

Age- and gender-related variations of leg power output and body composition in severely obese children and adolescents

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A low level of physical activity is considered to be both a determinant factor and a negative effect of childhood obesity, notably contributing to its development and maintenance, but the motor capabilities of obese children of different ages have scarcely been evaluated. The purpose of the study is to depict the general trends of muscle anaerobic performance in a cohort of Italian obese children. Three-hundred-six obese children (141 males, 165 females) aged 10-17 yr. with body mass index (BMI) range 28.9-62.0 kg/m² (mean BMI z-score: 2.71±0.56 SD; range: 1.6-4.5), were cross-sectionally studied. Lower limb maximal anaerobic power output (W) was assessed with the Margaria stair climbing test, and a consistent subgroup of 77 subjects (37 males, 40 females) was also selected for accessory study of body composition with bioimpedance analysis (BIA), in order to evaluate the relationships between fat-free mass (FFM) and W. In both genders, W increased significantly for effect of age and degree of obesity [three-factor multivariate analysis of variance (MANOVA), $p < 0.001$], but, while no difference was found between boys and girls in the age groups of 10-11 and 12-13 (post-hoc Tukey test, $p > 0.05$), boys in the age groups 14-15 and 16-17 were more powerful than girls of the same age ($p < 0.001$), whereas the relative W per unit body mass (W_{BM}) was higher (two-factor MANOVA) in boys ($p < 0.01$) of all age groups ($p > 0.05$). In the subgroup tested with BIA, the amount of FFM increased significantly [two-factor analysis of variance (ANOVA), $p < 0.001$] according to age, being similar in males and females in lower age groups (post-hoc Tukey test, $p > 0.05$), but higher in boys of older groups (post-hoc Tukey test, $p \leq 0.001$), so that all differences between age groups and genders disappeared (two-factor MANOVA) when W was expressed per unit FFM ($p > 0.05$). A significant linear correlation was found between FFM and W, ($R^2 = 0.66$, $p < 0.001$). In conclusion, no difference in absolute W can be detected between obese boys and girls up to the age of 13, but W differences observed in older age groups appear to be consistent with a concomitant gender-related variation in body composition. The capability of performing external work in short bursts (as represented by trends in W_{BM}) is lower in girls of all ages, and merits consideration on the clinical ground.

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