TACSM Abstract

Blood Lactate Kinetics Established Through Polynomial Line of Best Fit

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ABSTRACT

PURPOSE: The purpose of this research is to determine a consistent line of best fit to mathematically define blood lactate kinetics during an incremental test to volitional fatigue. METHODS: There were 28 male and 10 female (n=38) subjects. Prior to testing, subjects signed an informed consent approved by the Institutional Review Board (IRB) for humans as subjects at Midwestern State University. Resting measures include: age (y), height (cm), weight (kg), body fat (%). The exercise measures of heart rate (HR, $b*min.^{-1}$), minute volume of oxygen consumption (VO_2, $mL*kg^{-1}*min.^{-1}$) and blood lactate (BLa, mM) were taken during a maximal cycle ergometer (Velotron™) test utilizing the Australian Institute of Sport (AIS) cycle ergometer protocol. The aforementioned measures were taken each minute during the test until volitional fatigue. Statistical measures included means (standard deviation, SD) for group analysis. Trend line analysis was utilized to determine the line of best fit for BLa kinetic analysis. A coefficient of determination was used to establish level of association between the line of best fit and BLa kinetics. 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), peak BLa (mM), 12.7 (2.8), 9.3 (0.71). Third (3) order polynomial line of best fit was established for male and female BLa kinetics during the cycle ergometer test. Male and female polynomial equations with coefficient of determination (R^2) are the following, respectively: Male, $y = -(7 \times 10^{-7}) x^3 + 0.0007x^2 - 0.2104x + 19.917$, $R^2 = 0.9982$; Female, $y=-(2 \times 10^{-6}) x^3 + 0.0012x^2 - 0.2452x + 18.268$, $R^2 = 0.9892$. CONCLUSION: Within the sample tested, blood lactate kinetics showed a consistent kinetic pattern with male and female cyclists. Trend line analysis indicates a 3rd order polynomial line of best fit was highly associated with BLa kinetics.