

Glutathione Peroxidase Enzymatic Activity in Response to Transient Hypercapnic Aerobic Exercise

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ABSTRACT

Nasal breathing (NB) during aerobic exercise has gained attention due to its potential benefits to physical performance and health adaptations. However, it is unclear how an NB-induced increase in the partial pressure of CO₂ (PetCO₂) affects the enzymatic activity of glutathione peroxidase (GPX). **PURPOSE:** To determine the activity of GPX after 1-month of transient hypercapnic training induced by NB. **METHODS:** Fourteen males (age = 20.57 ± 1.22 yrs) were randomized to either the NB (*n* = 8) or combined breathing (CB, *n* = 6) group. Participants performed supervised aerobic training 4 times per week at ~70% of VO_{2max} for one month. During baseline (V1) and post-intervention (V2) visits, participants completed a maximal aerobic exercise test (VO_{2max}) on a recumbent bike and plasma samples were collected at pre- and immediately post-VO_{2max}. Plasma GPX enzymatic activity was examined at 1-minute intervals from zero to 8 minutes following NADPH oxidation. A Pearson correlation analysis examined the relationship between respiratory performance during the VO_{2max} test. A one-way ANOVA was utilized to examine respiratory differences between the NB and CB groups. **RESULTS:** The post-exercise GPX enzymatic activity was negatively associated [*r*(6) = -0.850, *p* = 0.007] with PetCO₂ at 100% VO_{2max} during V1 only in the NB group. Moreover, there was a significant difference (*p* = 0.013) in PetCO₂ between the NB (31.59 ± 4.18 mmHg) and CB (25.65 ± 3.17 mmHg) groups at 100% VO_{2max} during V1, where the post-exercise GPX activity of the NB (130.85 ± 25.28 nmol/min/mL) and CB (125.22 ± 23.47 nmol/min/mL) groups showed an apparent difference although it did not reach statistical significance. At V2, both NB (141.35 ± 33.04 nmol/min/mL) and CB (139.23 ± 30.42 nmol/min/mL) significantly increased (*p* = 0.039) the post-exercise GPX activity from their respective V1 values. Lastly, the association between post-exercise GPX activity and PetCO₂ seen during V1 in the NB group was no longer present at V2, suggesting a potential adaptation to the training. **CONCLUSION:** Though bouts of transient hypercapnic aerobic exercise might negatively affect GPX activity, we present preliminary evidence indicating that the potential link between an increased PetCO₂ and GPX inhibition may be blunted or no longer a factor of concern following 1-month of NB training.