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The effect of IMT on cycling time-trial performance at ~16°c (cool) and ~26°c (hot) temperatures

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Abstract

Background: Numerous studies have investigated the effects of respiratory muscle training (RMT) on rowing, running, swimming and cycling using a variety of different protocols and training devices that have resulted in improved athletic performance in thermo-neutral conditions. However, there appears to be a gap in the research literature with respect to the effects of RMT on athletic performance and additive thermal stress.

Purpose: The purpose of this study was to investigate whether inspiratory muscle training (IMT) improved cycling time-trial (CTT) performance in both cool (~16°C) and hot (~26°C) environmental conditions in well-trained competitive male cyclists.

Method: Twelve males were recruited (age: 39.3 ± 12.1 yrs.). Eight participants were assigned to the experimental (IMT) group ($\dot{V}O_2max$: 63.4 ± 7.6 ml · min^{-1} · kg^{-1}; age: 41.4 ± 8.5 yrs.) and 4 to the control (CTRL) group ($\dot{V}O_2max$: 62.1 ± 13.6 ml · min^{-1} · kg^{-1}; age: 35.0 ± 18.1 yrs.). The IMT group was prescribed an IMT training intervention and performance was assessed using a 10-km CTT in cool and hot conditions, pre- and post-intervention. IMT was performed using a pressure threshold loading (PTL) device set at 50% maximal inspiratory pressure (PI_{max}) twice daily for 6-weeks.

Results: CTT performance improved in the IMT group in the cool but not the hot. The IMT group went 1.17% faster in the cool (pre- vs. post-intervention: 940.38 ± 91.00 secs vs. 929.38 ± 81.75 secs) and 0.69% slower in the hot (927.63 ± 79.65 vs. 934.00 ± 74.73 secs) (P>0.05). Post-intervention PI_{max} increased in the IMT group both pre- and post-CTT by 25.90% and 22.01%; and 32.54% and 33.63%; respectively in the cool (P<0.05) and hot (P<0.05); the CTRL group observed no significant change in PI_{max}.

Discussion: IMT increased inspiratory muscle strength (IMS), attenuated inspiratory muscle fatigue (IMF) and improved CTT performance in the cool but not the hot condition. Heart rate increase (HR_{inc}) was attenuated during the hot CTT and an increase in ear temperature (T_{ear}) was counteracted during the cool CTT for a concurrent increase in physiological workload.

Conclusion: In conclusion, IMT is a proven ergogenic aid for well-trained cyclists confirming that elite cyclists can still benefit from marginal gains.

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