Relationships of self-reported physical activity, fitness and body mass index with inflammatory proteins in adolescents. The AFINOS study

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Inflammatory proteins during childhood and adolescence have been shown to be predictors of cardiovascular disease in adulthood[1]. Likewise, higher levels of body fat seem to play a pro-inflammatory role in adolescents[2]. However, there is limited knowledge about the role of physical activity and fitness on inflammatory proteins in adolescents. Therefore, the aim of this study was to examine the relationships between self-reported physical activity (PA), fitness, body mass index (BMI), and inflammatory proteins. A sub-sample of 193 adolescents (92 girls), aged 13–17 years old and enrolled in the AFINOS study, was selected for the current study. PA was assessed by a global activity rating (compared to others of your age and sex, how much PA do you get?). Similarly, fitness was self-reported by the following question: how is your physical fitness? Both PA and fitness assessments were rated on a 5-point scale ranging from 1 (much less active/very bad) to 5 (much more active/excellent). Weight and height were also obtained by self-report and BMI was calculated (kg/m^2). C-reactive protein (CRP, mg/dl), ceruloplasmin (mg/dl) and complement factors C3 and C4 (g/l) were determined, and logarithmic or square roots transformations were applied when necessary. Student's t test showed no differences between sexes regarding age and BMI. Adolescent boys were more active and fit than girls (both $P = 0.001$). No sex differences were found for inflammatory proteins, except for ceruloplasmin, adolescent girls reaching higher levels than boys ($P = 0.002$). PA was significantly related with fitness ($r = 0.546$, $P < 0.001$) but not with BMI ($r = -0.132$, $P = 0.077$) after controlling for age and sex. Fitness was also related with BMI ($r = -0.301$, $P < 0.001$) after controlling for age and sex.

Table 1. Partial correlations controlling for age and sex ($n = 193$)

	Ln(CRP)	Sqrt(Ceruloplasmin)	Sqrt(C3)	Sqrt(C4)
PA (score)	− 0.046	− 0.133	− 0.131	− 0.110
Fitness (score)	− 0.220*	− 0.257*	− 0.341*	− 0.270*
BMI (kg/m^2)	0.307*	0.214*	0.454*	0.336*

*$P < 0.05$.

PA was not significantly related/associated with inflammatory proteins, but borderline significances were found with ceruloplasmin ($P = 0.066$) and C3 ($P = 0.072$). On the contrary, fitness and BMI were significantly related with all the inflammatory proteins tested. When BMI was included as confounder, fitness was only significantly related with celluloplasmin ($r = -0.195$, $P = 0.008$) and C3 ($r = -0.216$, $P = 0.003$). These results suggest that PA has a potential beneficial effect on low-grade inflammation in adolescents due to its role on fitness.

1. Juonala M, Viikari JS, Rönnemaa T *et al.* (2006) *Arterioscler Thromb Vasc Biol* **26**, 1883–1888.
2. Wärnberg J, Nova E, Moreno LA *et al.* (2006) *Am J Clin Nutr* **84**, 505–512.