Prediction Equations for Competitive Male and Female Collegiate Road Cyclists

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ABSTRACT

The convenience and cost of metabolic measurements for oxygen consumption can be problematic. PURPOSE: The purpose of this study was to establish prediction equations for oxygen consumption applicable to collegiate, competitive male and female bicyclists. METHODS: Subjects were thirty-eight (n=38) female (n=10) and male (n=28) collegiate road cyclists. Prior to testing, each subject signed a university Institutional Review Board (IRB) approved informed consent. Resting measures were the following: age (y), height (cm), weight (kg) and body fat (%). Exercise measures were taken during a cycle ergometer test utilizing the Australian Institute of Sport (AIS). The ergometer test for males began at 150 watts (w) for five minutes with 25 w increases each minute after until volitional fatigue. The female protocol began at 125 w with 25 w increases each minute after until volitional fatigue. Measures taken during the cycle (Velotron™) test were the following: oxygen consumption (VO_2, mL*kg^{-1}*min.$^{-1}$), carbon dioxide production (L*min.$^{-1}$), heart rate (b*min.$^{-1}$), power (watts), time to exhaustion (TE, min). Statistical procedures included group means (standard deviation, SD), a Pearson Product R Correlation Coefficient and Multiple Stepwise Regression Analyses. Alpha was set *a priori* at $p \leq 0.05$. RESULTS: Group means (SD) for measures were the following for male and female subjects, respectively: age (y), 28.9 (12.2), 22.3 (5.3); height (cm), 177.3 (5.5), 167.7 (6.3); weight (kg), 75.8 (7.4), 63.5 (10.2); body fat (%), 10.01 (4.2), 22.9 (3.6); maximal VO_2 (mL*kg^{-1}*min.$^{-1}$), 84.9 (4.6), 63.1 (14.1); maximal power (w), 382.1 (46.5), 275 (42.5); maximal heart rate (b*min.$^{-1}$) 191.5 (9.8), 190 (7.8); TE (min.), 13.5 (2.9), 10.8 (1.7). Significant ($p < 0.05$) equations were the following: male $VO_2max = (.12*power) + (.21*HR) - 8.4$; female $VO_2max = (0.06*power) + (0.25*HR) - 8.7$. DISCUSSION: Significant prediction equations were established for male and female collegiate cyclists utilizing the independent variables of power and heart rate. These equations and their independent variables allow for accurate predictions of VO_2 without the need for metabolic gas analysis.