

Enhancing Oxygen Uptake Efficiency Through Nasal Breathing in Aerobic Exercise

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ABSTRACT

An individual's ability to use oxygen to sustain aerobic performance, as denoted by the oxygen uptake efficiency (OUE), is calculated by dividing oxygen uptake (VO_2) by ventilation (VE). Whether nasal breathing (NB) during exercise would improve OUE more significantly compared to combined breathing (CB) remains uncertain. **PURPOSE:** To determine the effects of utilizing NB during exercise on OUE.

METHODS: Fourteen males (age: 20.57 ± 1.22 yrs; BMI: 26.03 ± 3.16 kg/m²) were randomly assigned to the NB (n = 8) or CB (n = 6) group for a 4-week supervised aerobic exercise intervention conducted four times per week for 30 minutes at moderate intensity (70% maximal heart rate). VO_{2max} tests were performed during the pre- (week 0) and post-study (week 4) periods on a recumbent bike to determine the change in OUE, VO_2 , and VE at varying intensities (40%, 55%, 70%, 85%, and 100% of VO_{2max}). The OUE was calculated as VO_2 (L) \div VE (L). A one-way ANCOVA, controlling for OUE, VO_2 , and VE at pre-study, was utilized to examine if NB elicited cardiorespiratory adaptations that were superior to the CB training at post-study. A paired-sample t-test examined changes in OUE, VO_2 , and VE throughout the GXT from week 0 to week 4. Data are presented as mean \pm standard error. **RESULTS:** The NB group demonstrated significantly greater [F(1,11) = 7.213, p = 0.021] OUE (0.048 ± 0.002) at 85% of VO_{2max} than the CB (0.037 ± 0.003) group. Similarly, the NB group had a significantly greater (p = 0.014) OUE (0.025 ± 0.001) at 100% of VO_{2max} than the CB (0.021 ± 0.001) group. Only the NB group experienced significant improvements after exercise training in VO_2 at 40% (p = 0.003, 12.02 ± 0.50 to 13.72 ± 0.59 mL \cdot kg⁻¹ \cdot min⁻¹), 55% (p = 0.006, 16.68 ± 0.71 to 18.87 ± 0.81 mL \cdot kg⁻¹ \cdot min⁻¹), 70% (p = 0.005, 21.16 ± 0.93 to 24.00 ± 1.01 mL \cdot kg⁻¹ \cdot min⁻¹), 85% (p = 0.004, 25.81 ± 1.11 to 29.03 ± 1.23 mL \cdot kg⁻¹ \cdot min⁻¹), and 100% VO_{2max} (p = 0.005, 30.31 ± 1.30 to 34.18 ± 1.48 mL \cdot kg⁻¹ \cdot min⁻¹). While not statistically significant, the NB group displayed a trend of reduced VE compared to the CB group. **CONCLUSION:** The integration of NB during aerobic exercise enhanced the OUE, particularly at higher intensities, compared to CB. This adaptation is noteworthy, as the NB group achieved a comparable range of VO_2 as the CB group while maintaining a lower VE after just 1-month of training. This denotes that NB could promote enhanced oxygen movement. Future studies are warranted to investigate additional health adaptations resulting from such training benefits.