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Comparative Outcomes of High- vs Moderate-Intensity Exercise Prescription in Pulmonary Hypertension Patients

Kuan-Cheng*

Graduate Institute of Clinical Medical Science, China Medical University, Taiwan

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Introduction

Pulmonary hypertension (PH) is a progressive vascular disorder characterized by elevated pulmonary arterial pressure and increased vascular resistance, leading to right ventricular dysfunction, reduced exercise capacity, and impaired quality of life. Traditionally, patients with PH were advised to limit physical activity due to concerns over exertion-induced complications [1-5]. However, growing evidence now supports the inclusion of supervised exercise training as a safe and effective component of PH management. Exercise training improves endothelial function, oxygen utilization, and skeletal muscle performance, all contributing to enhanced functional capacity. Yet, the optimal exercise intensity remains under debate. While moderate-intensity continuous training (MICT) is the conventional recommendation due to its favorable safety profile, high-intensity interval training (HIIT) has gained interest for its potential to elicit greater physiological adaptations in a shorter time frame. This study aims to compare the outcomes of high- versus moderate-intensity exercise prescriptions in PH patients, with a focus on functional capacity, cardiopulmonary efficiency, symptom burden, and patient-reported quality of life. By analyzing both physiological markers and adherence patterns, this study seeks to determine the relative efficacy and safety of these two commonly used training approaches in the context of pulmonary rehabilitation [6-10].

Discussion

The comparative analysis revealed both high- and moderate-intensity exercise prescriptions to be effective in improving functional outcomes among pulmonary hypertension patients, though with nuanced differences. Patients in the high-intensity interval training (HIIT) group demonstrated greater gains in peak VO_2, anaerobic threshold, and six-minute walk distance (6MWD), suggesting superior enhancements in cardiopulmonary fitness and exercise tolerance. These results are consistent with existing literature indicating that interval-based exertion stimulates both central and peripheral adaptations, such as improved myocardial efficiency and capillary density. However, HIIT also posed challenges in terms of perceived exertion, fatigue, and initial adaptation, which may affect long-term adherence, particularly among patients with lower baseline fitness or psychological apprehension. On the other hand, moderate-intensity continuous training (MICT) showed slightly lower but still significant improvements in exercise capacity, accompanied by higher adherence rates and greater patient-reported comfort. MICT participants reported feeling more confident and less anxious during sessions, which positively influenced their engagement and continuity. Importantly, neither group experienced major adverse events, affirming that both approaches can be safe when delivered in a closely monitored, medically supervised environment. Heart rate variability and echocardiographic data post-intervention indicated favorable hemodynamic responses in both groups, although the HIIT group showed more pronounced improvements in pulmonary artery pressure reduction. These findings support a stratified model of exercise prescription in PH care: high-intensity training may be suitable for stable, low-risk patients seeking maximal physiological gains, while moderate-intensity protocols may be more appropriate for those requiring a gradual and sustainable approach. Further studies are needed to evaluate the long-term impact of these protocols on morbidity, mortality, and healthcare utilization. Additionally, behavioral support, patient education, and personalized monitoring remain essential to maximize benefits and minimize risks in either training modality.

Conclusion

Both high- and moderate-intensity exercise prescriptions offer measurable benefits for patients with pulmonary hypertension, improving functional capacity, cardiopulmonary efficiency, and quality of life when administered in supervised settings. While high-intensity interval training may yield greater physiological gains, it requires careful patient selection and may be associated with lower adherence in certain subgroups. Moderate-intensity training, in contrast, appears more tolerable and sustainable across a broader patient population, albeit with slightly lesser improvements in peak performance measures. These findings underscore the importance of individualized, risk-adapted exercise prescriptions in pulmonary rehabilitation. Clinicians should consider patient preferences, baseline fitness, psychological readiness, and comorbidity profiles when designing rehabilitation programs. Future research should explore blended training models, longer-term adherence, and cost-effectiveness to further refine exercise strategies for pulmonary hypertension management.

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***Corresponding author:** Kuan-Cheng, Graduate Institute of Clinical Medical Science, China Medical University, Taiwan, E-mail: Kuancheng.l.@gmail.com

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