TACSM Abstract

Effect of Hypoxia on VO2 Kinetics and Aerobic and Anaerobic Contributions in Severe Intensity Cycling Exercise

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ABSTRACT

During severe intensity exercise performed at altitude or under hypoxic conditions, there is little room for a compensatory increase in cardiorespiratory responses above those associated with VO_{2max} in normoxia, as VO_{2max} (the limit for a compensatory response) will be reduced compared to normoxia values. Although there is little involving research in the severe domain in a very low FiO_2 (FiO_2 < 11%), there were mixed findings compared to the heavy intensity exercise, mainly due to different study designs. **PURPOSE:** The purpose of this study was to investigate the effect of hypoxia on VO_2 kinetics and metabolic responses during severe intensity exercise. **METHODS:** In this study, four women (23 ± 1 y) and two men (23 ± 0 y) completed three constant power, severe intensity cycle ergometer tests to exhaustion, one in normoxia and two under hypoxic conditions (FiO_2 = ~15 % and FiO_2 = ~10 %). Cardiorespiratory, metabolic, and perceptual responses were measured throughout the exhaustive, severe intensity constant power exercise. **RESULTS:** In severe intensity exercise, compensatory responses were not adequate to maintain hemoglobin saturation and VO_2 kinetics were impacted. In severe intensity exhaustive exercise, with an FiO_2 of ~10 %, the amplitude of the primary response was 5 $mL \cdot kg^{-1} \cdot min^{-1}$ lower in hypoxia (p = 0.02 compared to normoxia). The amplitude of the slow component did not change. The maximal accumulated oxygen deficit was not significantly different between all 3 conditions (49, 51, and 51 $mL \cdot kg^{-1}$, respectively). **CONCLUSION:** Healthy young individuals are quite resilient in the face of reductions in FiO_2 to ~15% (roughly equivalent to an altitude of 2400 m) and even ~10 % (~5500 m). Under hypoxic conditions, the cardiorespiratory response is not sufficient to meet the metabolic demands of exercise and therefore performance time is reduced. MAOD was not significantly different across FiO_2 conditions, implying that the shorter time to exhaustion in hypoxic conditions is due to the reduced aerobic contribution. The results of this study suggest that there is a greater reliance on anaerobic pathways in hypoxic conditions.