Original Paper

Annals of Nutrition & Metabolism

Ann Nutr Metab 2007;51:288–296
DOI: 10.1159/000105459

Received: February 13, 2006
Accepted: December 27, 2006
Published online: July 11, 2007

Physical Performance and School Physical Education in Overweight Spanish Children

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Key Words
Adiposity · Children · Physical activity · Physical fitness

Abstract
Aims: To evaluate the effect of physical performance and extracurricular organized physical activities (EOPA) in normal- and overweight children. ***Methods:*** A random sample of 1,068 schoolchildren (7–12 years old) representative of the region of Aragon (Spain) was selected and divided into normal-, overweight and obese groups based on previously published body mass index reference standards. Physical performance was assessed by the European physical test battery. EOPA were estimated when children performed at least 3 h per week during the previous year in addition to school physical education. ***Results:*** Overweight and obese subjects had lower performances on all tests requiring propulsion or lifting of the body mass (standing-broad jump, sit-ups, bent-arm hangs, speed shuttle run and endurance shuttle run) when compared with normal-weight counterparts ($p < 0.001$). The overweight and obese children showed greater hand grip strength measures than the normal-weight ones ($p < 0.001$). Plate tapping and sit reach test scores were similar in both groups. The participation in EOPA was similar in normal- and overweight or obese groups; however, a significant increase with age was observed ($p < 0.01$). ***Conclusion:*** In this age group, overweight was not related to EOPA participation. Overweight children had poorer results on weight-bearing tasks. The good results in static strength, coordination and speed of limb movements in overweight children should be considered in the promotion of physical activity programs for overweight children.

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Introduction

The prevalence of overweight and obesity among adults, children and adolescents is increasing in industrialized countries. Obesity is a multifactorial process related with a high-energy supply and inactivity besides possible genetic determinants. A secular decrease in energy expenditure is seen as a major cause of the recent increase in overweight and obesity. Children today expend approximately 600 kcal/day less than their counterparts 50 years ago [1]. Physical activity patterns appear to play an important role in long-term regulation of body composition. Therefore, targeting children's patterns of physical activity is especially important given the argument that increasing physical activity in childhood might be essential for the lifetime regular physical activity [2]. Physical education programs for state primary schools are common and compulsory throughout Spain and the European Union. They are aimed at attaining motor

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skills and improving cardiovascular health-related fitness. However, there is little information about the influence of national curricula on aspects of motor and cardiovascular health-related fitness and overweight in children of different grades [3].

Many studies have reported a negative association between physical activity levels and adiposity [4–8], and some of them have investigated differences in physical fitness according to body fatness [9]. Physical fitness is considered to be 'the ability to perform daily tasks without fatigue' [10, 11]. Physical fitness includes several components: cardiorespiratory fitness, muscular endurance, muscular strength, flexibility, coordination and speed. Most studies that have investigated differences in physical fitness according to body fatness were focused on cardiorespiratory fitness and few of them have focused on the other components of physical fitness in children.

The purpose of this study was to assess physical fitness in normal-weight, overweight and obese children, and to determine whether the association between physical fitness and weight status showed significant results. As differences in physical fitness levels may be related to differences in practice and training, extracurricular organized physical activities (EOPA) were included in this study.

Methods

A random sample of 1,068 healthy Caucasian schoolchildren (7–12 years of age) was selected using multistage, proportional-cluster sampling from a total number of 64,116 schoolchildren in the region of Aragón (Spain; maximum error ±3% with 95% confidence). In the first step, a proportionate cluster with schools as the primary sampling cluster was selected. The different strata were selected according to the structure of the Aragón school system, the geographic distribution of the three provinces and gender. In the second step, full classes from each grade of a primary school were selected and used as the smallest sampling units. The Research Ethics Committee of the University of Zaragoza approved the investigation. Written informed consent was obtained from the children's parents or guardians.

Children were stratified depending on the level of physical activity performed in addition to that carried out during the compulsory sessions of physical education included in the Spanish academic curriculum, i.e. 3 h per week. In the region of Aragon, the school system is established by law, and objectives and procedures are described in the legal text, i.e. all the students of the same age have the same physical education curriculum. The 381 boys and 312 girls who participated in EOPA and competitions during at least 3 h every week, for at least 1 year prior to the start of the study, were ascribed to the physically active group (EOPA group), while the other 169 boys and 206 girls were considered as non-physically active (non-EOPA group).

Anthropometry was conducted by two experienced anthropometrists (one of them had level 3 ISAK accreditation) according to the procedures of the International Society for the Advancement in Kinanthropometry [12, 13]. Multiple measures were made to determine intra- and intertester technical error of measurements. The intra- and intertester percent technical error of measurements were lower than 5% for skinfolds and lower than 1% for the other measurements, i.e. well within the limits set by ISAK. Height was measured to the nearest 0.1 cm using a fixed stadiometer (Ka We, Asperg, Germany). Weight was measured to the nearest 0.1 kg on a balance scale (maximum 150 kg; Seca, Hamburg, Germany) with the subject wearing sports clothing without shoes. Body mass index (BMI) was calculated from height and weight measures. The adult cutoff points (obese BMI >30, overweight BMI >25 and normal-weight BMI <25) was adapted to each age and sex group according to the proposal of Cole at al. [14] and used as the reference. Skinfold thickness was measured in triplicate at the following sites: biceps, triceps, subscapular, suprailiac, thigh and medial calf (Holtain Caliper, Crymmych, UK). The median value was taken as final value. The sum of six skinfold thicknesses was also calculated.

Physical fitness was assessed using the European physical test battery (Eurofit) [15] containing eight tests that measure different components of fitness: plate tapping, sit and reach, standing-broad jump, hand grip, sit-ups, bent-arm hang, shuttle run and endurance shuttle run. For plate tapping (coordination and speed of limb movements) – rapid tapping of two plates alternately with the preferred hand – the better of the two attempts was considered the score. The score is the time needed to touch each disc a total of 25 times, recorded in tenths of a second. For the sit and reach (flexibility) test – reaching forward as far as possible from a seated position – the better of the two attempts was considered the score, in centimeters. For the standing-broad jump (explosive strength) – jumping for distance from a standing start – the better of the two attempts was considered the score. The result is given in centimeters. For the hand grip test (static strength) – a calibrated hand dynamometer with adjustable grip (Takey, TKK 5101) – the better of the two attempts was considered the score, recorded in kilograms (accurate to 0.1 kg). For sit-ups (trunk strength and endurance) – maximum number of sit-ups achievable in 30 s – the total number of correctly performed complete sit-ups in 30 s was considered the score. For bent-arm hang (upper body strength and endurance) – maintaining a bent-arm position while hanging from a bar – the time in tenths of a second was considered the score. For the shuttle run, 10 × 5 m (running speed, agility) – a running and turning (shuttle) test at maximum speed – two parallel lines were drawn on the floor (with chalk or tape) 5 m apart. The time needed to complete the five cycles was considered the score, and was written in tenths of a second. The endurance shuttle run test (cardiorespiratory endurance) is a test of cardiorespiratory fitness, which begins at walking pace and ends running fast, whereby the subjects move from one line to another 20 m distant, reversing direction, and in accordance with a pace dictated by a sound signal, which gets progressively faster. After the subject had stopped, the last completed half-step was noted. The maximal oxygen uptake ($VO_{2_{max}}$) was estimated using the result of the endurance shuttle run test [16].

This test battery is a valid instrument to measure fitness in children (6–16 years) and is a commonly used test battery in Europe.

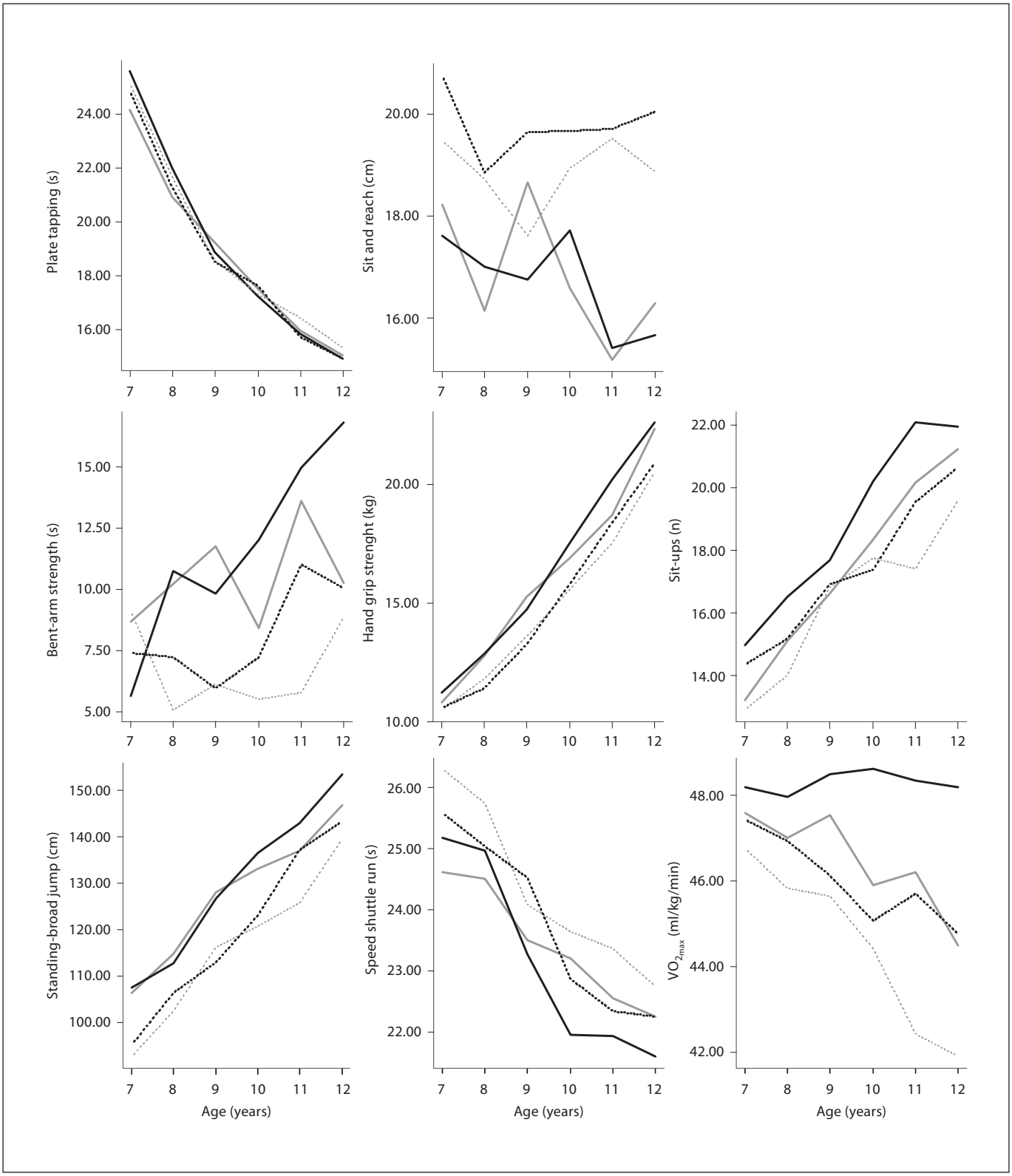

Fig. 1. Physical fitness results in boys and girls according to EOPA participation. Solid black lines = boys in the 'EOPA group'; dotted black lines = girls in the 'EOPA group'; solid grey lines = boys in the 'Non-EOPA group'; dotted grey lines = girls in the 'Non-EOPA group'.

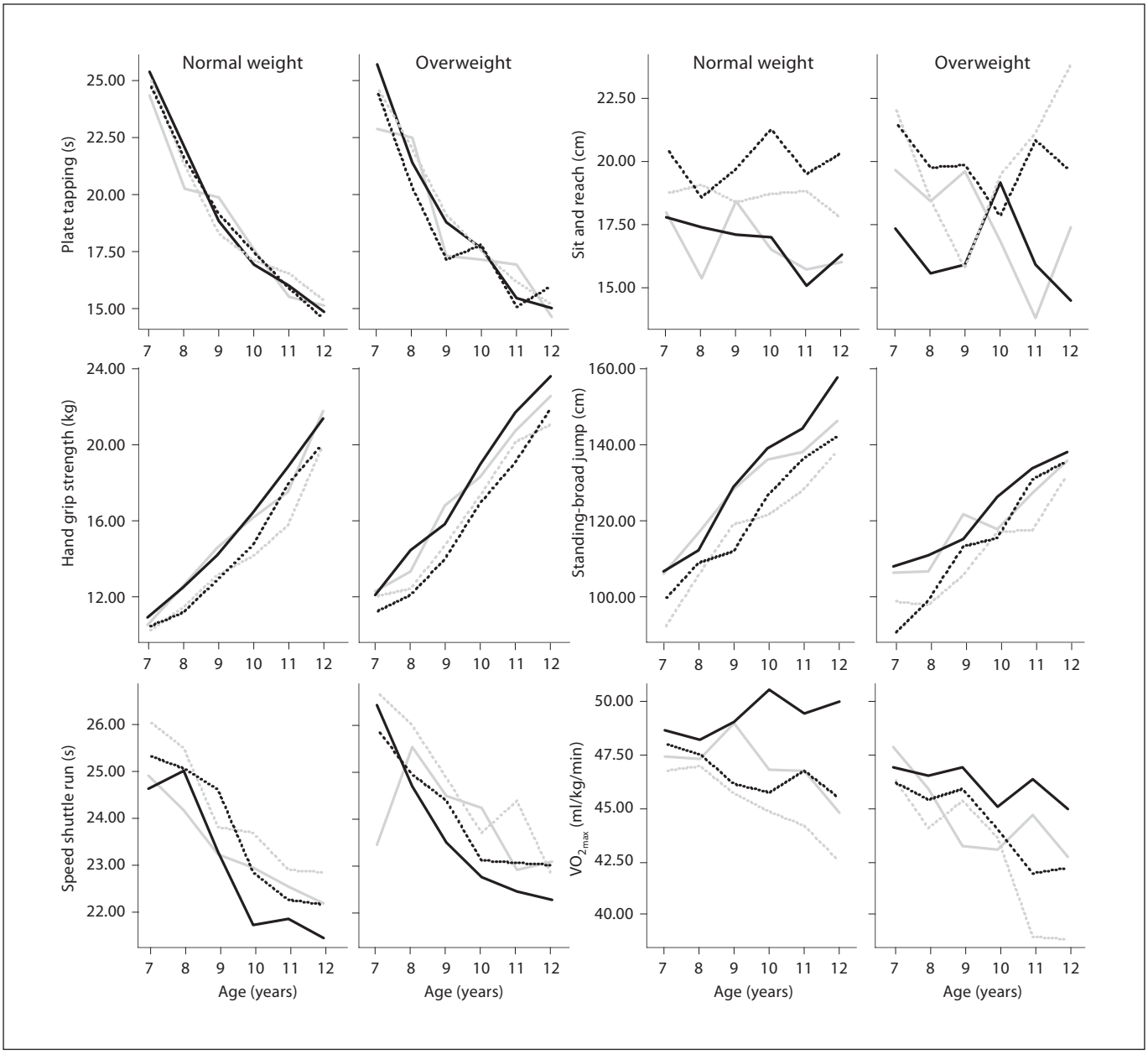

Fig. 2. Physical fitness results in boys and girls according to normal weight or overweight and EOPA participation. Solid black lines = boys in the 'EOPA group'; dotted black lines = girls in the 'EOPA group'; solid grey lines = boys in the 'Non-EOPA group'; dotted grey lines = girls in the 'Non-EOPA group'.

Subgroups were made for each gender, according to age 7–8, 9–10 and 11–12 years. Groups according to BMI values were defined using the criteria of Cole et al. [14]. Anthropometric and physical fitness variables were compared between obese children (BMI equivalent to >30 kg/m^2), overweight children (BMI equivalent between 25 and 29.9 kg/m^2) and normal-weight children (BMI equivalent to <25 kg/m^2). As results considering overweight and obesity groups did not differ, the current essay only presents results on overweight + obesity (overweight group) and normal-weight children in figures 1 and 2.

All data were assessed to be normally distributed. To examine differences between normal-weight, overweight and obese subjects, ANOVA tests were performed with physical fitness as dependent variables and weight groups and EOPA participation as the independent variables. Because we were interested in knowing whether we would find the same differences in fitness and physi-

Table 1. Anthropometric description of the groups (means ± SD)

Characteristics	Boys			Girls		
	normal weight	overweight	obese	normal weight	overweight	obese
7–8 years						
n	123	32	7	121	36	26
Weight, kg	24.5 ± 3.5	30.4 ± 3.3	36.7 ± 4.5	24.3 ± 3.6	31.0 ± 3.7	37.0 ± 5.0
Height, cm	124.0 ± 6.2	126.0 ± 6.3	127.6 ± 3.4	123.6 ± 6.6	127.2 ± 6.9	127.4 ± 4.7
BMI, kg·m^{-2}	15.9 ± 1.3	19.1 ± 0.7	22.5 ± 2.0	15.9 ± 1.3	19.1 ± 0.7	22.7 ± 2.1
BMI, z-score	–0.5 ± 0.7	1.4 ± 0.7	2.2 ± 0.9	–0.3 ± 0.5	0.9 ± 0.3	2.3 ± 0.8
Sum of skinfolds, mm	30.5 ± 10.1	47.0 ± 9.1	72.2 ± 9.2	39.1 ± 10.7	56.7 ± 10.9	80.3 ± 19.9
9–10 years						
n	134	44	13	105	53	10
Weight, kg	30.8 ± 4.5	42.2 ± 5.7	53.5 ± 6.6	30.6 ± 4.3	40.4 ± 4.8	51.7 ± 5.3
Height, cm	135.4 ± 6.1	139.8 ± 6.2	140.6 ± 4.3	134.9 ± 6.7	138.5 ± 6.3	142.7 ± 6.3
BMI, kg·m^{-2}	16.7 ± 1.6	21.5 ± 1.4	27.0 ± 2.8	16.7 ± 1.5	21.0 ± 1.4	25.3 ± 0.8
BMI, z-score	–0.3 ± 0.6	1.5 ± 0.4	3.7 ± 1.4	–0.4 ± 0.5	1.0 ± 0.4	2.2 ± 0.3
Sum of skinfolds, mm	35.2 ± 11.7	66.3 ± 15.1	101.5 ± 14.2	44.7 ± 12.1	70.0 ± 14.7	91.5 ± 11.6
11–12 years						
n	130	61	6	125	33	9
Weight, kg	37.1 ± 5.8	52.0 ± 6.5	61.5 ± 6.5	39.3 ± 7.1	51.8 ± 7.9	59.5 ± 3.3
Height, cm	145.1 ± 6.6	150.2 ± 7.0	150.5 ± 7.7	147.4 ± 8.8	149.3 ± 7.8	148.5 ± 3.6
BMI, kg·m^{-2}	17.5 ± 1.8	23.0 ± 1.4	27.1 ± 1.1	18.0 ± 1.8	23.1 ± 1.5	27.0 ± 1.3
BMI, z-score	–0.5 ± 0.6	1.4 ± 0.6	3.0 ± 0.7	–0.3 ± 0.7	1.7 ± 0.7	3.1 ± 0.7
Sum of skinfolds, mm	37.5 ± 12.2	77.1 ± 19.3	100.8 ± 16.5	46.1 ± 11.8	79.2 ± 13.6	92.2 ± 15.3

F values are presented in table 3.

cal activity between the weight groups for both sexes in all age categories, gender and age were also included as independent ones. Results are presented as means ± SD. Values of $p < 0.05$ were considered statistically significant. All analyses were performed using SPSS 11.5.

Results

Anthropometric measurements and indices (table 1) and physical fitness tests (table 2) are presented by gender and BMI categories (normal weight, overweight and obese), respectively. Weight, BMI, BMI (z-score) and sum of skinfolds were greater in overweight and obese than normal-weight groups ($p < 0.001$), with similar differences by age groups (table 3). There were only significant differences by gender in sum of skinfolds ($p < 0.05$). The significant interaction between BMI categories, age and gender for the BMI (z-score; $p < 0.001$) revealed that differences were greater in boys than in girls and increase with age.

Table 2 provides mean results of the Eurofit test battery, and corresponding F values are presented in table 3. The normal-weight subjects performed better on most tests (standing-broad jump, sit-ups, bent-arm hangs, speed shuttle run and endurance shuttle run; $p < 0.001$). There were few interactions between BMI categories, gender, and/or age. The significant interaction between BMI categories and gender for the bent-arm hang test ($p < 0.05$) revealed greater differences between the obese or overweight and normal-weight boys. The obese and overweight children showed greater hand grip strength measure than the normal-weight ones ($p < 0.001$). For plate tapping and sit reach tests, scores were similar for weight status groups.

No differences were found in EOPA between normal-weight, overweight and obese children; there were significant differences by gender and age ($p < 0.05$). The most common EOPA in boys were indoor soccer (33.6%), karate (8.4%), swimming (7.5%) soccer-7 (7.5%) and basketball (5.1). In girls they were skating (11.4%), gymnastics (10%), basketball (8.9%) and swimming (7.3%). The level of practice was low to moderate.

In boys, those who participated in EOPA were heavier and taller ($p < 0.05$) and with similar BMI and sum of skinfolds than the boys which did not participate in

Table 2. Mean values for physical performance in normal weight, overweight and obese boys and girls according to age groups (means ± SD)

Tests	Boys			Girls		
	normal weight	overweight	obese	normal weight	overweight	obese
7–8 years						
Plate tapping, s	23.2 ± 4.4	23.7 ± 3.6	24.2 ± 5.3	23.2 ± 4.3	23.2 ± 3.6	22.2 ± 3.5
Sit and reach, cm	17.1 ± 5.4	17.5 ± 4.8	17.3 ± 4.7	19.2 ± 5.6	21.0 ± 5.6	19.2 ± 6.0
Standing-broad jump, cm	111.0 ± 21.5	111.5 ± 15.0	95.6 ± 21.5	101.9 ± 17.9	95.1 ± 20.5	95.7 ± 16.4
Hand grip strength, kg	11.6 ± 2.4	12.6 ± 2.4	13.6 ± 3.6	10.6 ± 2.0	11.6 ± 1.7	12.1 ± 2.3
Sit-ups, n	15.1 ± 5.1	15.6 ± 4.4	13.1 ± 4.3	14.9 ± 5.7	13.5 ± 3.9	12.2 ± 6.2
Bent-arm hang, s	9.6 ± 8.5	5.6 ± 4.6	2.6 ± 2.9	7.9 ± 7.5	6.0 ± 11.4	4.7 ± 5.6
Speed shuttle run, s	24.7 ± 2.7	25.1 ± 2.4	27.2 ± 2.8	25.4 ± 2.5	25.8 ± 2.4	25.8 ± 2.4
Endurance shuttle run, steps	3.3 ± 1.4	2.8 ± 1.2	2.8 ± 1.4	2.9 ± 1.1	2.6 ± 1.2	2.0 ± 0.8
9–10 years						
Plate tapping, s	18.3 ± 3.3	17.7 ± 2.9	18.8 ± 2.8	18.1 ± 2.8	17.7 ± 2.8	18.1 ± 3.7
Sit and reach, cm	17.1 ± 5.0	17.1 ± 5.6	19.6 ± 8.1	19.5 ± 5.9	18.0 ± 4.9	20.7 ± 7.0
Standing-broad jump, cm	135.2 ± 19.4	124.5 ± 18.3	113.5 ± 13.7	120.9 ± 22.3	114.6 ± 18.8	115.9 ± 24.0
Hand grip strength, kg	15.2 ± 3.2	17.5 ± 3.2	18.3 ± 3.9	13.7 ± 2.9	15.7 ± 3.4	18.3 ± 4.0
Sit-ups, n	19.01 ± 5.3	18.1 ± 5.2	13.9 ± 7.1	17.2 ± 5.8	17.7 ± 4.7	14.4 ± 4.6
Bent-arm hang, s	13.2 ± 11.5	5.0 ± 3.4	2.4 ± 1.8	7.8 ± 6.9	3.6 ± 4.2	3.5 ± 3.2
Speed shuttle run, s	22.7 ± 2.0	23.1 ± 1.7	24.1 ± 2.0	23.7 ± 2.2	23.8 ± 1.7	23.9 ± 2.3
Endurance shuttle run, steps	5.1 ± 1.6	3.9 ± 1.4	2.6 ± 1.2	4.7. ± 1.7	3.3 ± 1.2	2.9 ± 1.2
11–12 years						
Plate tapping, s	15.3 ± 2.1	15.4 ± 2.4	16.5 ± 1.1	15.4 ± 2.4	15.7 ± 2.6	15.7 ± 1.7
Sit and reach, cm	15.8 ± 5.3	15.2 ± 5.1	13.2 ± 6.4	19.3 ± 5.2	21.1 ± 5.0	20.0 ± 3.7
Standing-broad jump, cm	152.3 ± 19.8	138.2 ± 19.8	128.2 ± 37.4	140.5 ± 21.9	133.9 ± 16.5	124.0 ± 15.5
Hand grip strength, kg	20.3 ± 4.2	22.9 ± 4.5	23.2 ± 2.7	19.1 ± 4.4	20.9 ± 3.8	21.3 ± 4.5
Sit-ups, n	22.3 ± 4.9	20.1 ± 5.3	15.8 ± 6.3	20.8 ± 4.6	17.5 ± 5.9	17.7 ± 7.3
Bent-arm hang, s	18.4 ± 12.9	9.1 ± 9.5	3.0 ± 4.2	11.1 ± 10.2	4.7 ± 4.3	2.4 ± 2.1
Speed shuttle run, s	21.7 ± 1.8	22.2 ± 1.6	23.9 ± 2.9	22.3 ± 1.8	23.2 ± 1.8	23.5 ± 1.7
Endurance shuttle run, steps	6.2 ± 1.7	4.9 ± 1.7	3.5 ± 1.5	4.9 ± 1.5	3.7 ± 1.5	2.2 ± 0.9

EOPA (table 4). The performances in standing-broad jump, sit-ups, hand grip, speed shuttle run ($p > 0.05$) and endurance shuttle run ($p > 0.001$) were better in those participating that in those not participating in EOPA. For plate tapping, sit-and-reach tests and bent-arm strength there were not significant differences between groups. In girls, there were only significant differences in sum of skinfolds ($p > 0.05$) with higher values in girls that did not participate in EOPA. The physical tests were better in girls who participated in EOPA competition with significant differences in sit and reach, sit-ups, bent-arm hangs ($p > 0.05$), speed shuttle run ($p > 0.01$) and endurance shuttle run ($p > 0.001$) when compared with girls who did not participate in EOPA.

In the overweight group (fig. 2), the children enrolled in EOPA performed better than their peers in the tests which required propulsion of the body mass.

Discussion

The population that constituted the data base of the current study is comprised of 1,068 healthy Caucasian schoolchildren (738 normal weight, 259 overweight and 71 obese), from whom anthropometric measures, physical fitness and EOPA participation were obtained. These features of the data base made it particularly applicable to the investigation of the association between fatness, physical activity and fitness. The purpose of this study was to investigate performance differences in physical tests and EOPA participation in normal- and overweight or obese children from Aragón (Spain). BMI in childhood substantially changes with age. The adult cutoff point of BMI of 25 kg/m^2 for overweight is related to health risk. Cole et al. [14] proposed that these adult cutoff point must be corrected for children to provide child

Table 3. F values showing differences in anthropometric parameters, physical performance and EOPA participation according to BMI categories, gender and age

	F_{BMI}	F_{gender}	F_{age}	$F_{BMI \times gender}$	$F_{BMI \times age}$	$F_{gender \times age}$	$F_{BMI \times gender \times age}$
Anthropometric parameters							
Weight, kg	604.8*	1.3	179.1*	2.3	11.4*	1.1	1.1
Height, cm	34.5*	0.4	130.4*	0.6	0.8	0.3	0.7
BMI	1,167.6*	0.7	64.1*	1.7	9.2*	1.8	1.2
BMI (z-score)	1,137.8*	2.8	21.8*	4.2***	7.1*	7.6*	3.4*
Sum of skinfolds, mm	624.3*	6.5***	25.1*	4.6**	7.9*	2.1	0.8
Physical tests							
Plate tapping	0.9	0.3	67.0*	0.3	0.5	0.3	0.5
Sit and reach	0.9	17.5*	1.7	0.5	1.0	1.8	1.2
Standing-broad jump	17.3*	10.5*	30.9*	1.5	1.1	0.5	0.7
Hand grip strength	34.6*	14.8*	85.5*	0.4	1.3	0.7	0.6
Sit-ups	11.8*	1.6	10.9	0.8	1.4	0.6	1.2
Bent-arm strength	46.7*	3.1	0.8	3.4***	1.4	0.8	0.3
Speed shuttle run	7.3*	2.2	21.5*	1.9	0.8	0.3	0.9
Endurance shuttle run	46.8*	16.4*	12.3*	2.1	2.3***	1.7	1.3
EOPA participation	1.4	4.7***	2.4***	0.5	1.1	1.2	0.8

* $p < 0.001$; ** $p < 0.01$; *** $p < 0.05$.

Table 4. ANOVA: EOPA participation

	Total		Boys		Girls	
	F	p	F	p	F	p
Anthropometric parameters						
Weight, kg	2.0	0.156	4.7	0.030	0.04	0.841
Height, cm	2.6	0.107	4.4	0.035	0.02	0.888
BMI	0.41	0.521	2.4	0.120	0.3	0.569
Sum of skinfolds, mm	4.2	0.037	0.0	1.0	5.3	0.022
BMI, z-score	0.34	0.560	1.9	0.170	0.23	0.632
Physical tests						
Plate tapping	1.3	0.253	0.4	0.488	0.6	0.427
Sit and reach	0.19	0.659	0.1	0.764	4.2	0.043
Standing-broad jump	13.3	0.000	5.3	0.022	3.7	0.053
Hand grip strength	8.5	0.004	5.9	0.015	1.0	0.313
Sit-ups	17.8	0.000	11.9	0.001	3.9	0.048
Bent-arm strength	8.5	0.004	1.8	0.183	4.7	0.031
Speed shuttle run	16.4	0.000	5.3	0.022	7.6	0.006
Endurance shuttle run	51.8	0.000	25.3	0.000	18.5	0.000

cutoff points. In this study, the BMI was estimated from the ratio kg/m^2 and organized using linear interpolations between the cutoff points according to age and sex as described by Cole et al. [14]. With this proposal a large sample of 1,068 children was divided into three groups: normal weight, overweight and obese.

In this study, the overweight and obese children had worst performances in all tests requiring propulsion or lifting of the body mass (standing-broad jump, sit-ups, bent-arm hangs, speed shuttle run and endurance shuttle run) compared with their normal-weight counterparts. Similar results are reported by other studies with a nega-

tive relationship between fatness and performance [17–20]. These poorer performances in overweight and obese children are probably due to the fact that their excess body fat is an extra load to be moved during weight-bearing tasks. In fact the obese group obtained the poorest results. Nevertheless, in tests requiring flexibility, coordination or speed of limb movements (plate tapping and sit-and-reach tests), excess fatness was not likely to hinder performance. In the present study the performance in these tests was similar for the three groups. Similar results are reported by Minck et al. [20] in 6- to 27-year-old subjects, whereas Pate et al. [21] found inconsistent results between fatness and sit-and-reach tests in children 6–18 years old. In the present study the only test which was performed better by overweight and obese than by normal-weight children was hand grip strength. This greater strength in overweight and obese children can be explained by their increased fat-free mass and may be an expression of maturational differences [22].

The results in physical fitness tests were similar when we consider BMI groups and EOPA participation. Children enrolled in EOPA performed tests which require propulsion or lifting of the body mass better. In plate tapping and sit-and-reach tests, EOPA participation was not likely to hinder performance. The effect of no EOPA participation on the physical fitness test was similar to the effect of being overweight. In this age group (7–12 years), participation in EOPA was higher in boys than in girls. Lindquist et al. [23], in a study of 120 children (6.5–13 years old), also reported that boys were significantly more physically active than girls. The literature supports the fact that boys are more active than girls at all ages during circumpuberal years when the physical activity is measured using a variety of self-report tools. Thompson et al. [24] reported that physical activity decreased with increasing chronological age in boys and girls (9–18 years of age). In the current research the results differ from those obtained by Thompson et al. [24].

There are no differences in EOPA participation in BMI categories, and the compulsory physical class was the same for everybody. Therefore, overweight and obese children spent the same amount of time in physical activities but their performance is worse than in normal-weight children in many tests. It is possible that the activities are less intense and tend to be more passive. Unfortunately, the verification of this circumstance is beyond the scope of the present study.

Longitudinal studies with several countries involved are required to clarify these points.

Conclusions

In the present study the EOPA participation increased with age in boys and girls. Boys who participated in EOPA were taller and heavier than their peers and the girls had less fatness than the non-active ones.

The overweight children showed poorer results in weight-bearing tasks, but did not have lower scores in all the other physical performance components. In this age group, overweight was not related to EOPA. Therefore, other causes must be taken into account such as genetics or nutrition. In order to encourage the adherence to physical activity practice in overweight children, the good results in static strength and coordination and speed of limb movements of overweight children must be kept in mind.

Acknowledgment of Financial Support

This study was supported by a grant (No. B57/99) from the Government of Aragón (Spain).

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