

# Review: rehabilitation improves exercise capacity and alleviates shortness of breath in chronic obstructive pulmonary disease

Salman GF, Mosier MC, Beasley BW, *et al.* Rehabilitation for patients with chronic obstructive pulmonary disease: meta-analysis of randomized controlled trials. *J Gen Intern Med* 2003;18:213–21.

**Q** In patients with chronic obstructive pulmonary disease (COPD), does rehabilitation (extremity or respiratory muscle exercise) increase exercise capacity and alleviate shortness of breath?

## METHODS



**Data sources:** Medline (1966–2000), CINAHL (1990–2000), the Cochrane Controlled Trials Register, abstracts presented at national meetings (American Thoracic Society and European Respiratory Society), and bibliographies of relevant articles.



**Study selection and assessment:** randomised controlled trials (RCTs) (published in any language) that involved patients with obstructive lung disease (forced expiratory volume in 1 second [FEV<sub>1</sub>] <70% of predicted value or FEV<sub>1</sub>/forced vital capacity <70% of predicted value) and symptoms of impaired exercise capacity; evaluated any type of rehabilitation (upper or lower extremity, or respiratory muscle exercise) provided 3 times a week for ≥4 weeks; and measured relevant outcomes.



**Outcomes:** exercise capacity (walking test) and shortness of breath (Chronic Respiratory Disease Questionnaire). Effect sizes were calculated as the mean difference in change from baseline scores between the intervention and control groups divided by the combined standard deviation of the difference.

## MAIN RESULTS

20 RCTs (n = 999) met the selection criteria. Meta-analyses were done using a random effects model. Improvement from baseline in exercise capacity was greater in the rehabilitation group than in the control group (table). Alleviation of shortness of breath was greater in the rehabilitation groups than in the control groups (table). Subgroup analysis of RCTs that evaluated at least lower extremity training also showed that improvement in exercise capacity (18 RCTs) and alleviation of shortness of breath (11 RCTs) were greater in the rehabilitation group than the control group (p values <0.05). Subgroup analysis of RCTs that evaluated only respiratory muscle training showed that the groups did not differ for any outcomes.

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## CONCLUSION

In patients with chronic obstructive pulmonary disease, rehabilitation (using at least lower extremity muscle exercise) improves exercise capacity and alleviates shortness of breath.

## Commentary

The meta-analysis by Salman *et al* used an extensive search strategy to identify studies and searched a wide range of sources. Sensitivity analyses were done to determine whether study size, quality, or the different models for aggregating studies (ie, fixed v random effects models) influenced the outcomes. The outcomes proved robust to these analyses.

Patients with COPD had improved dyspnoea and exercise capacity after pulmonary rehabilitation. A previous meta-analysis reached a similar conclusion.<sup>1</sup> However, the review by Salman *et al* has added value for clinicians because it also analysed the effects of pulmonary rehabilitation by disease severity, type of exercise programme, and length of programme. The criteria used for classification of COPD are widely recognised, and the rehabilitation programmes are typical to those generally used. Thus, the findings of this review should be broadly applicable. The authors concluded that effective programmes would use “at least” lower extremity exercise and that rehabilitation programmes for severe COPD should be ≥6 months long. Most programmes included upper extremity exercise in tandem with lower extremity exercise, and therefore no judgments could be made about the effects of purely upper extremity or respiratory exercise.

Upper extremity exercise can be difficult for patients with COPD, and therefore at least lower extremity exercises should be prescribed. Future studies should investigate whether upper extremity exercise or respiratory exercise is beneficial. In addition, studies should investigate the effect of rehabilitation on function of patients with COPD in daily life. There is a paucity of research on this question.

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1 Lacasse Y, Brosseau L, Milne S, *et al.* Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2003;(4):CD003793.

### Rehabilitation (upper or lower extremity, or respiratory muscle exercise) v control in chronic obstructive pulmonary disease\*

Outcomes at 8 weeks to 6 months	Number of RCTs (n)	Mean effect size (95% CI)	Percentage of control patients with worse outcome (CI)†
Exercise capacity	20 (979)	0.71 (0.43 to 0.99)	76% (67 to 84)
Shortness of breath	12 (723)	0.62 (0.26 to 0.91)	73% (60 to 82)

\*RCTs = randomised controlled trials. CI defined in glossary.

†Compared with the average patient in the treatment group.