Original Article

Fitness test profiles in children aged 8-12 years old in Granada (Spain)

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ABSTRACT

Fitness test profiles in children aged 8-12 years old in Granada (Spain). *J. Hum. Sport Exerc.* Vol. 6, No. 1, pp. 135-145, 2011. The aim of this study was to determine the effects of physical education in body composition and health-related fitness among boys and girls aged 8 to 12 years old in Granada (Spain) in a longitudinal, randomized study of 5 months. 106 children (49 boys and 57 girls) between 8 and 12 years old completed the study. They were healthy students of the public schools and no history of formal exercise training. Subjects were tested (body composition and health-related fitness, measured by EUROFIT) at baseline and at week 20. After 5 months of study, girls showed more fat mass than boys ($p<0.05$) and boys was more height than girls ($p<0.05$). Health-related fitness showed differences by gender only in slalom (boys vs. girls ($p<0.05$)). The results of body composition and health-related fitness revealed that the physical activity at school is not sufficient to support an ideal level of health-related fitness. **Key words**: BODY COMPOSITION, PHYSICAL FITNESS, HEALTH, EUROFIT, CHILDHOOD.

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INTRODUCTION

The physical fitness in children has been defined as the aptitude to realize physic tasks without fatigue related to the cardio respiratory general resistance, muscular specific resistance, and the levels of muscular force, extent of movement, speed and coordination (Mondal, 2006; Deforche, 2003). The physical fitness in the children is narrowly related to his/her level of cardiovascular health, there is a direct relation between the development of the physical fitness and health (health-related fitness). It is evident that in the last decade, the level of physical fitness in children has been decreasing and the levels of obesity have increased (World Health Organization, 2009; Slinger, 2005), probably because the levels of physical activity needed from the children in school age are not sufficient to promote an ideal health (Koutedakis & Bouziotas, 2003).

The obesity is an important problem in the primary school, the poor food habits and the lack of physical daily activity can lead to the obesity in the children with genetic predisposition. The children should increase the physical activity to avoid the obesity. However, the quantity of time in physical educational schools programs has diminished and the interventions of the seasons have limited effects (Lobstein et al., 2004; Simsek et al., 2005).

The World Health Organization, (2009) warns about the increase of the childhood obesity is a global epidemic, which in the adults major risk of mortality is associated with one in numerous diseases (Bender et al., 1998) and in the children with an increase in the factors of cardiovascular risk. Locomotor (Ball et al., 2003) and psychological problems (Torok et al., 2001) have been carrying out in several studies. Nalan et al. (2000) described the benefits associated with the physical activity in children and teenagers, improving possible heart diseases, the obesity and the problems derived from them. In addition, they indicate the social and psychological benefits that provide the development of the physical fitness by means of the physical activity and the sport. Koutedakis and Bouziotas (2003) established that one of the strongest difficulties in the follow up of the obesity is his adhesion to physical activity programs.

Nowadays, the efforts to promote levels of physical fitness in the youth, is necessary to be a priority. The majority of studies on the physical fitness centred on the aerobic capacity neglecting the aptitude neuromotor based on the muscular force, flexibility, speed of movement and coordination, several studies had reported that the levels of physical fitness in the children of today had diminished whereas others do not show differences (Matton et al., 2007; Tomkinson, 2007).

The relation between the physical activity and health of the children has been documented by Hallal et al. (2006) and Vicente-Rodriguez (2006), these researchers established a clear relationship among health, physical fitness and diet. There are no sufficient tests that studied if the physical activity contributes benefits in terms of physical, mental and social well-being, to the children to express confidence in their self sensation of achievement, the social interaction and the integration, as well as to promote the adoption of a different way of life, avoiding the consumption of tobacco, alcohol, drugs and violent conducts.

Barnett et al., (2008) reported that the children who are competent in the accomplishment of the motor skills took part more in the type of activities that can improve his/her levels of physical fitness. The improvements in the muscular capacity, the speed and agility, instead of the aerobic capacity, seem to have a positive effect on the musculoskeletal health. Therefore, Armstrong and Welsman (1997) reported that the neuromotor system can be as important as the aerobic capacity in the maintenance of the health. The description of the levels of physical fitness of the children can do that the promotion of aptitude and the

most effective interventions it can improve the present and future health in children. In addition the information might be taken advantage by the teachers of physical education and sports trainers and it is in use for identifying the children with talent that they might be trained for the competitive sport.

The aim of this study was to determine the effects of physical education in body composition and health-related fitness of children aged 8 to 12 years.

MATERIAL AND METHODS

The sample of the study has been constituted by 119 children (58 boys and 61 girls) between 8 and 12 years old (10.40±1.17 and 10.15±1.30 years for boys and girls respectively) students of the public schools no history of formal exercise training.

Only medically healthy subjects with haematology and biochemical values in the normal range were included in this study. Thus, subjects presenting with chronic, metabolic, or acute diseases or taking any medications were excluded from the study. After the medical analysis, a total of 106 children (49 boys and 57 girls) completed the study.

The protocol was approved by the school guidelines, and informed written consent was obtained from the parents of the participants. The study was conducted in accordance with the ethical rules of the local committee of the University of Granada.

The descriptive design of this research was carried out using a model of longitudinal study throughout the time, double blind and randomized of 5 months. At the beginning of the study and after 5 months of intervention, anthropometric measurements were taken. In this design an independent variable has conjugated with two levels, male and female. The dependent variables had been the evaluations anthropometric and the evaluations of the health-related fitness that are described below.

The participants were barefoot and wore only underwear. Body weight (kg) was measured using a standard balance beam (Seca 220). Body height (cm) was measured using a precision stadiometer (Seca 220), attached to the balance beam. The subjects stood upright, with feet together, knees straight, heels, buttocks and back touching the back part of the stadiometer and the head held so that the Frankfurt line was horizontal. Waist circumference (cm) was measured with an inelastic tape, applied horizontally, midway between the lowest rib margin and the iliac crest at about the level of the umbilicus. The body composition was measured using bioelectrical impedance method (Bodystat-500, UK).

The valuations of the tests of the battery of test EUROFIT were fulfil them at the beginning of the study (pre-test) and after 5 months (postest). 7 tests integrated inside the battery EUROFIT (Moreno et al., 2003) validated and standardized by the Council of Europe and used for the detection of sports talents in early ages they were applied in the shape of organized circuit, in the educational schools.

1-PlateTapping: to measure this test I use an adjustable table in height so that it comes to the waist of the pupil. On his board it has printed two circles of twenty centimetres of diameter and whose centres are separated eighty centimetres, equidistant of both circles a rectangular plate of 10 places x 20 cm. The pupil placed opposite to the table and with the feet lightly separated, places his not dominant hand on the rectangular zone and the most skilful hand on one of two circles. The test passes touching alternative the every some of the circles a total of 25 times with the dominant hand and so fast as one could. The least

skilful hand remains in continuous contact with the rectangle painted between the circles. The chronometer for when the contact takes place number fifty; and the time registers in hundredth of second. The aim is to touch two plates of alternative form with the maximum speed.

2-Handgrip: The aim of the test is to measure the static force by means of a precision dynamometer. The pupil holds the measuring device with his stronger hand (normally of precision) and his arm falls down totally extended along the body, but without touching any part of this one. The pupil must press everything what could flexing on the dynamometer the fingers of this one. In the moment in which it has obtained his maximum degree of flexion the brand is registered in kilograms. Two attempts are admitted and there is certified the best of both measures of the maximum force the realized with the grasp of the dominant hand in a manual dynamometer.

3-Flexibility: The test to measure this quality is named a “deep flexion of trunk” and his aim is to indicate the global flexion of the trunk and extremities. It is necessary to use a platform of 0.76 x 0.88 m on the one that places a metric scale. The pupil places on her of foot and I take off, towards his heels coincide with the line that it determines 0 in the scale of measurement and these must remain totally supported during his execution. The flexion of knees is realized, so that the hands come as behind as possible on the metric scan, after spending them between both legs. This position must be kept until the distance expressed in centimetres, is read by the examiner. Two attempts are realized and the major one is valued.

4-Reaction speed: The test of rod or Galton's cane has the aim to measure the speed from the point of view of the ocular-manual coordination. His execution needs a rod that has a gradual scale in centimetres (approximately of 1 meter of length, 2.5 cm of diameter and 0.5 kg of weight). The scale has placed the point 0 to 30 cm of one of the ends of the rod.

The pupil places sat astraddle in a chair, with the face towards the support, supporting the most skilful (dominant) arm of the elbow up to the wrist on the support of the chair, the palm of the hand inward, the stuck-up fingers, the separated thumb (semi closed hand) and the sight fixes in this hand.

The teacher places opposite to the pupil and introduces the cane in the hollow of the hand making the zero of the scale of measurement with the top edge of the hand. The pupil is warned by the word “ready" & "go" of that the examiner is going to stop to fall the cane in three following seconds. The pupil must seize the cane as soon as possible; the look must remain towards the hand with the one that has to hold the rod. There is registered in centimetres the distance that coincides with the top edge of the hand of the pupil as soon as this one has held the cane and, therefore, stopped the fall, there is annotated the best of both attempts that it realizes.

5-The slalom test: The used test has the aim measure the dynamic - global coordination and the coordination across the skill in the managing of an object (boat of ball). It develops in a flat and non-slipping surface where four beacons arrange on line straight and separated two meters between yes and the first one, in turn, the placed to two meters of the line of item. The pupil places behind the line of exit supported in the hand a ball of mini basketball. To the sign of beginning it has to realize a tour of going and return in zigzag throwing the ball between the beacons. The second attempt is allowed in case the ball escapes. It registers the time that invests in realizing the test, being necessary up to the tenth ones of second.

6-Flamingo balance: To remain in balance on the dominant foot, it measures the general stability, taking the measure in seconds.

7-20 m Shuttle run: The used test has the aim to measure the aerobic capacity of the children. To realize it is necessary to have a flat space, with both parallel lines separated between yes 20 meters, and with a minimal margin of a meter for the exteriors; a recording tape or an electronic device commercialized for this end, which indicates the fractions of time or pallets.

The development of the test begins when the children place behind the line, to a meter of distance some of others. On having heard the sign of item it begins to move up to the opposite line and they exceed it. There they expect to hear the sign acoustics (pallets). Every child will repeat these displacements constant until it could not manage to spend the line in the moment in which the sign sounds. Then he will move back from the test and the applicator will register the last pallet to that the child has listened.

The test-retest intraobserver reliability coefficient observed for physical fitness tests demonstrated a mean intraclass coefficient (ICC) of 0.87 and a range of 0.76–0.98.

There was realized the descriptive statistics of the information registered to the participants. The differences between the established groups were calculated by means of analysis of the variance multifactorial (ANOVA) the groups boys and girls has been the independent variable and the parameters that indicate the physical condition the dependent variables. They have been verified by means of the application of test ANOVA and the significance has been established in $p<0.05$.

RESULTS

Table 1 shows the descriptive statistics and inferential of the results obtained in relation to the gender of the subject of the anthropometrics characteristics of the participants, only significant differences ($p<0.05$) had been found between the sample of the male and female in the variable of the height and in the fat percentage top mass in the sample of the children in the variable of the height and in the girls in the variable of the percentage of fat mass, in other measurements significant differences were not observed in either gender. In order to establish the differential existing possibilities between the measurements anthropometrical, they have been compared by means of the application of test ANOVA, the independent variable to the groups of the study to be able to realize the study of the analysis of the multiple variance, the information has settled down expressing in percentage of increase with regard to the basal initial value, fulfilling the previous suppositions that the analysis demands statisticians (Martín-Andrés & Luna del Castillo, 2009).

***Table 1**. Changes in body composition and anthropometrical characteristics by gender.*

	Pretest	Postest	Changes (%)
Boys, n = 49			
Height (cm)	147.76±13.40	150.34±13.38	1.76±0.62
Body mass (kg)	43.41±12.61	44.59±12.78	2.80±3.34
BMI (kg/m^2)	19.47±3.27	19.32±3.24	-0.71±3.27
Waist circumference (cm)	70.88±10.88	71.17±10.16	0.64±4.40
Fat mass (%)	20.72±5.96	19.26±5.57	-6.81±7.31
Girls, n = 57			
Height (cm)	145.92±12.90	148±12.40	1.46±0.85
Body mass (kg)	43.34±14.40	44.66±14.27	3.46±4.03
BMI (kg/m^2)	19.82±3.96	19.89±3.85	0.49±3.55
Waist circumference (cm)	72.91±12.21	72.59±11.15	-0.05±5.45
Fat mass (%)	27.28±5.93	26.25±5.96	-3.77±6.54

Table 2 and 3 shows the results of the ANOVA for the differences by gender in the height values and fat mass respectively.

***Table 2.** Results of the analysis of the variance (ANOVA) of the independent variable with regard to the variable dependent on the height.*

Gender	N	Mean	SD	F-Ratio	P-Value
Male	49	1.76 %	0.62	5.34	0.0230*
Female	57	1.46 %	0.85		

**p<0.05*

***Table 3.** Results of the analysis of the variance (ANOVA) of the independent variable with regard to the variable dependent on the fat mass.*

Gender	N	Mean	SD	F-Ratio	P-Value
Male	49	-6.81 %	7.31	6.93	0.0099*
Female	57	-3.77 %	6.54		

**p<0.05*

Table 4 show the results of health-related fitness tests. The inferential analysis shows significant differences by gender only in the slalom.

Table 4. *Health-related fitness tests by gender.*

	Pretest	Postest	Changes (%)
Boys, n = 49			
Plate Tapping (s)	14.89±2.55	13.85±2.12	-6.44±7.08
Handgrip (kg)	25.11±9.36	26.89±10.13	7.22±7.79
Flexibility (cm)	25.69±6.64	27.89±8.07	8.48±12.74
Reaction speed (cm)	24.59±10.00	15.08±7.51	-36.26±24.97
Slalom (s)	10.66±1.95	10.02±1.83	-5.45±9.57
Flamingo Balance (n)	16.48±7.39	11±7.05	-31.58±35.05
20 m Shuttle run (n)	7.27±2.82	7.84±2.33	17.09±34.00
Girls, n = 57			
Plate Tapping (s)	14.77±2.25	13.73±1.72	-6.29±8.17
Handgrip (kg)	19.74±6.02	20.97±6.63	6.46±10.42
Flexibility (cm)	24.07±4.76	25.61±5.16	7.08±13.20
Reaction speed (cm)	28.66±11.77	19.96±9.44	-28.51±29.03
Slalom (s)	12.98±3.00	11.48±2.22	-10.07±12.02
Flamingo balance (n)	16.21±8.80	11.57±8.60	-23.51±52.51
20 m Shuttle run (n)	4.54±1.67	5.16±1.65	21.88±40.57

To establish the possible existing differences between the physical test, they have been verified by means of the application of test ANOVA, the independent variable to the groups of the study to be able to realize the study of the analysis of the multiple variance, the information has settled down expressing in percentage of increase with regard to the basal initial value, fulfilling the previous suppositions that the statistics analysis demands, Must and Tabor (2005). Table 5 shows that in the independent variable from the test of slalom they found significant differences by gender (p=0.0355).

Table 5. *Results of the analysis of the variance (ANOVA) of the independent variable with regard to the variable dependent on the slalom test.*

Gender	N	Mean	SD	F-Ratio	P-Value
Male	49	-5.45 %	9.57	4.55	0.0355*
Female	57	-10.07 %	12.02		

**p<0.05*

DISCUSSION AND CONCLUSION

In spite of an awaited significant increase in the weight and the height due to the normal growth during the childhood, changes were not observed in the BMI, abdominal perimeter after 5 months of the study. The results showed that the male have major trend towards the growth of the height, whereas in the female they tend to the increase fat mass.

The results obtained in this study are similar to those found by Koutedakis et al., (2003) and Tsimeas et al., (2005) and they indicate that the diet and the physical activity of the samples, are not sufficient to support an ideal level of health, as suggests Armstrong et al. (1997) and the article of consensus about physical activity in children, published by Sallis et al. (1994).

The results of the information of percentage of fat mass are similar to other studies Koutedakis and Bouziotas, (2003) in other countries that also question the affirmation of which the classes of physical education should full fill the needs of physical activity in children. Others studies could aim the differences between physical activity levels in children without extracurricular activities opposite to those who in addition follow a physical extracurricular systematic activity.

In the studies analyzed on the existing relation between the characteristics by gender and health-related fitness of children and young girls they have found differences. Perez-Zorrilla et al., (1996) found bigger levels of height in females than males. Amusa et al., 2010, also, proved sex similar that agree with other investigations that indicate that the girls are higher that the children in a sample in rural zones of South Africa. Tinazci et al., (2009) found higher levels of fat in children in a sample in a zone of Cyprus, results that contrasts with the information obtained in our study where differences are situated in the fat mass between children of both genders.

Nevertheless, Gungor et al., (2010) demonstrated significant differences after 3 weeks in the body mass of the children who take part in programs of training football (pretest= 39.5±8.8; postest= 39.9±9). In our finding they did not find significant differences, but if a major level in male body weight, results that contrast with the information obtained of study Perez-Zorrilla et al. (1996). There has been brought in recent studies those environmental factors, like way of life and diet (Gungor et al., 2010). The familiar structure, cultural differences and others several factors are narrowly related to the physical aptitude and the physical activity, there are also opinions in against on the environmental and cultural factors (Finn et al., 2002; Rowlands et al., 1999).

The literature review had indicated that the girls have more flexibility than the boys, and the differences by gender there occupies a place emphasized during the period of rapid growth the adolescence and the sexual maturity (Monyeki et al., 2005). In these results showed that boys were more flexible than girls but they did not find significant differences.

In the present study, only significance has been obtained in the variable of the slalom, showing improvements in males, this information contradicts the obtained ones for the author Perez-Zorilla et al. (1996). These results could be owed to the more inactivity of the girls compared with boys, which results in a decrease in the coordination.

In the results of the test of dynamometric manual of the study of Amusa et al. (2010) demonstrated that grasp force in children increases with the age. These results support the conclusions of Van Gent et al. (2003) and Micheli (1983) that increases grasp force with the age. Nevertheless the results of our study were not significant differences of the force during the increase in the age. These results, and in the context of the present study, one should increase the quantity of physical activity to at least three times per week and take care of the diet in children of this age.

The curriculum of health-related fitness developed in the primary education is not sufficient to reach the levels of physical fitness and cardiovascular desirable health in the sample analyzed by what nowadays must develop physical complementary activities. In addition this classes of physical education and the professorship if they can be promoters of the participation of the students in physical activity extracurricular and healthy habits of life (Warburton et al., 2006).

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