Functional Inspiratory Muscle Training (IMT) Improves Load Carriage Performance Greater than Traditional IMT Techniques

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Background: The addition of external thoracic loads is common in occupational groups such as the military. The positioning upon the thorax poses a unique challenge to breathing mechanics and causes respiratory muscle fatigue (RMF) following exercise. IMT techniques provide a positive impact to exercise performance as well as attenuating RMF in both health and athletic populations. However in occupational groups, despite increased inspiratory muscle strength and performance, IMT has so far failed to attenuate RMF, potentially limiting the performance enhancement of IMT. It has been suggested that functional inspiratory muscle training (IMT_F) may elicit performance adaptations above that of traditional IMT techniques as it targets the inspiratory muscles throughout the length-tension range adopted during exercise.

Methods: All participants (n=17) completed 4-week foundation IMT using a Powerbreathe device (2 x 30 breaths, daily at 50% maximal inspiratory pressure (MIP), either side of a pre-loaded time-trial (LC_{TT}) while carrying a 25 kg thoracic load. Participants were then randomly assigned to either IMT_F (n=9) or a maintenance group (CON, n=8) and completed 4 additional weeks of training. IMT_F consisted of 3 sessions per week whilst simultaneously breathing through the training device at 50% MIP and conducting 4 predetermined core exercises. CON, comprised of 30 breaths at 50% MIP, 3 times weekly.

Results: Baseline LC_{TT} was 15.93 ± 2.30 and improved to 14.73 ± 2.40 min post 4 week IMT LC_{TT} ($P < 0.01$). Following IMT_F, LC_{TT} further improved by 0.58 ± 0.65 min to 13.59 ± 2.33 min ($P < 0.05$) while CON was unchanged ($P > 0.05$). Relative to baseline values (151 ± 36 cmH_2O), MIP was greater post IMT (172 ± 39 cmH_2O, $P<0.05$) but was similar following IMT_F (179 ± 25 cmH_2O, $P > 0.05$) and CON ($P>0.05$). The post exercise reduction in MIP in all trials remained unchanged.

Conclusion: IMT improves MIP and exercise performance with thoracic load carriage and the improvement is enhanced by incorporating a period of IMT_F, which provides an additional ergogenic effect to exercise performance. This appears to be the result of improved coordination between core and respiratory muscle groups that are tasked heavily via load carriage exercise and IMT_F. However, it did not attenuate respiratory muscle fatigue observed after load carriage activities.