

The relationship between body composition and muscle power output in men and women with obesity

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In order to investigate the effect of gender, age and level of obesity on body composition and anaerobic power output, and to test the hypothesis that variation in body composition affects muscle power output in obesity, a cohort of 377 subjects (112 males and 265 females, aged 18-75 yr) with different levels of obesity [class III, body mass index (BMI) range: 30.6-60.3 kg m⁻²] was cross-sectionally investigated. Body composition was assessed with bioelectric impedance analysis (BIA), in standardized conditions and using obesity-specific prediction formulas. Lower limb anaerobic power output (W) was measured with a modification of the Margaria stair climbing test. In males, a similar increase in fat-free mass (FFM) and fat mass (FM) was observed as a function of BMI, while in females, FM increased more than FFM. In both genders, FFM significantly decreased as a function of age ($p < 0.001$), but was higher in men of all ages. Similar patterns of variation were observed in W. A differently significant correlation between BMI and W was observed between men and women, and it was found by multivariate analysis of variance (MANOVA) that W was affected negatively by age ($p < 0.001$) and positively by BMI ($p < 0.001$) in males, while in females only age had a significant effect ($p < 0.001$) but not BMI. A positive correlation ($p < 0.001$) was detected between FFM and W, in both genders. W per unit body mass, the actual muscle power for rapid external work, was higher in men than in women of all groups, and decreased with age in both genders, but only in older women decreased significantly ($p < 0.01$) depending on BMI. It is concluded that the gender-dependent pattern of variation in body composition may be an important determinant of the different motor limitations observed in men and women. Older women (≥ 50 yr) with extreme obesity (class III) suffered from the most serious motor dysfunction within this obese cohort. This result may have important clinical relevance in the care of obesity.

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