SWACSM Abstract

Comparing Muscle Oxygenation and Maximal Blood Lactate Concentration in Middle-Distance Athletes: A Speed Reserve Ratio Analysis

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ABSTRACT

Middle-distance running is a unique discipline that utilizes both aerobic and anaerobic abilities, resulting in a physiologically diverse athlete population. This diversity in athlete makeup underscores the necessity for precise physiological profiling methods to improve individualized training and race strategy approaches. While the Speed Reserve Ratio (SRR) has garnered attention as an accurate and effective tool in athlete profiling, skeletal muscle oxygenation (SmO2) and blood lactate also have shown potential in this field. However, the effectiveness of these biomarkers in middle-distance populations, especially in conjunction with SRR, is less understood. **PURPOSE**: This research aims to understand the relationships between SRR, changes in SmO2, and peak blood lactate concentrations in male middle-distance runners. By establishing correlations between these biomarkers, we aim to evaluate their potential to characterize an athlete's aerobic and anaerobic capabilities, which could enhance personalized training and performance optimization. **METHODS**: Nine male middle-distance runners (age 22.89±2.62 years, weight 71.03±8.42 kg, height 172.03±9.24 cm) were evaluated in two distinct exercise tests. The initial test was a 50m sprint designed to determine max sprint speed (MSS). The subsequent test involved an incremental treadmill protocol that measured VO2 max, max aerobic speed (MAS), the change in SmO2 via a portable near-infrared spectroscopy (NIRS) device, and post-exercise peak blood lactate levels. Pearson correlation coefficients were used to analyze associations. **RESULTS**: Analysis revealed significant correlations between SRR and VO2max ($r = -0.897$, $p = 0.009$), SRR and changes in SmO2 ($r = 0.698$, $p = 0.036$), and between SmO2 and MSS ($r = 0.756$, $p = 0.019$). **CONCLUSION**: The correlations establish a strong link between SRR, VO2max, and SmO2 changes. The data suggests that measuring SmO2 can help predict a middle-distance runner's aerobic and anaerobic capacities, emphasizing its potential as a pivotal biomarker for athlete profiling. Additionally, our findings bolster the SRR's role as a tool for detailed physiological profiling, advocating for its application in athlete evaluation and tailored training recommendations.