TACSM Abstract

The Usage of Skeletal Muscle Oxygenation and Heart Rate Variability as Predictors of Aerobic Fitness.

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ABSTRACT

Heart rate variability (HRV) is used to assess the autonomic nervous system's (ANS) activity on the heart, while skeletal muscle oxygenation (SmO_2) measures how well muscles uptake oxygen from the blood. Both measurements have demonstrated strong associations with cardiorespiratory fitness and are altered with increased exercise workloads. Both have been used to assess athletic performance. While the gold standard for assessing cardiorespiratory fitness is VO_2 max testing, several situations preclude the usage of a true VO_2 max. **Purpose:** To determine if HRV and SmO_2 possess predictive qualities to accurately assess cardiorespiratory fitness levels. **Methods:** Thirty-six healthy fit individuals (n = 22 men; n = 14 women; age 37.6 $\pm$ 12.4 yr; BF% 19.2 $\pm$ 7.1%; VO2max 41.8 $\pm$ 7.4 ml/kg/min) completed a single VO_2 max ramp protocol treadmill test while wearing an infrared oxyhemoglobin (MOXY) Sensor to assess SmO_2 while HRV was assessed via Polar (Bluetooth monitor (Polar H7)) heart rate (HR) monitor. The MOXY Sensor was placed on the lateral-posterior belly of the gastrocnemius while the Polar HR monitor was placed on the distal third of the sternum using an elastic belt. The data was analyzed using a Pearson Correlation to compare SmO_2, HRV indices, and VO_2max associations. In addition, a multiple linear regression analysis was performed to examine the relationship between HRV indices and SmO_2 to VO_2 max. All analyses were performed using SPSS (v. 28.0.1.1). **Results:** There was a significant correlation between VO_2 max, mean of RR intervals (mRR) ($r = 0.440$, $p = 0.007$), and THb Max ($r = 0.509$, $p = 0.002$). mRR and THb Max were able to significantly predictive ($r^2 = 0.365$, $p = 0.001$) VO_2 max outcomes. **Conclusion:** The combination of SmO_2 measurements and HRV can assist in predicting VO_2 max levels, but further research is needed to