Does exercise training change physical activity in people with COPD? A systematic review and meta-analysis

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CRD summary
The authors concluded the evidence demonstrated that exercise training may confer a significant but small increase in physical activity in people with chronic obstructive pulmonary disease (COPD). The authors' conclusions reflect the evidence presented, but the potential for language and publication bias and the variation in the included studies should be borne in mind.

Authors' objectives
To evaluate the effect of exercise training on daily physical activity in people with chronic obstructive pulmonary disease.

Searching
PubMed, EMBASE, CINAHL, PEDro and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to week 27 of 2010 for articles in English. Search terms were reported. Further studies were sought by using the PubMed 'related articles' function, searching clinical trial registries, and scanning reference lists of retrieved studies.

Study selection
Studies of any design, except case reports, that evaluated the effects of at least four weeks supervised exercise training on physical activity in patients with chronic obstructive pulmonary disease were eligible for inclusion. Physical activity had to be measured using activity monitors and be reported in absolute values such as steps or activity counts.

In included studies, the duration of supervised exercise training ranged from six weeks to six months; it was measured using various monitors. Control groups, where present, included a general exercise programme, counselling and pedometer in addition to exercise. Most of the participants were men (72%). The mean age of participants ranged from 62.5 to 69.3 years. Most participants had severe airflow obstruction with forced expiratory volume (FEV₁) ranging from 36% to 52%, where reported. Body mass index ranged from 24kg/m² to 30.8kg/m², where reported.

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

Assessment of study quality
Study quality of randomised trials was assessed using the 10 point PEDro scale. Quality of single group studies was assessed using a modified Downs and Black tool (maximum score 28 points).

Two reviewers independently assessed quality.

Data extraction
Data were extracted for physical activity outcomes to calculate effect sizes and corresponding 95% confidence intervals (CIs) based on results before and after the intervention. Study authors were contacted to obtain data in absolute values; studies were excluded from the meta-analysis if the authors that failed to respond.

Two reviewers independently extracted data.

Methods of synthesis
Pooled effect sizes together with 95% confidence intervals were calculated using a random-effect model. Effect sizes were considered small (0.2 or less), moderate (0.5) or large (0.8 or more). Heterogeneity was assessed using I². Publication bias was assessed by visual inspection of a funnel plot.

Results of the review
Seven studies (472 participants based on numbers reported in tables 1 and 2) were included in the review. Two studies were randomised trials that evaluated two interventions. Five studies were single group intervention studies. Both the randomised trials scored 5 out of 10 points for quality. The single group studies scored between 14 and 21 points out of 28. Sample sizes ranged from 14 to 180 (from tables 1 and 2).

Overall, there was a significant positive effect on physical activity after supervised exercise activity (effect size 0.12, 95% CI 0.03 to 2.55; seven studies). There was no evidence of statistical heterogeneity ($I^2=0\%$).

The possibility of publication bias could not be excluded due to the asymmetry in the funnel plot.

**Authors' conclusions**

The evidence demonstrated that exercise training may confer a significant but small increase in physical activity in people with chronic obstructive pulmonary disease.

**CRD commentary**

The review question was broadly defined. Inclusion criteria were clearly reported. Some relevant sources were searched, but the limitation to studies published in English meant there was the potential for publication and language bias. Appropriate methods to reduce reviewer error and bias were used for quality assessment and data extraction, but it was unclear whether similar methods were used for selecting studies.

Quality was assessed, although only an overall score was reported. Both the groups included in the randomised trials were included in the meta-analysis separately. The meta-analysis compared changes in physical activity before and after an intervention, but wide confidence intervals indicated substantial variability among studies. In addition, (although not specifically reported) the authors stated that the individual physical activity interventions varied between studies. Given the differences between studies for the duration of intervention and physical activity undertaken, a narrative synthesis may have been more informative. The review included details of individual studies, but there were inconsistencies in the reporting of sample sizes between the tables and the text.

The authors’ conclusions reflect the evidence presented but the potential for language and publication bias and the variation in the included studies should be borne in mind.

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

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

**Research:** The authors stated that future large-scale randomised controlled trials were needed to evaluate the effect of physical activity on patients with chronic obstructive pulmonary disease. Future research should: use accelerometers to measure physical activity; offer supervised exercising training at least three times a week over a minimum period of eight weeks; and extend the intervention period for those who experience an acute exacerbation of their disease.

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