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Effect of eight-week sprint interval training on the local muscle oxygen metabolism and aerobic capacity of elite female badminton players

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INTRODUCTION:
Elite badminton players are highly demanded on performing numerous high-intensity multi-shuttles sprints and jumps for saving and attacking. Sprint interval training (SIT) by alternating the interval duration, intensity, and sprinting formats, the specific interval patterns can mimic the intermittent stop-start nature and closely replicate the structure of a typical team and racquet sports game.
One of the critical determinants of aerobic performance is the oxygen utilization ability of skeletal muscles. Whenever an exercise condition creates an imbalance between oxygen supply and consumption (i.e. the use of an aerobic energy system), there are diverse changes in muscle oxygen content. Near-infrared spectroscopy (NIRS) can provide information regarding muscle oxygenation levels, oxygen depletion, and oxygen recovery rates during exercise.
Currently, the study of chronic physiological adaptations to SIT in elite badminton players is lacking. This study aimed to compare the effect of an 8-week SIT and continuous aerobic-based Fartlek endurance training on the aerobic capacity and muscle oxygen contents of elite female badminton players. The empirical findings of this study can inform the coaches and athletes if SIT can be an alternative format to continuous endurance training for aerobic enhancement. Furthermore, the mechanism of improvement is further explained by measuring physiological parameters related to oxygen intake, utilization, and recovery.
METHODS:
Sixteen female badminton players volunteered to participate and were randomly assigned to the SIT group (n = 8) and the control (CON) group (n = 8). The SIT group performed SIT three times a week for eight weeks, while the CON group undertook fartlek running three times a week during the same period. All participants finished the incremental exercise test and arterial occlusion test to assess aerobic capacity and muscle oxygen conditions before and after the intervention. The non-clinical magnitude-based decision (MBD) and the precision of estimation were adopted to compare between and within the groups.
RESULTS:
The results revealed that both SIT (3.7% and d = 0.49) and CON (1.6% and d = 0.43) enhanced VO2max. SIT induced a moderate decrease in oxyhemoglobin difference (O2Hb: -8.2% and d = -0.76) and muscle oxygen consumption (mVO2: -8.2% and d = 0.77), and a moderate increase in super-compensation volume (O2HbS: 8.6% and d = 0.69) as well as a small decrease in recovery time (TR: -4.9% and d = -0.29). CON only showed small decrease in O2Hb (-2.0% and d = -0.31) and mVO2 (-1.9% and d = -0.29).
CONCLUSION:
This study indicates that SIT potentially yields superior performance in local muscle utilization and recovery capabilities, and also the aerobic performance of elite badminton players than continuous Fartlek training. Bike-based SIT might be an alternative to provide trained athletes with an efficient and safe option for aerobic training.

Topic: Physiology

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