Acute breath-holding does not improve 3km cycling time trial performance

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Purpose: Intense exercise evokes a spleen contraction releasing red blood cells into the blood circulation. This improves oxygen transport capacity which is beneficial for performance. The same mechanism is found following acute apnea, increasing [Hb] by 2 to 5%. Therefore, the aim was to examine whether pre-race apnea can improve performance in a 3km time trial (TT) through apnea-induced spleen contraction before the onset of exercise.

Methods: 11 recreationally active subjects performed 3km cycling TT following a 10 minute warm-up in 3 different conditions: an apnea (one maximal static apnea finishing 3 minutes before TT), control and placebo condition. Power output, maximal heart rate and VO\textsubscript{2} uptake were continuously measured. Lactate and venous [Hb] were sampled at baseline, after warm-up and before TT.

Results: Interaction effects (F=3.475, p=0.049) for [Hb] values revealed that including an apnea during the rest period evoked a positive change in [Hb] pattern. With completion times of 264.8±14.1s for apnea, 263.9±12.9s control and 264.0±15.8s placebo, performance did not differ between conditions (F=0.250, p=0.840). Power output (F=0.406, p=0.584) and peak physiological parameters did not differ either (VO\textsubscript{2} p=0.602; heart rate p=0.757; lactate p=0.185). HR and VO\textsubscript{2} responses during TT also were not different (p>0.05), while power was significantly lower in the last 250m interval in AP compared to CO and PB (F=5.940, p=0.010).

Conclusion: Although a small positive impact on the Hb values was seen, implementing a single apnea in the warm-up did not change the physiological parameters during nor improve the TT performance.