The effectiveness of high-intensity interval training compared to moderate-intensity continuous training in patients with heart failure: a systematic review and meta-analysis

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Background/Introduction: Cardiac rehabilitation including exercise therapy is beneficial for improving exercise tolerance, physical function, quality of life (QOL), and life expectancy in patients with heart failure. High-intensity interval training (HIIT) has attracted attention as a new training modality in heart failure, whereas moderate-intensity continuous aerobic training (MCT) is recommended as the main training modality to improve exercise tolerance. However, the effects of HIIT in patients with heart failure remain controversial.

Purpose: This systematic review and meta-analysis aimed to examine the effectiveness of HIIT compared to MCT on exercise tolerance in patients with heart failure.

Methods: We searched for studies published up to 4 March 2022 in EMBASE, MEDLINE via Ovid SP, PubMed, and the Cochrane Library via Wiley Online Library with no limitations on data, language, or publication status. We included randomised controlled trials comparing the effectiveness of HIIT and MCT on peak oxygen uptake (VO₂), as a measure of exercise tolerance, aerobic threshold (AT) VO₂, ventilatory equivalent of carbon dioxide (VE/VCO₂), and QOL. We pooled the data on peak VO₂, compared HIIT to MCT, and conducted a sub-analysis if there was heterogeneity in the result.

Results: We identified 15 randomised controlled trials with 557 patients from a total of 23,272 records. Our meta-analysis showed that participants who underwent HIIT achieved a significantly higher peak VO₂ than those who underwent MCT (mean difference 1.46 ml/kg/min, 95% confidence interval 0.39 to 2.53; I² = 65.7%; very low-quality evidence) (Figure 1). Participants who underwent HIIT had no statistically significant difference in AT VO₂, VE/VCO₂, and QOL compared to those who underwent MCT. The meta-regression analysis, conducted as a sub-analysis to explore possible causes of heterogeneity, revealed that the effect size of HIIT compared to MCT was inversely associated with body mass index (r = -0.508, p = 0.028, 95% confidence interval -0.95 to -0.07) (Figure 2).

Conclusions: Our systematic review showed that HIIT achieved a higher peak VO₂ than MCT in patients with heart failure. In addition, HIIT may be more effective in improving exercise tolerance in patients with low body mass index.