Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
OR-039

Normal-weight obesity and physical fitness in Chinese university students: an overlooked association

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Objective The primary aim of this study was to examine the associations of normal weight obesity with physical fitness in Chinese university students. As a secondary aim, we assessed whether possible differences in physical fitness between students classified as NWO and normal weight non-obese (NWNO) were mediated by skeletal muscles mass.
Methods A total of 383 students (205 males and 178 females, aged 18–24 years) from two universities volunteered to participate in this study. Body height and weight were measured by standard procedures and body composition was assessed by a bio-impedance device (InBody 720). NWO was defined by a BMI of 18.5 - 23.9 kg/m^2 and a body fat percentage of > 20% and > 30% in male and female students, respectively. Physical fitness was measured using a 10-min intermittent endurance running test (Andersen test), counter movement jumps (CMJ) and a 5 × 5-m shuttle run test (5mSR). The level of leisure time physical activity (PA) was assessed by a questionnaire.
Results 13.7% of male and 27.5% of female students were classified as NWO. Compared to NWNO, students classified as NWO showed a significantly poorer performance on the Andersen test (males: 1146 ± 70 m vs. 1046 ± 95 m, females: 968 ± 61 m vs. 907 ± 67m, $p < 0.001$), CMJ (males: 55.0 ± 7.6 cm vs. 44.9 ± 7.5 cm, females: 39.8 ± 8.0 cm vs. 33.7 ± 5.9 cm, $p < 0.001$), 5mSR (males: 18.7 ± 1.0 s vs. 20.0 ± 0.9 s, females: 21.1 ± 1.1 s vs. 22.4 ± 1.3 s, $p < 0.001$), respectively. The lower levels of physical fitness in NWO were partially explained by lower skeletal muscle mass ($p < 0.001$) both in male and female students
Conclusions NWO was associated with poorer physical fitness and the relationship was partially mediated by lower skeletal muscle mass. The study indicated that attention should be paid for the potential hidden health risk in university students with normal body mass index but excessive fat mass.