

INFLUENCE OF ELEVATED OXYGEN FRACTION ON BREATHING GAS CONSUMPTION DURING PHYSICAL WORKLOAD IN SHALLOW-WATER SUBMERSION

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Background: Using oxygen enriched air (EAN) as breathing gas has become increasingly popular in recreational diving for the benefits of increased oxygen partial pressure (p_{O_2}) and lowered nitrogen partial pressure (p_{N_2}). Whereas many beneficial and detrimental effects of altered gas fractions are known, little is known about the influence of p_{O_2} on GC in underwater settings. **Aim:** As safety is highly important when acting or working underwater this study investigated a possible relationship between breathing gas O_2 -fraction and gas consumption (GC) during physical exercise (PE).

Method: Eleven divers (age: 25.8 ± 4.1 ; mean \pm SD; 6 females) participated in this prospective double-blind, cross-over study. Participants performed two dives each, swim-diving with increased speed until exhaustion while using either normal air (AIR) or EAN40 as breathing gas. Heart rate (HR) and GC were measured throughout the dive, lactate samples were taken once before and five times directly after the dive.

Results: Rest HR was 96 ± 4 beats \cdot min⁻¹ and increased to 170 ± 4 beats min⁻¹ for $0.8 \text{ m} \cdot \text{s}^{-1}$ swim-diving speed. Anovas revealed a significantly lower GC with EAN40 ($35 \pm 2 \text{ l} \cdot \text{min}^{-1}$; $62 \pm 7 \text{ l} \cdot \text{min}^{-1}$) compared to AIR ($44 \pm 4 \text{ l} \cdot \text{min}^{-1}$ and $73 \pm 8 \text{ l} \cdot \text{min}^{-1}$) only for the velocities $0.6 \text{ m} \cdot \text{s}^{-1}$ and $0.8 \text{ m} \cdot \text{s}^{-1}$ (both $p \leq 0.05$).

Discussion/Conclusion: These findings suggest that GC is influenced by the oxygen fraction in breathing gas when swim-diving in shallow-water with high PE (velocity $\geq 0.6 \text{ m} \cdot \text{s}^{-1}$). The findings might become important for dives with limited gas supply and involuntary or planned high physical exercise.