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MAOD Is Estimated by Sum of Contributions

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Abstract : Maximal accumulated oxygen deficit (MAOD), the gold standard measure of anaerobic capacity, is the difference between the oxygen cost of exhaustive severe intensity exercise and the accumulated oxygen consumption (O2; mL·kg–1). In theory, MAOD can be estimated as the sum of independent estimates of the phosphocreatine and glycolysis contributions, which we refer to as PCr+glycolysis. Purpose: The purpose was to test the hypothesis that PCr+glycolysis provides a valid measure of anaerobic capacity in cycling and running. Methods: The participants were 27 women (mean ± SD, age 22 ±1 y, height 165 ± 7 cm, weight 63.4 ± 9.7 kg) and 25 men (age 22 ± 1 y, height 179 ± 6 cm, weight 80.8 ± 14.8 kg). They performed two exhaustive cycling and running tests, at speeds and work rates that were tolerable for ~5 min. The rate of oxygen consumption (VO2; mL·kg–1·min–1) was measured in warmups, in the tests, and during 7 min of recovery. Fingerprick blood samples obtained after exercise were analysed to determine peak blood lactate concentration (PeakLac). The VO2 response in exercise was fitted to a model, with a fast 'primary' phase followed by a delayed 'slow' component, from which was calculated the accumulated O2 and the excess O2 attributable to the slow component. The VO2 response in recovery was fitted to a model with a fast phase and slow component, sharing a common time delay. Oxygen demand (in mL·kg–1·min–1) was determined by extrapolation from steady-state VO2 in warmups; the total oxygen cost (in mL·kg–1) was determined by multiplying this demand by time to exhaustion and adding the excess O2; then, MAOD was calculated as total oxygen cost minus accumulated O2. The phosphocreatine contribution (area under the fast phase of the post-exercise VO2) and the glycolytic contribution (converted from PeakLac) were summed to give PCr+glycolysis. There was not an interaction effect involving sex, so values for anaerobic capacity were examined using a two-way ANOVA, with repeated measures across method (PCr+glycolysis vs MAOD) and mode (cycling vs running). Results: There was a significant effect only for exercise mode. There was no difference between MAOD and PCr+glycolysis: values were 59 ± 6 mL·kg–1 and 61 ± 8 mL·kg–1 in cycling and 78 ± 7 mL·kg–1 and 75 ± 8 mL·kg–1 in running. Discussion: PCr+glycolysis is a valid measure of anaerobic capacity in cycling and running, and it is as valid for women as for men.

Keywords : alactic, anaerobic, cycling, ergometer, glycolysis, lactic, lactate, oxygen deficit, phosphocreatine, running, treadmill

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