Predicting VO$_{2max}$ in Collegiate American-Style Football Athletes

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ABSTRACT

INTRODUCTION: Maximal oxygen uptake (VO$_{2max}$) is an important measurement for athletic performance. A common method of VO$_{2max}$ prediction is the Foster equation (MSSE, 1996). This equation produces accurate predictions in a normal population, however, significant difference has been noted between predicted and measured VO$_{2max}$ values when testing athletes. While other studies have produced new equations for athletes in general or even for soccer players, to our knowledge none have made one specifically for American-style football players. PURPOSE: The aim of this study is to develop an accurate VO$_{2max}$ prediction equation for collegiate American-style football athletes for testing on the treadmill with the standard Bruce protocol. METHODS: Over 13 years, a total of 413 collegiate American football players (age: 18.5 ± 1.15 yrs, height: 186.8 ± 7.0 cm, weight 102.1 ± 20.8 kg) were assessed for VO$_{2max}$ (Medical Graphics, Corp® Metabolic Cart) using the standard Bruce treadmill protocol. Linear regression analysis (JMP v. 12) determined which factor out of height, weight, or time spent on the test had a greater impact on VO$_{2max}$. The linear regression analysis of the most significant factor against VO$_{2max}$ produced a prediction equation. Predicted VO$_{2max}$ was calculated using these data in both the Foster equation and this novel equation. Predicted values were compared to actual measured values with a t-test. $\alpha=0.05$ for all statistical tests. RESULTS: Of all the factors, time had the strongest relationship ($p<0.0001$; $r^2=0.6464$). The linear regression between VO$_{2max}$ and time produced a prediction equation: VO2max= -3.546 + 3.904(time in minutes). Both the Foster equation and this new equation were significantly and positively correlated with the actual VO$_{2max}$ values (Foster=0.805, New r=0.804). However, t-tests indicate that the Foster equation results were significantly different from the measured values ($p=0.0007$), and the new model's results were not significantly different ($p=1.0$). CONCLUSION: The Foster equation is not a reliable predictor of VO$_{2max}$ as assessed on a treadmill in collegiate American-style football athletes. This new equation is more accurate to predict VO$_{2max}$ in this population.