Developing a Predictive Model for VO\textsubscript{2MAX} in Middle-Distance Track and Field Athletes

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ABSTRACT

**Purpose:** Aerobic capacity is an indicator of an athlete’s endurance and a key predictor of performance. The greater the aerobic capacity, the more oxygen available for working muscles, leading to delays in lactate buildup, thus increasing the potential for successful performance. Studies have investigated non-exercise and/or submaximal exercise measures to predict aerobic capacity, but few have analyzed the combination of maximal exercise and non-exercise measures in Division-3 runners. Therefore, the purpose of this pilot study is to determine the predictive ability of heart rate (HR\textsubscript{max}), ventilation (VE), respiratory quotient (RQ), and rate of perceived exertion (RPE) on VO\textsubscript{2max} in middle distance track and field runners. **Methods:** Eleven Division-3 400- and 800m runners (F:5, M:6, age 18-24) reported to the Human Movement Laboratory twice. HR\textsubscript{max}, RQ, and RPE were collected during VO\textsubscript{2max} testing using a CosMed treadmill and Cardiopulmonary Exercise Test (CPET), while VE was obtained through spirometry testing. A multiple regression analysis (\(\alpha=0.05\)) was used to predict VO\textsubscript{2max} from HR\textsubscript{max}, VE, RQ, and RPE. Additionally, the pool was split by sex, and correlations were run to assess relationships among variables (\(\alpha=0.05\)). **Results:** The multiple regression model statistically significantly predicted VO\textsubscript{2max} (\(p= 0.018, \text{adj. } R^2= 0.71\)). Both HR\textsubscript{max} (\(p= 0.004\)) and VE (\(p=0.014\)) added to the statistically significant prediction. Correlation results indicate a positive relationship between HR\textsubscript{max} and VO\textsubscript{2max} in males (\(r=0.90, p=0.015\)) and females (\(r=0.97, p=0.006\)). **Conclusions:** HR\textsubscript{max} contributed significantly to the model predicting VO\textsubscript{2max}. VE also proved to be a significant contributor to the prediction of VO\textsubscript{2max}. These results suggest that increasing VE through breathing training may positively influence VO\textsubscript{2max} and performance in middle-distance runners. Future studies should formulate breathing exercises that work the respiratory muscles and test the effectiveness of breathing training in improving aerobic capacity in athletes.