

Wearable Positive End-Expiratory Pressure Valve Improves Exercise Performance

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ABSTRACT

Positive end-expiratory pressure (PEEP) provides benefits to pulmonary patients, yet effects in healthy, exercising adults are unknown. **PURPOSE:** We designed two experiments (EXP) to test a novel PEEP (4.2 cmH₂O PEEP) mouthpiece (PMP) on maximal cycling performance of physically active volunteers. **METHODS:** EXP-1 PMP vs. control (CON) mouthpiece (N=9, Age=30±2 yr, Weight=72.2±3.7 kg, BMI=24.4±1.2, 5 ♂); and EXP-2 PMP vs. no mouthpiece (NMP) (N=10, Age=27±1 yr, Weight=76.7±3.6 kg, BMI=23.9±0.8, ♂). Exercise test procedures for both experiments were identical. On Day 1, under the first mouthpiece condition assigned at random subjects performed graded exercise cycling testing (GXT) (Corival®) for VO_{2peak} (ml·kg⁻¹·min⁻¹), oxygen pulse (mlO₂·bt) (O₂pulse), GXT endurance time (s) (GXT-T), and VO₂(ml·kg⁻¹·min⁻¹)-at-ventilatory-threshold (VO₂@VT). Subjects returned 72 h later (Day 2), to complete an endurance ride timed (s) to exhaustion (VTER) at an intensity equivalent to their VO₂@VT power (W). One week later, subjects repeated exercise testing protocols (Days 3 & 4, time-of-day controlled) under the alternate mouthpiece condition. **RESULTS:** Selected outcomes were as follows (paired T-test, *<0.05) **PMP vs. CON, respectively:** VO_{2peak}= 45.2±2.4* vs. 42.4±2.3; VO₂@VT= 33.7±2.0 vs. 32.3±1.6; GXT-T=521.7±73.4* vs. 495.3±72.8; VTER=846.2±166.0 vs. 743.1±124.7; O₂pulse=24.5±1.4* vs. 23.1±1.3. **PMP vs. NMP, respectively:** VO_{2peak}=43.3±1.6* vs. 41.7±1.6; VO₂@AT=31.1±1.2* vs. 29.1±1.3; GXT-T=511.7±49.6 vs. 486.4±49.6; VTER 872.4±134.0 vs. 792.9 ± 122.4; O₂pulse=24.1±0.9* vs. 23.4±0.9. **CONCLUSION:** These results demonstrate that the novel PEEP mouthpiece we tested confers a significant performance benefit to cyclists completing high intensity exercise. By extension, it is likely to be an advantage in any physical activity having an aerobic component.