous data using a random-effects model. Where possible, differences between treatment groups in the change from baseline to end point were included in the pooling, otherwise post-intervention treatment differences were used. For studies that reported outcomes in more than one way, the results were included in the meta-analysis separately for each outcome measure. Multifactorial and exercise-only interventions were pooled together. Where pooling was not possible, the studies were combined in a narrative. The possibility of publication bias was explored using a funnel plot (based on 9 data sets).

How were differences between studies investigated?
Some differences and similarities were considered in the pooling process.

Results of the review
Twelve RCTs (n=830) were included in the review.

The internal validity scores ranged from 2 (2 studies) to 6 (1 study) out of 10 points. Three studies reported blinding of the outcome assessor. One study reported an intention-to-treat analysis. Where reported, drop-outs ranged from 6 to 51% and compliance with the intervention from 72 to 100%.

Five short- and 3 long-term studies of muscle strength were found. The meta-analysis showed that exercise significantly improved short-term strength in mainly leg muscles (WSMD 4.6, 95% CI: 3.08, 6.11; based on 3 studies), but there was no significant difference between exercise and control in the 2 long-term studies that both measured handgrip strength.

The meta-analysis did not show any statistically significant difference between exercise and control for balance (data from 3 short-term studies were pooled), mobility (data from 3 studies were pooled) and gait (data from 3 studies were pooled).

No consistent improvements were found for the effect of exercise on falls (both short-term studies reported no significant difference between exercise and control) or chair-rise time (1 of the 2 long-term studies and 1 of the 3 short-term studies reported a significant improvement in chair-rise time with exercise).

The funnel plot neither ruled in nor ruled out the possibility of publication bias.

Authors’ conclusions
There is no compelling evidence that exercise improves factors associated with mobility or falls in institutionalised older people. Only short-term muscle strength showed any improvement.

CRD commentary
The review addressed a clear question that was defined in terms of the participants, intervention, outcomes and study design. Several databases and one journal were searched. No attempt was made to locate unpublished studies, thus raising the possibility of publication bias; this was assessed using a funnel plot and could not be excluded. Although no language restrictions were applied to the search, it was unclear whether any were applied to the included studies. Methods were used to minimise reviewer errors and bias in the validity assessment, but it was not clear whether similar
steps were taken in the study selection and data extraction processes. Validity was assessed and the results of the assessment were reported; however, the validity of methods used to measure outcomes in individual studies was neither assessed nor discussed.

Several studies used multiple measures of similar outcomes and these were considered separately in the review; where multiple comparison groups shared a control group, no adjustment was made for statistical dependency. The data were pooled without prior assessment of statistical heterogeneity and, since the results were not displayed graphically, it was not possible to judge the appropriateness of pooling studies. In addition, studies assessing exercise alone interventions were combined with multi-component interventions, which the authors themselves acknowledged as a problem. In conclusion, there were limitations to this review but the authors’ conclusion about the lack of firm evidence appears justified.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that there is a need for more long-term studies that evaluate the effects of exercise on strength, gait, balance, falls and mobility. Exercise programmes should also evaluate endurance, flexibility and balance exercises that do not include a strength component. Exercise programmes should be suitable for populations of interest; score 8 on Van Tulder's internal validity criteria; ensure blinding of the outcome assessment; use intention-to-treat analysis; try to achieve baseline comparability of the treatment groups; and maximise compliance and minimise drop-outs. Either large studies should be undertaken, or a series of small studies that can be pooled.

**Bibliographic details**


**Indexing Status**

Subject indexing assigned by CRD

**MeSH**

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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.