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Proceedings of the 1st International Summit Conference on Exercise Science, Sports Management, Outdoor Recreation, and Physical Education, ExSPORT 2024, 28th - 29th August, Malaysia

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Comparative Analysis of Intermittent Exercise Training with and without Blood Flow Restriction on Physiological and Performance Matric

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Abstract | This study tested the hypothesis that intermittent exercise training (IET) combined with blood flow restriction (BFR) would improve muscle oxygen saturation (SmO2) and exercise performance. We investigated the effects of 6 weeks (3 days per week) of intermittent exercise training combined with BFR on the high-intensity intermittent exercise performance, SmO2, blood [glucose], and rating of discomfort. Following completion of a baseline Yo-Yo intermittent recovery level 1 test (Yo-Yo IR1), twenty-eight young men recreationally active in endurance-based sports were pair-matched and randomly assigned to the IET-BFR and IET-only groups. The IET-BFR group performed IET (50% of the maximum distance covered in Yo-Yo IR1 at baseline in 5 sets) with inflatable cuffs (1.3 × resting systolic blood pressure), and the IET-only group performed the same training without inflatable cuffs. Performance in the Yo-Yo IR1 was 8.3% greater ($p < 0.05$) with IET-BFR (1,444 ± 319 m) compared to IET-only (1,330 ± 362 m) after 18 training sessions. Additionally, the IET-BFR group exhibited significantly higher post-training SmO2% during the Yo-Yo IR1 test ($p < 0.05$). There were no significant differences between groups in blood [glucose] or rating of discomfort. These findings suggest that incorporating BFR into IET protocols could effectively enhance exercise performance, potentially attenuating the decline in local oxygen delivery.

Keywords: *Blood flow restriction, intermittent exercise, muscle oxygenation, exercise performance, endurance training.*

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I. Introduction

Recent studies have suggested that exercise training with blood flow restriction (BFR) may improve muscular strength and hypertrophy [1], but its combined effects with intermittent exercise training (IET) have not been examined [2]. This study examines the effects of a 6-week IET with and without BFR on performance, muscle oxygenation, blood glucose levels, and the rate of discomfort in recreationally active young men.

II. Methods

Twenty-eight young men (*mean* ± SD: age 21 ± 2 years, body mass 59 ± 9 kg, height 1.7 ± 0.09 cm) were divided into: IET-BFR (n = 14) and IET-only (n = 14). The IET-BFR trained with inflatable cuffs on their thighs (154 ± 6 mmHg), while the IET-only trained with minimal pressure cuffs. The training lasted 6 weeks, 3 days/week. Performance was measured using the Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo IR1) [3], muscle oxygenation (SmO2) with the MOXY Muscle Oxygen Monitor [4], and blood glucose levels [5] and the rate of discomfort [6] were recorded.

III. Results and Discussion

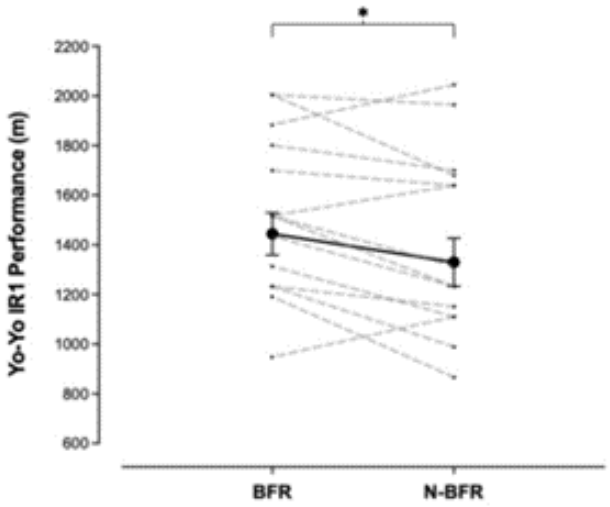

Fig. 1. The distance covered in the Yo-Yo IR1 between IET-BFR and IET-only post training (mean ± SEM and matched pair score).

The IET-BFR group showed an 8.3% improvement in Yo-Yo IR1 performance (1,444 ± 319 m) compared to the IET-only (1,330 ± 362 m, $p < 0.05$, Fig. 1). The SmO2 % was significantly higher ($p < 0.05$, Fig. 2) in the IET-BFR post-training. No significant differences were observed in blood glucose levels or the rate of discomfort.

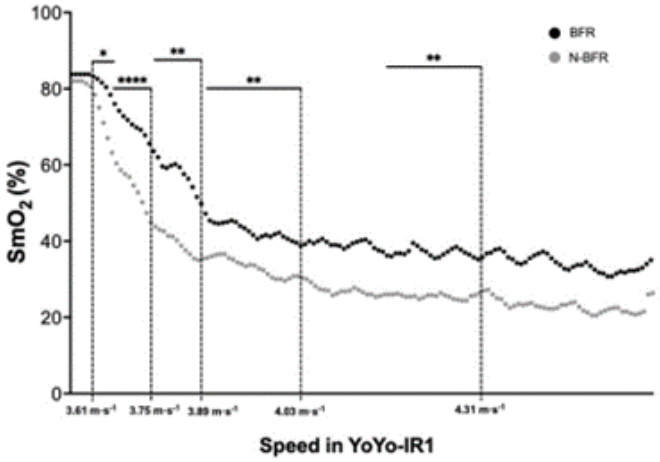

Fig. 2. Muscle oxygenation during Yo-Yo IR1 (*mean* ± *SEM*).

The results support the previous study by [7], demonstrating that incorporating BFR into IET significantly enhances performance and muscle oxygenation, without affecting blood glucose levels or discomfort. Additionally, this suggests BFR-IET as an effective training method for improving endurance in intermittent sports, consistent with previous findings by [8].

IV. CONCLUSIONS

IET-BFR improves performance, possibly by enhancing the muscle's ability to utilize oxygen more efficiently. Using BFR in intermittent sports (e.g., football, basketball, & rugby) training could enhance exercise performance and improve oxygen utilization, making it a useful technique for athletes to enhance their endurance and training efficiency.

ACKNOWLEDGEMENTS We would like to thank the Faculty of Sports Science & Recreation, Universiti Teknologi MARA Negeri Sembilan Branch, Seremban Campus, for their support in this study.

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