ACUTE EFFECT OF AN INCREASED FRACTION OF INSPIRED OXYGEN ON CRITICAL POWER AND ANAEROBIC WORK CAPACITY IN HIGHLY TRAINED ATHLETES.
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It has been demonstrated in the literature that a modification of the fraction of inspired O2 (FIO2) can influence the outcome of critical power (CP), without a change in anaerobic work capacity (AWC) (Moritani et al., 1981, Whipp et al., 1982). The purpose of this study was to examine the influence of an elevated FIO2 (0.45) on the power-time (P-t) relationship in highly trained males. 12 subjects (Age: 28±8yrs, Wt: 72.4±5.3kg, Ht: 177.3±5.2cm, VO2peak: 4.42±0.30L·min-1, MAP: 381±22W) performed a maximal incremental cycle test and twelve exhaustive constant load tests (ET): three times a series of four ET corresponding to 144, 113, 91 and 84% of maximal aerobic power (MAP). Series 1 (PRE) was performed in normoxia (NORM), series 2 was in hyperoxia (HYPER) (0.45) and series 3 (POST) was again in NORM. The order of tests within each series was randomized. CP and AWC were determined for each series using the power inverse time model (Whipp model) (Whipp et al., 1982) and the work vs time (W-t) model (Monod and Scherrer, 1965). Pulse oximetry was measured with a temporal sensor.

Time to exhaustion (TE) was significantly increase by HYPER when compared to PRE (PRE: ET1: 64±9s, ET2.5: 139±20s, ET6: 346±51s, ET10: 580±82s vs HYPER: ET1: 75±8s, ET2.5: 182±35s, ET6: 630±179s, ET10: 1061±229s) corresponding to an improvement of 17, 31, 82 and 83% respectively. PRE and POST TE were not significantly different. Total work followed the same trends as TE. When regressions between percent improvement (%imp) in TE and %impSpO2 were performed, %impSpO2 explained ET1: 13%, ET2.5: 20%, ET6: 77% and ET10: 48% of the variance in %impTE. CP was significantly increased by HYPER when compared to PRE and POST, with both models (Whipp: PRE: 300±23W, HYPER: 314±23W, POST: 294±25W; W-t: PRE: 290±25W, HYPER: 302±26W, POST: 285±23W). AWC was also found to be increased by HYPER when compared to PRE (Whipp: PRE: 16.3±2.8kJ, HYPER: 18.0±2.0kJ, POST: 17.6±1.8kJ; W-t: PRE: 18.3±2.8kJ, HYPER: 21.7±2.4kJ, POST: 19.4±2.5kJ). R2 for both models demonstrated linearity of the relationship (Whipp: >0.9853, W-t: >0.9985).

It has been believed that CP would be representative of the aerobic component of the P-t relationship whereas AWC would represent the anaerobic component of the relationship. The findings from this study indicate that a modified FIO2 may not only influence CP but also AWC, unlike findings from Moritani et al. (1981) and Whipp et al. (1982), possibly due to low sample size (N=2 and N=5 respectively). Our results lead to further questioning of the validity of the underlying constructs of CP and AWC. Finally, it is interesting to note that O2 availability may also prove to be a contributing limiting factor for performances of one minute.

References

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