

BMI as a mediator of the relationship between muscular fitness and cardiometabolic risk in children: A mediation analysis

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Objective: Muscular fitness levels have been associated with cardiometabolic risk in children, although whether body weight acts as a confounder or as an intermediate variable in this relationship remains controversial. The aim of this study was to examine whether the association between muscular fitness and cardiometabolic risk factors is mediated by body mass index (BMI).

Design and Methods: Cross-sectional study using a sample of 1158 schoolchildren aged 8-11 years from the province of Cuenca, Spain. We measured anthropometrics and biochemical variables and we calculated a muscular fitness index as the sum of z-scores of handgrip dynamometry/weight and standing long jump, and we estimated a previously validated cardiometabolic risk index (CMRI). Linear regression models were fitted for mediation analysis to assess whether the association between muscular fitness and cardiometabolic risk was mediated by BMI.

Results: Children with normal weight (NW) had a better cardiometabolic risk profile than their overweight (OW) or obese (OB) peers after controlling for muscular fitness. Marginal estimated mean \pm SE values for NW, OW and OB categories of CMRI were $-0.75\pm 0.06 < 0.84\pm 0.10 < 2.18\pm 0.16$ in boys and $-0.73\pm 0.06 < 0.96\pm 0.10 < 2.71\pm 0.17$ in girls, both $p < 0.001$. Children with higher levels of muscular fitness had a better cardiometabolic risk profile (CMRI marginal estimated mean \pm SE $1.04\pm 0.13 > 0.05\pm 0.09 > -1.16\pm 0.13$ for lower, middle and upper quartiles of muscular fitness in boys and $1.01\pm 0.16 > 0.10\pm 0.09 > -1.02\pm 0.15$ in girls, both $p < 0.001$), but differences disappeared when

controlling for BMI. BMI acted as a full mediator between muscular fitness and most cardiometabolic risk factors (Sobel test $z=-11.44$ for boys; $z=-11.83$ for girls; $p<0.001$ in CMRI mediation model) and as a partial mediator in the case of waist circumference (Sobel test $z=-14.86$ for boys; $z=-14.51$ for girls; $p<0.001$). Conclusions: BMI mediates the association between muscular fitness and cardiometabolic risk in school-children. Overall, good muscular fitness is associated with lower cardiometabolic risk, but particularly when accompanied by normal weight. © 2015 Díez-Fernández et al.