Effect of outpatient exercise training programmes in patients with chronic heart failure: a systematic review

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CRD summary
The authors concluded that outpatient exercise training programmes seemed safe and could improve exercise capacity and performance, and quality of life in patients with chronic heart failure. This was a well conducted review and the authors’ caution in making recommendations for practice seems justified given the high levels of variation and methodological issues in the included trials.

Authors’ objectives
To assess the efficacy and safety of outpatient exercise training programmes compared with usual care in patients with chronic heart failure.

Searching
PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, and PEDro were searched from 1998 up to March 2010 for articles in English, German or Dutch. Search terms were reported. Three trial registers were searched and reference lists of eligible studies were manually searched.

Study selection
Eligible for inclusion were randomised controlled trials (RCTs) or controlled clinical trials that assessed the effects of supervised outpatient training programmes (lasting at least eight weeks) at home, hospital, rehabilitation centres, or physiotherapy practices. Eligible studies were in patients (aged 18 to 75 years) with chronic heart failure New York Heart Association (NYHA) class II, II, or IV, with a left ventricular ejection fraction of 40% or below. Outcomes of interest were exercise performance, exercise capacity, and/or quality of life. Studies including controls participating in an exercise programme were excluded.

In included trials, the mean age of patients was 60.1 years. Exercise programmes consisted of cycling, walking, or aerobic training with or without strength exercise. All training sessions were supervised by a physical therapist, physician, or nurse. Training frequency ranged from two to seven times per week, and session durations ranged from 10 to 60 minutes. Exercise intensity was measured based on heart rate, maximal oxygen uptake (VO₂ max; 50% to 80%), wattage of the speed rate test, or the BORG scale (which measures perceived exertion), where reported. Trial duration ranged from two and 12 months.

Two reviewers independently screened studies for inclusion; disagreements were resolved by discussion or referral to a third reviewer where necessary.

Assessment of study quality
Two reviewers assessed study quality according to the Physiotherapy Evidence Database criteria. Individual studies received a score between zero and 10.

Data extraction
Two reviewers independently extracted baseline and follow-up data on continuous outcomes to calculate mean differences. Where standard deviations were not reported, they were calculated from 95% confidence intervals or standard errors. Numbers of adverse events were also extracted. Primary authors were contacted for missing data, where necessary.

Methods of synthesis
A fixed-effect model (or random-effects model if statistical heterogeneity was evident) was used to pool continuous data to calculate weighted mean differences and 95% confidence intervals.

Statistical heterogeneity was assessed using $I^2$. Where statistical heterogeneity was evident ($I^2>50$%), potential
influencing factors such as participant selection and type of intervention were explored.

Adverse events were reported narratively.

Publication bias was assessed using funnel plot.

**Results of the review**

Twenty-two trials (3,826 participants) were included in the review. Trials scored from 4 to 8 on the PEDro quality scale; the main issues were lack of allocation concealment, absence of blinding, and lack of intention-to-treat analysis.

**Exercise capacity:** Exercise capacity (measured with VO$_2$max) significantly improved in patients receiving exercise training programmes compared with those in control groups (WMD 1.85ml/kg/min (95% CI 0.75 to 2.94; 14 trials; $I^2=89$%), as did the maximal workload (W$_{max}$) achieved during the maximal exercise test (WMD 13.98 Watts, 95% CI 8.96 to 19.0; seven trials; $I^2=0$%), and duration of the maximal exercise test (WMD 2.11 minutes, 95% CI 1.11 to 3.13; eight trials; $I^2=80$%).

**Exercise performance:** Patients who received exercise training programmes showed a statistically significant improvement in distance walked during the six-minute walking test compared with those in control groups (WMD 47.90m, 95% CI 20.92 to 74.87; 10 trials; $I^2=82$%).

**Quality of life:** Patients who received exercise training programmes reported statistically significant improvements in quality of life compared with those in control groups (WMD -6.89 points on the Minnesota Living with Heart Failure Questionnaire, 95% CI -10.92 to -2.86; nine trials; $I^2=57$%).

There was no statistically significant association between exercise training and adverse events.

The authors reported that there was no evidence of publication bias.

**Authors’ conclusions**

Outpatient exercise training programmes could lead to significant and clinically relevant improvements in exercise capacity, exercise performance, and quality of life in patients with chronic heart failure; participation in these programmes seemed to be safe.

**CRD commentary**

The review question and supporting inclusion criteria were clearly stated. A number of sources were searched for relevant data, but there were some language restrictions. Each stage of the review process was performed in duplicate, which minimised the potential for reviewer error and bias.

Trial quality was assessed using previously published criteria, but most trials had some methodological limitations. It appeared that appropriate methods were used to pool statistical data, but there was evidence of high statistical heterogeneity for some outcomes, which the authors acknowledged. Although the evidence suggested benefit from exercise programmes, the confidence intervals were wide for some outcomes, which reduced their robustness.

This was a well-conducted review and the authors' caution in making recommendations for practice seems justified given the high levels of variation and methodological issues in the included studies.

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

**Practice:** The authors stated that recommendations on the most effective training type, intensity, duration, or setting could not be made yet, and long-term efficacy could not be ascertained.

**Research:** The authors stated that future good quality research should further investigate the evidence for exercise training, particularly optimal training programmes and long-term effects of training, in patients with chronic heart failure.

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