COULD ACADEMIC ACHIEVEMENT BE AN INDICATOR OF PHYSICAL FITNESS IN 6th YEAR ELEMENTARY EDUCATION STUDENTS?

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INTRODUCTION

The lack of physical activity in children has become a serious problem in our society in recent years. Physical inactivity is considered a risk factor for developing obesity and diseases such as diabetes (Morales et al., 2011). Apart from the physical benefits that physical activity bestows, some believe that cognition improves with physical activity, including benefits in the learning process. Aerobic fitness, in particular, appears to be related to academic performance (Guillamón, Canto, & Carrillo López, 2019). In fact, some studies report that higher level of aerobic performance is related to a higher efficiency in cognitive tasks that require optimal attentional control (Pontifex et al., 2011). Other studies show that interventions based on improving aerobic capacity may have positive effects on children's academic achievements (de Bruijn, Hartman, Kostons, Visscher, & Bosker, 2018). While numerous studies have analyzed the relationship between academic performance and sportive habits, there is a lack of quantitative data on the relationship between aerobic capacity and academic performance in specific school subjects. The aim of the present study is to analyze the relationship between aerobic capacity and performance across different academic subjects in a sample of Spanish school children.

METHODS

A retrospective cross-sectional design was performed to compare the level of academic achievement and physical fitness in sixth-year elementary education students. A total of 116 students (68 girls, 48 boys) with a mean age (SD) of 11.35 years (0.42) were recruited. All the participants came from schools in Barcelona. Academic achievement was assessed by the "competències bàsiques" test. Student grades were used to classify the students into four groups (low, medium-low, medium-high, and high) according to their academic performance in the following subjects: Catalan, Spanish, English, and Math (all of which were evaluated by the "competències bàsiques" test). Physical fitness was assessed by the Cooper test, in which participants try to run as far as possible in 12 minutes (Cooper, 1968). Statistical analysis was performed using SPSS.20 for Mac (SPSS Inc., Chicago, IL, USA). Differences in physical fitness (dependent variable) between the groups (independent variable) were tested using a one-way analysis of variance (ANOVA) for the group (low, medium-low, medium-high, and high academic achievement). Moreover, effect sizes were reported as partial eta-squared (ηp2), with cut-off values of 0.01-0.05, 0.06-0.13, and >0.14 for small, medium, and large effects respectively (Cohen, 1988). The results were expressed as mean±SD and significance was stated at $p<0.05$.

RESULTS

The main effect was found for the level of academic achievement in Catalan, Spanish, English, and Math and the physical condition in the Cooper test ($F_{(3,112)} = 7.425$ $p<0.05$, ηp2 = 0.16; $F_{(3,112)} = 9.153$ $p<0.05$, ηp2 = 0.19; $F_{(3,112)} = 8.816$ $p<0.05$, ηp2 = 0.19; $F_{(3,112)} = 9.823$ $p<0.05$, ηp2 = 0.21, respectively). Figure 1 shows the pair wise comparison between the levels of academic achievement and physical fitness.

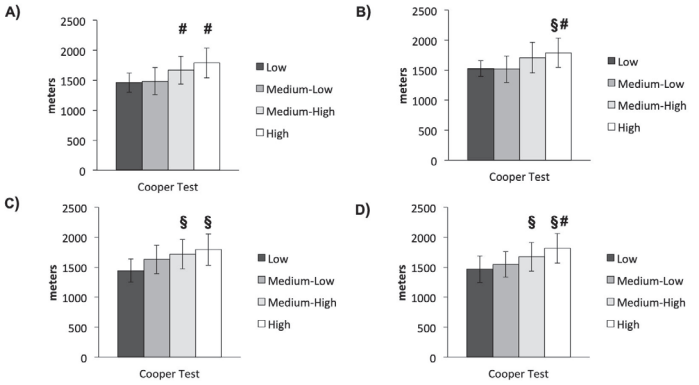

Figure 1. Comparison between physical fitness and different levels of academic achievement* for the subjects : a) Catalan, b) Spanish, c) English, and d) Math. Each bar represents the mean and the error bar represents the standard deviation (SD).

* Academic achievement is based on the "competències bàsiques test" grade as low, medium-low, medium-high, and high.
\# Significantly higher than low academic achievement group
§ Significantly higher than medium-low academic achievement group.

CONCLUSIONS

The present study shows that students with high performance in four academic competencies (Catalan, Spanish, English, and Math) also perform well on the Cooper test. These findings are in line with prior studies which found a positive relationship between aerobic capacity and academic achievement (Morales et al., 2011) and can be explained as follows: first, on a biological level, an improvement of aerobic capacity positively influences the development of some regions of the brain (Esteban-Cornejo et al., 2017). Second, on psychological and sociological levels, schoolchildren with higher aerobic capacity tend to be more physically active, have less sedentary behaviour patterns, and spend more of their free time participating in activities with greater cognitive involvement (Guillamón et al., 2019). The findings of the present investigation are of interest from a curricular point of view since a positive link between physical fitness and academic achievement could be a strong reason to raise the status of physical education in schools, which traditionally has been perceived by the educational community as a less important subject.

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