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Physical Activity Behavior, Aerobic Fitness And Quality Of Life In School-Age Children

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Abstract

The aim of this article is to assess the differences in sedentary and physical activity behavior, physical fitness and quality of life in school-age children according to their adiposity state (BMI-SD= Body Mass Index Standard deviation) and gender. 352 children participated in the study (11.99 ± 1.5 years). Children were assigned to a normal weight group (NW= Normal Weight) (n=175) or to an overweight/obese group (OW/OB= Overweight and Obese) (n=177). The percentage of OW/OB was significantly superior ($p < 0.05$) in boys (55.4%) than in girls. Boys reported spending 2:19h/week (sd= 2:33; $p < 0.01$) watching TV and 3:21h/week (4:28; $p < 0.001$) more than girls practicing moderate-high intensity physical activity. In contrast, in weight groups differences appeared only at high intensity activities to which NW children devoted 52minuts/week (2:33; $p < 0.01$) longer than OW/OB children. NW and OW/OB groups presented significant ($p < 0.05$) differences in all the physical fitness tests, except for the medicine ball toss one. Children's involvement in at least three hours a week of physical activity were associated to a lower prevalence of overweight or obesity, and to higher physical fitness in children.

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Keywords: children, school, eating, parental studies, sport practice, BMI-SD: Body Mass Index Standard deviation; OW/OB: overweight and obese; NW: normal weight, MH: Moderate to High

1. Introduction

Childhood obesity has mainly been attributed to factors related to lifestyle (Ballabriga, Carrascosa, 2001),

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specifically to the lack of physical activity and to unhealthy eating (ACSM, 1999; Fullana, Momparler, Quiles, Redondo, 2009). This excess of weight is associated with an overload to the musculoskeletal system, an increase prevalence of cardiovascular risk factors, psychological and social problems. Obesity can also lead to having a poor body image and a sense of inferiority and rejection (ACSM 1999). This has important health, social and economic consequences. It is important to know how obesity affects children at school age. In that sense, the aim of the study was to assess differences in sedentary conduct and physical activity behavior, physical fitness and quality of life in school-age children according to their adiposity state (BMI-SD) and gender

2. Method

This is a cross-sectional study that took place in several school centres of Lleida, Catalonia. Eligible participants were children aged from 8 to 13 years that attended these schools. Before proceeding with the measures, informed parental and children consent and authorization from schools were obtained. All procedures were conducted in accordance with the Declaration of Helsinki and subsequent revisions. Waist circumference, waist-to-height ratio and body mass index (BMI) were collected as anthropometric parameters. Children were grouped as overweight/obese (OW/OB) or normal weight (NW) based on their BMI-SD according the LMS method.(Pan, H., Cole, T.J. 2007) Sedentary and physical activity behaviors were assessed with a modified version of the 7-day recall physical activity questionnaire, which has been validated for children (Sallis, Buono, Roby, et.al. 1993) Following Ainslie et al recommendations, activities were classified according to their metabolic cost as sedentary, light, moderate and high intensity. The physical fitness test comprised aerobic resistance (6 minutes walking test) (Morinder, Mattsson, Sollander, Marcus, Larsson, 2009), medicine ball toss (Legido,; Segovia, y Ballesteros 1995), standing broad jump and sit-ups(EUROFIT 1989). The children's health related quality of life (HRQOL) was assessed by means of the Spanish version of the EQ-5D-Y (Gusi, Badía, Herdman, & Olivares, 2009)

2.1. Data analysis

All statistical analyses were conducted with SPSS version 15.0 (SPSS Inc., Chicago, IL, 2007). Data are reported as mean \pm standard deviations (SD). Student t-test was used to compare independent samples (NW versus OW/OB and girls versus boys). Statistical significance was set at $p < 0.05$.

3. Results

The main anthropometric results are presented in table 1. More than half (55.4%) of the boys were OW/OB. In girls this percentage was also high (44.6%) but significantly lower ($p < 0.05$) than in boys. Nevertheless, between genders, no differences in any other anthropometric parameter were observed. On the other hand, as it could be expected all the adiposity parameters, were significantly ($p < 0.001$) higher in OW/OB children compared to NW peers

Table 1. Anthropometric parameters

	Boys (n=184)	Girls (n=168)	Non-Obese (n=175)	Overweight/Obese (n=177)
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
Age (years)	12.02 \pm 1.45	11.90 \pm 1.50	12.10 \pm 1.33	11.82 \pm 1.58
Weight (kg)	50.28 \pm 13.06	48.62 \pm 12.13	41.80 \pm 7.60	57.08 \pm 12.03 ^{$\delta\delta\delta$}
Height (cm)	1.53 \pm 0.11	1.51 \pm 0.09	1.51 \pm 0.09	1.53 \pm 0.11
BMI (kg/m ²)	21.35 \pm 4.15	21.10 \pm 4.10	18.12 \pm 1.63	24.31 \pm 3.47 ^{$\delta\delta\delta$}
BMI SD (units)	1.11 \pm 1.07	0.93 \pm 1.03	0.16 \pm 0.56	1.88 \pm 0.64 ^{$\delta\delta\delta$}
Waist circumference (cm)	76.84 \pm 11.70	75.44 \pm 11.13	68 \pm 5.53	84.25 \pm 9.92 ^{$\delta\delta\delta$}
Waist-to-Height ratio (cm/m)	50.39 \pm 7.48	49.93 \pm 6.80	44.98 \pm 2.73	55.30 \pm 6.43 ^{$\delta\delta\delta$}

BMI: body mass index ^{$\delta\delta\delta$} $p < 0.001$ Significantly different in respect to Non-obese

As shown in table 2 boys devoted more time than girls to watching TV ($2:19 \pm 2:33$ h/week; $p < 0.01$), in light intensity activities ($3:29 \pm 7:21$ h/week; $p < 0.001$); and in moderate plus high (MH) intensity activities ($3:21 \pm 4:28$ h/week; $p < 0.001$). In contrast, between adiposity groups, differences were observed only at high intensity activities, where NW children spent 52 minutes/week ($2:33$; $p < 0.01$) more than OW/OB children. There was a modest but significant correlation ($p < 0.01$) between BMI-SD and TV-time, and high or MH intensity activities.

Table 2. Sedentary and physical activity behaviors

	Boys (n=184)	Girls (n=168)	Non-Obese (n=175)	Overweight/Obese (n=177)
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
TV time (h/w)	15.83±9.01	13.51±7.90**	14.26±7.69	15.19±9.35
Computer time (h/w)	9.28±9.18	9.06±8.19	9.66±8.74	8.70±8.68
Sedentary intensity (h/w)	123.20±12.68	125.54±11.91	123.97±11.83	124.67±12.88
Light intensity (h/w)	8.62±7.35	12.10±8.06***	9.88±7.29	10.68±8.43
Moderate intensity (h/w)	8.10±6.98	5.60±5.40***	7.16±6.28	6.66±6.51
High intensity (h/w)	2.93±2.76	2.08±2.63*	2.96±2.99	2.09±2.36 ^{δδ}
Moderate-High intensity (h/w)	11.03±7.70	7.68±6.22***	10.12±7.35	8.75±7.04

h/w: hours per week

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$ Significantly different in respect to boys.^{δδ} $p < 0.01$ Significantly different in respect to Non-obese children.

Boys and girls presented similar results to the physical fitness tests (table 3), apart from sit-ups, where boys did 1.69 (2.49 ; $p < 0.05$) extra sit-ups compared to girls. OW/OB children achieved lower results than their NW peers in all physical condition tests where weight was a determinant of performance. In contrast no differences were observed in medicine ball toss.

Table 3. Physical fitness test

	Boys (n=184)	Girls (n=168)	Non-Obese (n=175)	Overweight/Obese (n=177)
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Medicine ball toss (cm)	3.59±1.22	3.56±1.26	3.55±1.29	3.60±1.18
Sit-ups (n°)	22.42±6.01	20.73±6.42**	22.57±5.66	20.74±6.66 ^{δδδ}
Standing broad jump (cm)	1.36±0.40	1.35±0.37	1.40±0.42	1.32±0.34 ^δ
Aerobic resistance (meters)	478±127	467±118	511±108	437±125 ^{δδδ}

** $p < 0.01$ Significantly different in respect to boys^{δδδ} $p < 0.001$; ^δ $p < 0.05$ Significantly different in respect to Non-obese

Apart from data where all participants were pooled together, several differences were observed between OW/OB and NW children within gender groups. The prevalence of obesity was high among boys, where 55.4% ($n=102$) of them were OW/OB, while the proportion of NW was 44.5% ($n=82$). Surprisingly, OW/OB boys showed similar results to NW ones in sedentary conduct, physical activity behavior, medicine ball toss, sit-ups, standing broad jump and self-related quality of life. Both groups only differed on the aerobic resistance test results, where NW children obtained better scores compared to OW/OB peers (531.49 ± 103.45 meters vs. 438.18 ± 128.71 meters; $p < 0.001$, respectively). In contrast, more differences were observed among NW and OW/OB girls. The percentage (44.6%; $n=75$) of OW/OB girls was high, but slightly lower than in boys, the rest, 55.4% ($n=93$) were NW. Compared to NW girls, OW/OB girls devoted more weekly time to light intensity physical activities (10.87 ± 6.96 h/week vs. 13.62 ± 9.06 h/week; $p < 0.028$) and less weekly time to high intensity activities (2.70 ± 3.06 h/week vs. 1.31 ± 1.68 h/week; $p < 0.001$). They also had lower physical fitness and obtained lower results in sit-ups (22.12 ± 5.50 vs. 19.11 ± 7.05 number; $p < 0.003$) and aerobic resistance test (494.29 ± 110 meters vs. 435.72 ± 119.66 meters; $p < 0.002$). No differences in quality of life scores between groups determined by gender or by adiposity were observed, where

the mean of the total score for the whole group was 80.45 over 100 (17.22). For the whole group, correlation analysis between adiposity parameters and TV-time showed a significant positive correlation and a significant negative correlation with physical activity behavior (time devoted to high or MH physical activities). Adiposity parameters also showed a significant negative correlation with the physical fitness test, except in medicine ball toss.

4. Discussion

The main finding of the study was the discrepancy found in sedentary conducts and physical activities when comparisons were made between gender and weight groups and subgroups of gender and weight. Differences were found when they were compared between boys and girls. Unexpectedly, between weight groups differences are almost inexistent and the only difference was close to 1 hour/week more of high intensity activities of the NW group in relation to OW/OB. However, it is surprising when children were subdivided into boys NW vs. OW/OB that no differences were found, but we still observed them when comparing NW vs. OW/OB girls. The present discrepancies are probably reflecting the results existing in the literature about the influence or not of sedentary and physical behavior in the degree of obesity in children. On the one hand, OW/OB children seem to be less active than NW children (Page, Cooper, Stamatakis, Foster, Crowne, Sabin, & Shield, 2005). On the other hand, no difference between them was found (Ortega, 2007) In preschool children, this controversy has already been mentioned. Due to design limitations, it is not possible to conclude a cause-effect relationship. However, it could be suggested that some of these discrepancies could account for the differences existing between NW vs. OW/OB boys and NW vs. OW/OB girls, as observed in the present study. In relation to their physical fitness, several differences were also found when all the groups were compared. Probably, it is difficult to explain these differences bearing only in mind weight and gender. According Klein (2013) other characteristics should be taken into account (socio-economic status, living situation, leisure behavior, school performance). However, the biggest difference between all the groups, except for gender, seems to be in their aerobic resistance. Despite the existing controversy, data could indicate that it is necessary that OW/OB children change their lifestyle into a more active one, achieving at least one hour more of high physical activity intensity. It could be a good tool to reduce obesity and help their physical fitness, reducing the possibility several health diseases in young and adult life (Delgado, Gutiérrez, Castillo, 1999) Children's behavior was self-reported by children and this could be in itself a limitation, as non objective measures could be not recorded. However, the tests were specific for children and it was a self-administered version. In addition, the data was collected with their teachers' help and with experimented and formed collaborators.

5. Conclusion

Practicing at least three hours a week of physical activity is associated to a lower prevalence of overweight or obesity and a higher physical fitness in school ages.

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