Evaluation of some physical fitness characteristics in 11-13 years old

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Abstract

Many studies indicate that a physical fitness characteristic is an important marker for healthy body and healthy mind. The major purpose of this study is to explore the levels of physical fitness of the students between 11 and 13 years of age. The participants of this study are 251 volunteer students including 95 boys and 156 girls between the ages 11 and 13 who participated at physical education lessons two times a week. The students were assessed for six anthropometric characteristics and five physical tests. Mean, standard deviation, and multiple comparisons were used for statistical analyses to find out differences between sexes with ANOVA, and Bonferoni Tests for differences between ages. Anthropometric measurements were reported as body mass index, height, weight, arm span, waist and hip and physical fitness traits such as agility, balance and strength. The findings suggest some differences between female and male students and between ages; male participants obtained higher results as means compared to female participants.

Keywords: anthropometrics, agility, balances, strength, students.

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1. Introduction

Regular physical activity bears a significant part in enhancing and maintaining human health (Cordova, Villa, Sureda, Rodrigues-Marrovo & Sanchez-Collado, 2012), and is generally considered to be necessary for adequate growth and development (Canhadas, Lopez, Silva, Rodrigures, Leslie & Portes, 2010). In addition, physical activity of children is not only a therapeutic act but also it is a preventive measure to lower the risk of obesity related diseases as cardiovascular problems (Fuster, Topol & Nabel, 2005; Garcia-Ortiz, Grandes, Sanchez-Perez, Montoya, Iglesias-Valiente, Recio-Rodriguez & Gomez-Marcos, 2010). Physical education as educational process means to help children and adolescents in the acquisition of skills, fitness, knowledge and attitudes that plays an important role for their well being and development at optimal levels.

Some physical fitness characteristics are taken in consideration for this study; agility, balance and strength of upper limbs, lower limbs and abdominal muscles. According to Gallahue and Cleland-Donnelly (2003), balance is a complex part of one's motor fitness that is influenced by vision and the power to keep the equilibrium against the gravitational force through making certain movements with the body when put in different positions. Balance is a mechanical condition indispensable for the motor function, as it ensures the stability of positions (posture) and the orientation of movements in space; hence, it is required in daily, professional, and sports activities (Cordun, 2009). Agility is being able to change any position quickly and it is affected by coordination, balance and center of gravity. (MacKenzie, 2004). Power represents the ability to perform one maximum effort in as short time as possible as known as explosive strength. The combination of strength and speed is exhibited during jumping, striking, or throwing for distance (Gallahue & Cleland-Donnelly, 2003).

2. Materials and methods

The study was carried out on 252 students from National College "Mihai Eminescu" from Iasi, Romania (158 girls and 94 boys) with ages between 11 and 13 years old. The purpose of the research was explained to all the participants and a written consent from the parents and students was obtained. The anthropometric measurements included 5 evaluation of physical status; weight, height, arm span, waist and hip. On the base of first two measurements we calculated the Body Mass Index (BMI). All of the participants were measured in line with the standard procedure as recommended by the International Society for the Advancement of Kinanthropometry (ISAK, 2001) as follows:

- Basics (height and weight); a stadiometer and a weighing scale were employed. The features of height were measured to the nearest 0.1 cm and mass features were measured in kilograms.

- Girths (waist and hip); an anthropometric tape was employed and the features were expressed in centimeters.

- Arm span was measured on a flat wall with the participants' arms stretched, palms turned around to face the researcher. It was measured from one fingertip to the other with a tape on the wall and was expressed in centimeters.

- The formula to calculate body mass index (BMI) points out to the ratio of weight and height of the participants; and was calculated as weight (kg)/ total height2.

Three tests were performed by the participants to evaluate agility, balance and strength of abdominal, lower limb and lower limb muscles (MacKenzie, 2005).

- Standing Long Jump (SLJ). This test was used to assess explosive power and strength. Test was performed from static position behind a line and jumping as far as possible by swinging arms foreword. Subjects performed two times and was recorded the best results in centimeters.

- Sit Ups Test. Participants were asked to rise 90 degrees and turn back with their arms folded over their chest from their back with knees bent and feet on the floor. The number of sit ups in 30 seconds was registered.

- 10x5m shuttle test. The subjects ran to the opposite marker at 5 meters distance from starting line, turned and went back at the starting point. The shuttle test was repeated five times and the participants did not stop. The total time was recorded in seconds.

- Flamingo Test. The subjects completed the test on the dominant foot and required a wood beam stabilized by two supports at each end. The participants stood on one leg on the beam with shoes removed. The participants were asked to bend their free legs so that they can hold their free feet close to their buttocks as much as possible. The number of falls in 60 seconds was recorded and in the case that there were more than 15 falls in the first 30 seconds, the score was recorded as zero and the test was terminated.

- Overhead Medicine Ball Throw. The participants brought the ball over and behind their heads and threw forward with force as much as possible. The participants were encouraged to step forward once they threw the ball to maximize the distance. The best out of three attempts was recorded as the result.

To evaluate data, descriptive statistics including the mean (X), standard deviation (SD) were calculated. Difference of means was analyzed with ANOVA and multiple comparisons were calculated with Bonferoni using the SPSS version 17.0 for Windows. Value of p less than 0.05 is considered significant.

3. Results and discussions

Anthropometrics characteristics of the male participants are presented in Table 1. Groups were divided by ages of subjects (Group 1 = 11 years old; Group 2 = 12 years old; Group 3 = 13 years old). We observed that results were similar between first two groups for all measurements and higher data for group of 13 years old.

Table 1. Anthropometric measurement by age (boys)

	Weight	Height	Arm span	BMI	Waist	Hip
Group 1 (N=9)	39.00±11.21	1.46±0.08	146.33±7.50	1.33±0.50	71.22±8.85	80.55±8.00
Group 2 (N=43)	41.48±9.80	1.49±0.08	148.93±7.51	1.46±0.54	71.53±5.54	80.07±5.42
Group 3 (N=42)	49.44±10.91	1.58±0.08	159.71±9.29	1.74±0.67	76.68±7.44	85.57±8.58
Total (N=94)	44.80±11.17	1.52±0.09	153.50±10.02	1.57±0.57	73.68±7.04	81.43±6.78

Characteristics of female participants are presented in Table 2. Similar results were found between first two groups and third. These differences are predicted by puberty period for both sexes (Pearson, Naughton & Torode, 2006). On other researchers found 1,55 cm height and 50 kg weight at 12 years and 1,53 cm (Radu & Vanvu, 2013); 47.74 kg at 13 years (Moraru & Radu, 2014), and 1.57 m and 48.29 kg for non-athletes female at 12.51years (Popovici & Radu, 2014). The anthropometric characteristics increased with age as expected for all measurements.

Table 2. Anthropometric measurements by age (girls)

	Weight	Height	Arm span	BMI	Waist	Hip
Group 1 (N=15)	42.26±4.59	1.47±7.71	146.00±10.65	1.66±0.72	72.73±10.28	82.80±10.33
Group 2 (N=89)	42.42±11.03	1.50±0.07	149.62±7.37	1.47±0.64	73.09±8.98	82.25±10.53
Group 3 (N=54)	50.63±10.92	1.57±0.06	1.56±6.70	1.74±0.67	76.68±7.44	85.57±8.58
Total (N=158)	45.21±11.95	1.51±2.37	151.77±8.33	1.58±0.66	74.28±8.74	83.44±9.95

In Table 3 we found results of physical fitness measurements and observed that in all tests group 2 (12 years) obtained the lower performance. In girls group (Table 4) we observed that the lower performances were obtained by first group in standing long jump, balance and medicine ball throw, second group for 10x5 m shuttle run and group 3 in sit-up. Between gender, boys have a better lower limb and upper limb strength and abdominal muscle, and girls have a better balance comparative boys.

Table 3. Physical fitness measurements by age (boys)

	SLJ	Sit-up	10x5m	Flamingo	Ball throw
Group 1 (N=9)	1.49±0.17	21.89±2.89	23.21±4.01	14.89±3.98	4.35±0.86
Group 2 (N=43)	1.45±0.16	20.14±4.34	23.74±2.65	16.28±6.25	4.06±0.66
Group 3 (N=42)	1.61±0.24	21.57±3.31	21.13±2.31	15.69±6.30	5.40±0.90
Total (N=94)	1.53±0.21	20.95±3.82	22.52±2.92	15.88±6.06	4.68±1.02

Table 4. Physical fitness measurements by age (girls)

	SLJ	Sit-up	10x5m	Flamingo	Ball throw
Group 1 (N=15)	1.32±0.19	18.07±3.41	23.96±1.55	17.07±7.67	3.87±0.99
Group 2 (N=89)	1.41±0.18	18.30±3.59	24.91±2.53	13.71±7.79	4.10±0.70
Group 3 (N=54)	1.45±0.88	16.85±3.98	21.88±1.94	15.50±7.96	4.43±0.93
Total (N=158)	1.42±0.19	17.78±3.75	23.78±2.66	14.64±7.87	4.10±0.83

Some statistically differences were obtained with Bonferoni test for multiple comparisons between groups. In boys group (Table 5) significant differences ($p<0.05$) are between group 2 and 3 for standing long jump, agility test 10x5m and medicine ball throw. Mean difference is significant between groups 1 and 3 too.

Table 5. Physical fitness measurements by age –multiple comparisons with Bonferoni

Boys	SLJ	Sit-up	10x5m	Flamingo	Ball throw
Mean differences (Group 1 – Group 2)	0.044	1.749	-0.533	-1.390	0.289
Mean differences (Group 1 – Group 3)	-0.118	0.317	2.081	-0.802	-1.050*
Mean differences (Group 2 – Group 3)	-0.163*	-1.432	2.615*	0.589	-1.339*

In girls group (Table 6) differences are significant statistic only for agility (group 1- group 3 and group 2 – group 3).

Table 6. Physical fitness measurements by age –multiple comparisons with Bonferoni

Girls	SLJ	Sit-up	10x5m	Flamingo	Ball throw
Mean differences (Group 1 – Group 2)	-0.093	-0.237	-0.952	3.350	-0.228
Mean differences (Group 1 – Group 3)	-0.131	1.215	2.086*	1.564	-0.553
Mean differences (Group 2 – Group 3)	-0.038	1.452	3.038*	-1.791	-0.324

The effects of physical education during this phase of life are difficult to distinguish from those of normal growth and development (Rogol, Clark & Roemmich, 2000). In the study by Simsek et al. (2014) the average of sit up test for 11 years were 17.75±3, 88 times for boys. Research results show that our data are in according with literature, both for girls and boys. In a Lithuanian research, at 12 years were found 23.8 times for girls and 26.3 times for girls, more than our subjects at this age (Yuksel, Tamer & Caliscan, 2014).

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4. Conclusions

The research points out to the importance of physical fitness as an essential health marker in youth. In order for the interpretations of physical fitness assessment to be correct, the scores should be compared with normative scores of the general population of the same age and gender. The findings of this study reveal that male students have performed better than female students except for the balance performance. Further research may be conducted on the methods to increase physical fitness levels among scholars.

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