

## MAOD Is Estimated by Sum of Contributions

**Authors :** David W. Hill, Linda W. Glass, Jakob L. Vingren

**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 (O<sub>2</sub>; mL·kg<sup>-1</sup>). 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 (VO<sub>2</sub>; mL·kg<sup>-1</sup>·min<sup>-1</sup>) 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 VO<sub>2</sub> 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 O<sub>2</sub> and the excess O<sub>2</sub> attributable to the slow component. The VO<sub>2</sub> 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<sup>-1</sup>·min<sup>-1</sup>) was determined by extrapolation from steady-state VO<sub>2</sub> in warmups; the total oxygen cost (in mL·kg<sup>-1</sup>) was determined by multiplying this demand by time to exhaustion and adding the excess O<sub>2</sub>; then, MAOD was calculated as total oxygen cost minus accumulated O<sub>2</sub>. The phosphocreatine contribution (area under the fast phase of the post-exercise VO<sub>2</sub>) 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<sup>-1</sup> and 61 ± 8 mL·kg<sup>-1</sup> in cycling and 78 ± 7 mL·kg<sup>-1</sup> and 75 ± 8 mL·kg<sup>-1</sup> 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

**Conference Title :** ICPOCMB 2020 : International Conference on Post-Exercise Oxygen Consumption and Metabolic Bases

**Conference Location :** Madrid, Spain

**Conference Dates :** March 26-27, 2020