

Optimizing fat oxidation through exercise in severely obese Caucasian adolescents

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Objective: to measure the contribution of substrate oxidation to energy expenditure during cycling at different workloads and to identify the exercise intensity that elicits the maximum fat oxidation rate in groups of severely obese or nonobese Caucasian adolescents.

Design: a total of 30 severely obese subjects (mean body mass index, BMI=34.7 kg/m²; fat-mass=39.9%) and 30 nonobese sedentary adolescents (mean BMI=22.7 kg/m²; fat-mass=21.8%) aged 14-16 years, participated in this study. Body composition was assessed by bioelectrical impedance. Peak oxygen uptake (VO₂peak) and maximal fat oxidation rate were determined with indirect calorimetry by using a graded exercise test on an electromagnetically braked cycle ergometer.

Results: predicted VO₂max were expressed in absolute (l/min) and relative max (ml/kg FFM/min) values, and maximal work rates were not significantly different between obese and nonobese adolescents, but were significantly higher in boys than in girls. No significant differences in fat oxidation rates were found in obese and nonobese sedentary adolescents during the graded exercise test. Maximal fat oxidation was observed at an exercise intensity corresponding to (mean±SD) 41±3% VO₂max or 58±3% HR_{max}. At this exercise intensity, fat oxidation rates were higher in boys than in girls (0.32±0.02 g/min vs. 0.25±0.02 g/min, *P*<0.001).

Conclusions: severely obese and sedentary nonobese adolescents reached maximal fat oxidation rates at 41% VO₂max, which corresponds to 58% HR_{max}. At this exercise intensity, fat oxidation rates were higher in boys than in girls probably due to higher VO₂max and absolute workload during the exercise steps for boys compared with those for girls.

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