Effects of high-intensity interval training on physical capacities and substrate oxidation rate in obese adolescents

S. Lazzer, G. Tringali, M. Caccavale, R. De Micheli, L. Abbruzzese, A. Sartorio

Journal of Endocrinological Investigation 40: 217-226, 2017

Purpose: To investigate the effects of a 3-week weight management program entailing moderate energy restriction, nutritional education, psychological counseling and three different exercise training (a: low intensity, LI: 40% $V'O_2$max; b: high intensity, HI: 70% $V'O_2$max; c: high-intensity interval training, HIIT), on body composition, energy expenditure and fat oxidation rate in obese adolescents.

Methods: Thirty obese adolescents (age: 15-17 years, BMI: 37.5 kg m^{-2}) participated in this study. Before starting (week 0, W0) and at the end of the weight-management program (week 3, W3), body composition was assessed by an impedancemeter; basal metabolic rate (BMR), energy expenditure and substrate oxidation rate were measured during exercise and post-exercise recovery by indirect calorimetry.

Results: At W3, body mass (BM) and fat mass (FM) decreased significantly in all groups, the decreases being significantly greater in the LI than in the HI and HIIT subgroups (BM: −8.4±1.5 vs −6.3±1.9 vs −4.9±1.3 kg and FM: −4.2±1.9 vs −2.8±1.2 vs −2.3±1.4 kg, $p < 0.05$, respectively). $V'O_2$peak, expressed in relative values, changed significantly only in the HI and HIIT groups by 0.009±0.005 and 0.007±0.004 L kg FFM^{-1} min^{-1} ($p < 0.05$). Furthermore, the HI and HIIT subgroups exhibited a greater absolute rate of fat oxidation between 50 and 70% $V'O_2$peak at W3. No significant changes were observed at W3 in BMR, energy expenditure during exercise and post-exercise recovery.

Conclusion: A 3-week weight-management program induced a greater decrease in BM and FM in the LI than in the HI and HIIT subgroups, and greater increase in $V'O_2$peak and fat oxidation rate in the HI and HIIT than in the LI subgroup.