

# 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  $\text{VO}_2$  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  $264.8\pm 14.1$ s for apnea,  $263.9\pm 12.9$ s control and  $264.0\pm 15.8$ s 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 ( $\text{VO}_2$   $p=0.602$ ; heart rate  $p=0.757$ ; lactate  $p=0.185$ ). HR and  $\text{VO}_2$  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.

