

DIGITAL THERAPEUTICS ENHANCE CARDIORESPIRATORY FITNESS IN HOME-BASED CARDIAC REHABILITATION

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OBJECTIVE

Despite its well-established benefits, participation in cardiac rehabilitation (CR) remains suboptimal, largely due to limited accessibility and insufficient patient engagement inherent to traditional center-based models. Home-based CR has been proposed as an alternative to center-based programs to improve accessibility and adherence. Recent advances in technology have led to the development of digital therapeutics (DTx), integrating mobile technologies, wearable sensors, and telemonitoring, which are expected to further enhance the effectiveness and reach of CR. This study aimed to evaluate the clinical efficacy of home-based CR supported by a novel digital therapeutic system.

METHODS

Patients with cardiovascular disease who were eligible for CR and had recently undergone revascularization or cardiac surgery were randomized to either the DTx or control group. The DTx group used a chest-worn Holter electrocardiogram device for heart-rate monitoring during exercise, along with a novel software that provided personalized exercise prescriptions based on home-based evaluations and offered real-time monitoring and feedback through a mobile application. The control group received education to perform exercise independently without HR monitoring. All participants were instructed to perform high-intensity interval training three times per week for 12 weeks. The primary outcome was peak oxygen uptake (peak VO₂). The secondary outcomes included quality of life, physical activity index, and depression score.

RESULTS

87 patients (42 DTx, 45 control) completed 3-month follow-up. Peak VO₂ significantly increased in the DTx group (27.0 ± 5.0 to 29.2 ± 5.0 mL/kg/min, P < 0.001) but not in the control group (28.5 ± 5.1 to 29.1 ± 5.3, P = 0.245). Consistently, the DTx group exhibited a significantly greater improvement in peak VO₂ compared to the control group (2.3 ± 2.7 vs 0.6 ± 3.3, P = 0.009). After adjustment for age, sex, and baseline peak VO₂, the adjusted mean peak VO₂ at 3 months was 30.0 (95% CI, 29.1–30.8) in the DTx group and 28.4 (95% CI, 27.6–29.3) in the control group (P = 0.015 by analysis of covariance). Regarding secondary outcomes, within-group analysis revealed a significant improvement in the Korean Activity Scale/Index in the DTx group (64.5 ± 15.0 to 68.0 ± 11.4, P = 0.043), whereas no meaningful change occurred in the control group.

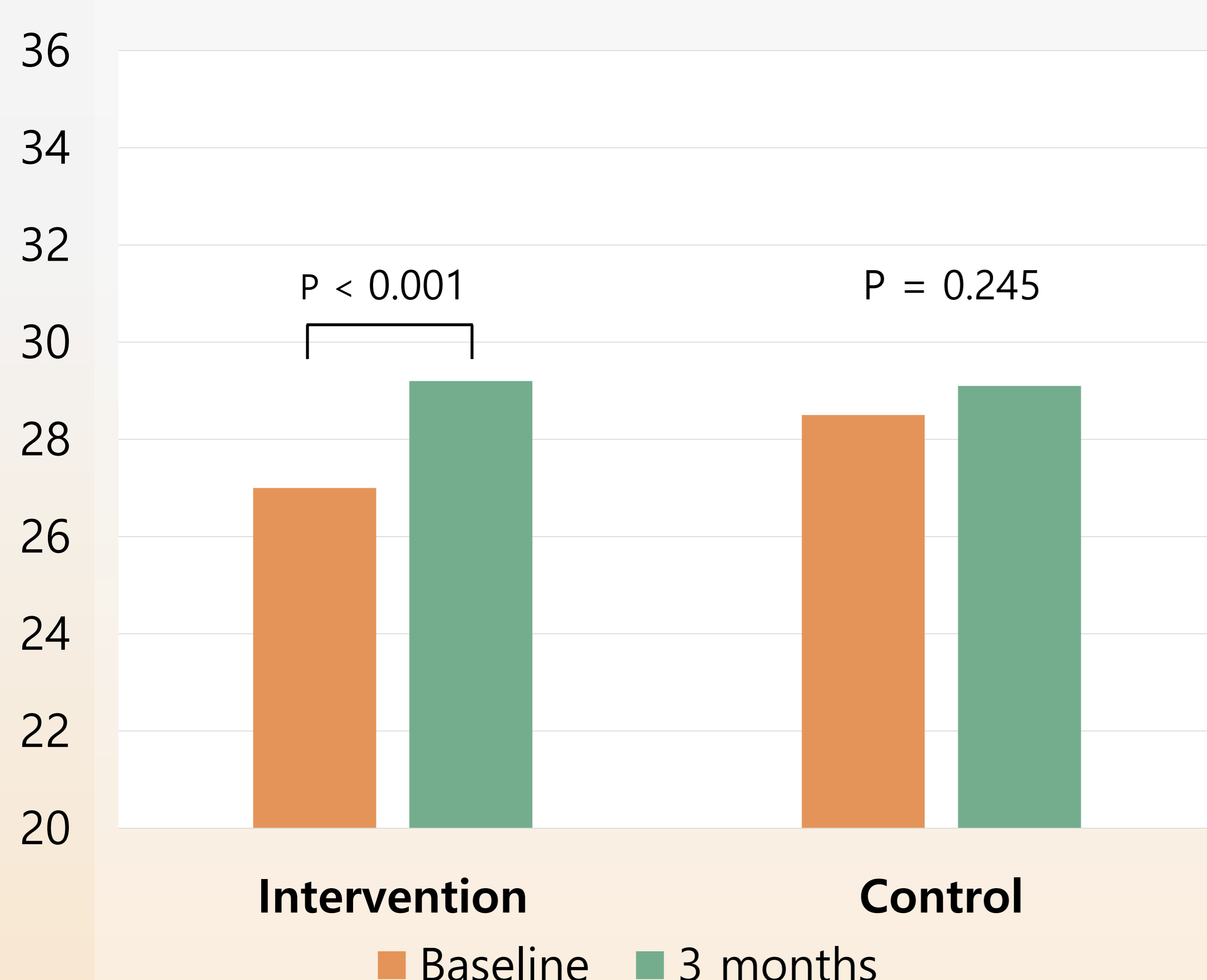


Figure 1. Change in Peak VO₂ Over 3 Months in the Intervention and Control Groups

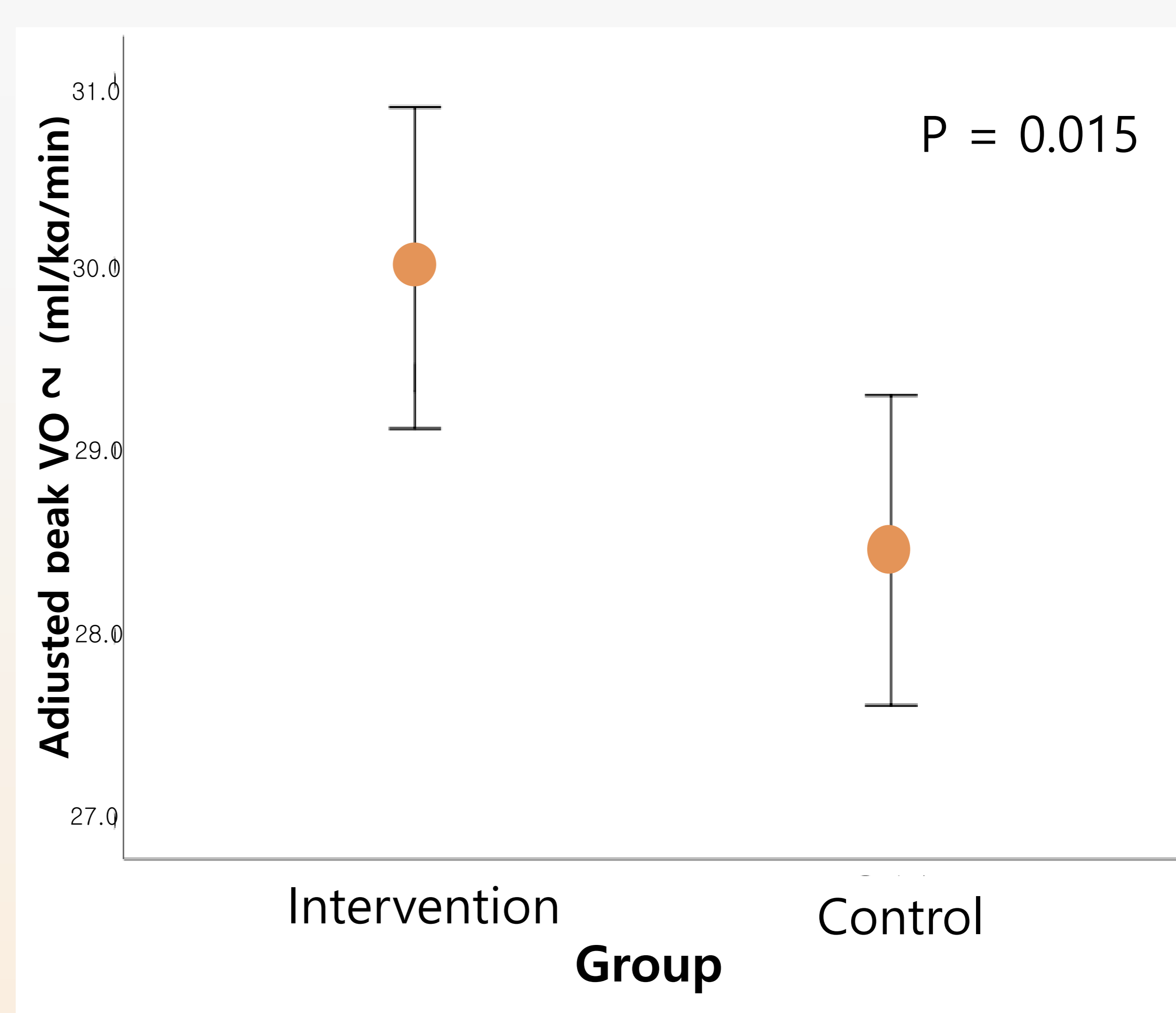


Figure 2. Peak VO₂ at 3 months adjusted for age, sex and baseline VO₂

CONCLUSION

Home-based CR supported by DTx which integrates real-time heart-rate monitoring, remote patient supervision, and individualized exercise prescription, resulted in a significant improvement in exercise capacity compared to conventional self-directed exercise. These findings underscore the potential of digital, home-based CR to enhance overall program effectiveness and extend access to patients who are unable to participate in traditional center-based rehabilitation.