*TACSM Abstract*

# An Alternate to Accumulated Oxygen Deficit (AOD) for Measuring Anaerobic Contribution: 'AODalt' is Valid in Normoxia and Hypoxia

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ABSTRACT

Accumulated oxygen deficit (AOD) is the gold standard measure of anaerobic contribution; however, its calculation requires several contentious assumptions and it is time-consuming, requiring participants to perform a number of submaximal exercise bouts to establish exercise efficiency. A new method, AODalt, requires performance of only a single bout of exercise, and is based on the presumption that the fast phase of the post-exercise oxygen uptake ($VO_2$) profile reflects the alactic or phosphocreatine (PCr) contribution and that the exercise-induced increase in blood lactate concentration is quantitatively related to the lactic or glycolytic contribution representing a measure of total anaerobic contribution. **PURPOSE:** The purpose of this study was to investigate the validity of an alternate measure, AODalt. **METHODS:** In *Study One*, six women (mean ± SD age, 23 ± 1 y) and three men (23 ± 0 y) performed three 6-min bouts of heavy intensity cycle ergometer exercise, one in normoxia ($F_IO_2$ ~21 %) and two under hypoxic conditions ($F_IO_2$ ~15 % and ~12 %). In *Study Two*, four women (23 ± 1 y) and two men (23 ± 0 y) performed severe intensity tests to exhaustion, one in normoxia (time to exhaustion ~10 min) and two in hypoxia ($F_IO_2$ ~15 % and ~10 %; time to exhaustion ~7½ min and ~4 min). Physiological responses were measured during exercise and during 7 min of recovery. **RESULTS:** In 6 min of heavy exercise, *Study One*, the alternate and criterion measures of anaerobic contribution (AODalt and AOD, respectively) were correlated both in normoxia and in hypoxia ($r \geq 0.82$, $p < 0.01$) although AODalt values were slightly lower ($p < 0.01$) in normoxia (25 ± 3 mL·kg$^{-1}$ *vs* 28 ± 4 mL·kg$^{-1}$). In exhaustive severe intensity exercise, *Study Two*, the two measures of anaerobic capacity were correlated ($r \geq 0.77$, $p \leq 0.02$) and not different ($p \geq 0.43$) in normoxia and at $F_IO_2$ ~15 % (*e.g.*, 51 ± 9 mL·kg$^{-1}$ *vs* 49 ± 8 mL·kg$^{-1}$ in normoxia). However, the AODalt and AOD values were neither correlated ($r = 0.27$, $p = 0.44$) nor similar ($p < 0.01$; 57 ± 8 mL·kg$^{-1}$ *vs* 51 ± 7 mL·kg$^{-1}$) at $F_IO_2$ ~10 %. **CONCLUSION:** These results confirm the validity of AODalt as a measure of anaerobic contribution / anaerobic capacity in severe intensity exercise, demonstrate its validity in heavy intensity exercise, and assert its validity in conditions of hypoxia ($F_IO_2 \geq 12\%$).