

Effects of a multidisciplinary body weight reduction program on static and dynamic thoraco-abdominal volumes in obese adolescents.

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Applied Physiology, Nutrition and Metabolism 4: 649-658, 2016.

The objective of this study was to characterize static and dynamic thoraco-abdominal volumes in obese adolescents and to test the effects of a 3-week multidisciplinary body weight reduction program (MBWRP), entailing an energy-restricted diet, psychological and nutritional counseling, aerobic physical activity, and respiratory muscle endurance training (RMET), on these parameters. Total chest wall (VCW), pulmonary rib cage (VRC,p), abdominal rib cage (VRC,a), and abdominal (VAB) volumes were measured on 11 male adolescents (Tanner stage: 3-5; BMI standard deviation score: >2; age: 15.9±1.3 years; percent body fat: 38.4%) during rest, inspiratory capacity (IC) maneuver, and incremental exercise on a cycle ergometer at baseline and after 3 weeks of MBWRP. At baseline, the progressive increase in tidal volume was achieved by an increase in end-inspiratory VCW ($p<0.05$) due to increases in VRC,p and VRC,a with constant VAB. End-expiratory VCW decreased with late increasing VRC,p, dynamically hyperinflating VRC,a ($p<0.05$), and progressively decreasing VAB ($p<0.05$). After MBWRP, weight loss was concentrated in the abdomen and total IC decreased. During exercise, abdominal rib cage hyperinflation was delayed and associated with 15% increased performance and reduced dyspnea at high workloads ($p < 0.05$) without ventilatory and metabolic changes. We conclude that otherwise healthy obese adolescents adopt a thoraco-abdominal operational pattern characterized by abdominal rib cage hyperinflation as a form of lung recruitment during incremental cycle exercise. Additionally, a short period of MBWRP including RMET is associated with improved exercise performance, lung and chest wall volume recruitment, unloading of respiratory muscles, and reduced dyspnea.

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