Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
PO-136

Cycling Incremental test using Breath-by-breath Metabolic Cart to Predict VO2 max

Fei Wang[1],Haixia Fu[2]
1.Sport Science Institute， Shanxi University
2.School of Physical Education， Shanxi University

Objective Maximal oxygen uptake (VO_2 max) is a key indicator to assess health as well as sports performance. In heterogeneous, athletic populations, VO_2 max is one of the most frequently measured variables in exercise physiology laboratories. The purpose of this study was to investigate the relationship between Maximal oxygen uptake with other metabolism parameters during one high-intensity activity, and provide simple solution for VO_2 max prediction.
Methods A total of 27 young athletes were selected. The incremental test was performed on a cycle ergometer (Monark 874 E, Sweden). Participants warmed up for 5 min at 50 watts (W); thereafter, the power output was increased 125 W every 3 min until exhaustion, which was defined as the incapacity to maintain a pedal cadence above 60 revolution per minute (rpm). Oxygen uptake ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$) and other metabolism indexes were obtained breath-by-breath throughout the test using a metabolic cart (Quark b[2], COSMED, Italy). Heart rate (HR) was measured throughout the test using a HR monitor (Polar Vantage NV, Finland). The main method in the VO_2 prediction is the use of a mixed effects regression model. The potential explanatory variables include VO_2kg (functional data with information on oxygen consumption per kg weight during the test), HR (functional data with heart rate information during the test), MHR (maximum heart rate of the athlete), VO_2kgmean (average oxygen consumption during the test), VO_2kgmax (maximum oxygen consumption value during the test), VCO_2 (carbon dioxide emissions per minute during the test), HRmean (heart rate average), HRmax (maximum heart rate value during the test), age, height, weight. The model statistical analyses were implemented in R platform (version 3.3.3).
Results (1) regression model results revealed MHR did not have stronger effects on VO_2 max prediction. **(2)** Parameters of VO_2kg, HR, HRmean, height, weight showed relative higher r^2 values and lower RMSE values indicating the possible indexes for VO_2 max prediction. **(3)** the interaction effects occurred between indicators which increase the complexity of the model.
Conclusions In this study, a simple methodology for the prediction of maximum oxygen consumption has been presented. It combines a relatively simple level of base metabolism parameters. Despite the easy test and low level of exercise required the test provides an rational prediction of VO_2 max, which could provide necessary information when it applied as a simple way.