PRESSURE THRESHOLD INSPIRATORY MUSCLE TRAINING IMPROVES SUBMAXIMAL CYCLING PERFORMANCE

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Improvements in submaximal endurance performance have been reported following 4 weeks of respiratory muscle training comprising isocapnic hyperpnea (Boutellier et al., 1992). The purpose of the present study was to examine whether similar effects would be observed using resistive, flow independent loading of the inspiratory muscles.

Eight endurance trained individuals were assigned randomly to either a training or control group. Subjects completed six laboratory visits; all measures were duplicated on separate occasions pre-intervention and then again following the training period. Endurance performance was appraised on a cycle ergometer using a submaximal ride to volitional fatigue (at an intensity above the individual's maximum lactate steady state). Comprehensive lung function measures were obtained using a hand-held spirometer, whilst measures of inspiratory muscle strength and endurance were appraised using a mouth pressure meter and incremental loading device respectively. During exercise, ventilation and gas exchange were measured breath by breath. Ratings of perceived exertion were obtained every 1.5 min, whilst arterialised blood samples and heart rate measures were obtained at 3.5 min intervals.

Following completion of baseline and pre-intervention measures, the training group performed 30 inspiratory efforts twice daily for a period of 4 weeks. Each effort required the subject to inspire against a resistance equivalent to 50% peak inspiratory mouth pressure (pMIP) using a commercially available inspiratory muscle trainer (POWERbreathe®). The control group trained using the same device, however, they were required to perform 60 breaths once daily, for 4 weeks, at a resistance to inspiration equivalent to 15% peak pMIP, a load known to elicit a negligible training effect.

Figure 1. depicts the changes observed in inspiratory muscle strength and cycle endurance time pre- and post- intervention in both groups. Results are expressed as percent change from baseline measures (obtained on visit 1); thus, the pre-IMT changes indicate non-intervention variability. In the training group pMIP increased by 45.3% post intervention whilst Tlim increased by 26.2% relative to baseline. Furthermore, blood lactate, heart rate and ratings of perceived exertion were all attenuated. In the control group no significant changes were observed in any measures.

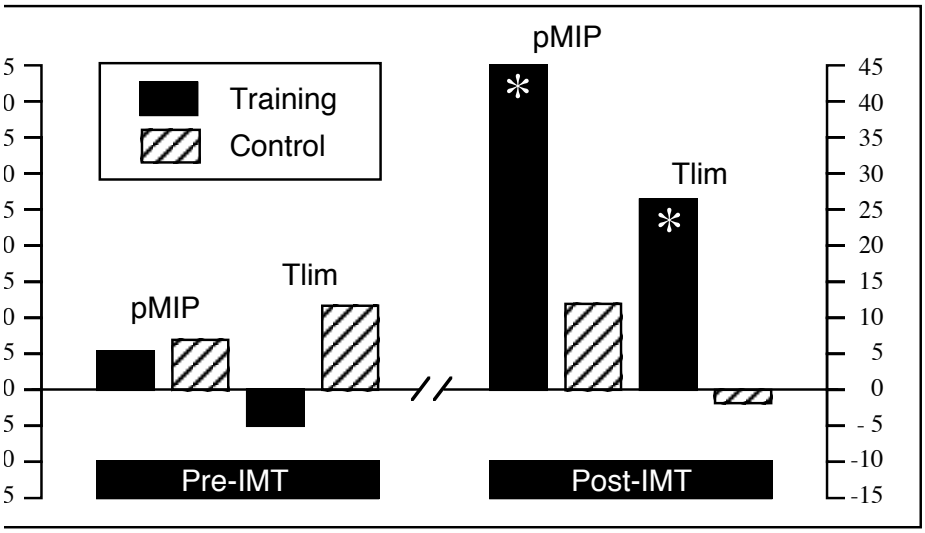

Figure 1. Changes in pMIP and Tlim pre and post intervention in both the control and training group (* = P<0.05).

Whilst preliminary in nature, these results indicate that resistive, flow independent inspiratory muscle training improves submaximal exercise performance in endurance trained subjects. Furthermore they add credibility to Boutellier's assertion that, “the respiratory system is an exercise limiting factor in normal, endurance trained subjects.”

REFERENCE

Boutellier U. Büchel R. Kundert A and Piwko P. [1992]. Eur. J. App. Physiol. 65: 347-353.

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