

Original research papers

STRENGTH IN YOUNG ITALIAN STUDENTS: RESULTS FROM EUROFIT TEST AND COMPARISON AMONG EUROPEAN DATA

Fitness level in students

Abstract

Introduction. The health-related benefits of physical activity are well known. Participation in a physical activity could improve social well-being, as well as physical and mental health, among children and adolescents. **Material and methods.** Thus, during Physical Education lessons, over 1500 students were tested with the Bent Arm Hung and the Standing Broad Jump test; according to the instructions given by Eurofit battery. All phases of the test had been run by teachers that collected data relative to lower limb power and upper limbs isometric endurance strength. **Results.** Females jumped 150 cm (on average) while in Bent Arm Hung scored scantily results. The variability was high in both test. Males jumped over their own height with a variation smaller than females'. About isometric endurance strength the best group was the 16 years (male). **Conclusion.** These two tests showed in both genders a similar pattern to that of other young Europeans but future research are necessary to separate the correlation about country, rural area of origin and socio-economic status. It may be concluded that the level of physical activity (and the possibility to play it) was a decisive factor on the level of performance.

Key words: Eurofit battery test, lower and upper limb, strength, student, physical health

Introduction

Over the past decades the population in most European countries has undergone profound transformation that has affected the entire structure and organization of the society [1]. Indeed, participation in "recreational sport" and in "organized competitive sport" was placed by the young in sixth and nine position in the list of leisure activities [2] while "listening to music" and "watching TV or videos" were the two dominant leisure activities in EU member states.

This situation plays a negative influence on the important role of sport in the prevention of several diseases. Indeed, physical activity (PA) is an important factor to consider in the maintenance of normal growth and development for children and adolescents [3]. In point of this, important association between health, growth, motor development and PA has become the focus of several investigations [4, 5, 6, 7].

Thus, during 2008-2009 scholastic year a series of tests (following the Eurofit battery indication [8]) were performed by a wide sample of Italian students. In particular all sedentary students were tested during curricular physical education (PE) lessons and the results are stored to have a baseline database.

In particular the Bent Arm Hung (BAH) and the Standing Broad Jump (SBJ) test results are shown in this paper like an

indication of state. Furthermore a comparison with other countries data was made to determine the real efficiency of our students within a general contest that minimize the local factor influence.

Material and methods

Subjects

During the implementation of Motorfit project [9] proposed by the regional office of public instruction (Regional Institute for Educational Research) a wide sample of students were recruited within the Lombardian schools. All subjects were healthy, active during PE lessons and unrelated to present or past impairments and disease. The subjects grouped within gender and age were 16 05 (Tab. 1) and self-declared sedentary.

Measurements

Before the assessment, an informed consent from the parents of students was obtained and an electronic sheet guaranteed the anonymous storing of data. Variables were selected and collected following Eurofit battery protocol (Council of Europe 1988) because all variables are strictly defined and not influenced by the authors. In particular, the

Table 1. Anthropometric characteristics about young students. Data divided within age and sex. Numerical position relative to all groups is also reported

Age	FEMALE				MALE			
	n	Weight	Height	BMI	n	Weight	Height	BMI
12	197	41.82±9.28	150±8.11	18.66±3.08	156	41.1±8.7	147.9±7	19.1±3.1
13	175	46.31±9.67	155±7.36	17.25±3.33	213	45±9.8	153.6±8.5	19.2±3.6
14	183	49.98±8.75	160.6±7.32	19.19±2.64	160	51±12.3	161.1±10.2	19.7±3.4
15	100	53.41±7.44	164±5.8	19.81±2.26	115	59.3±9.7	171±8.6	20.2±2.7
16	106	53.96±7.50	164.0±16.33	20.21±2.54	200	63.5±10.4	173.5±7.3	21.0±2.8

performance evaluated were: explosive strength and the upper body muscular endurance through SBJ and BAH tests respectively [10].

Study design

Data were collected in the month of October 2008 by PE teachers (after the same specific task training) during curricular PE lessons. Height was measured with a fixed stadiometer to the nearest 0.5 cm and weight was measured with a beam balance to the nearest 0.2 kg. All data recorded in the same format table have determined the general database to define the fitness baseline of the Italian student [9].

Results

Physical characteristics of the subjects are shown in Table 1. Females and males started their weight from 41 kg (12 y) and reached to 53 and 63 kg at 14 y respectively. These 10 kg of difference are similar to 11 cm of gap in their own height. Indeed, they started from 149 cm (on average) and reached 164 and 173 cm.

In particular, the females improved the height of 5 cm every year stopping at 15 years while males did not show a regular trend. At 16 years males are higher than females of 11 cm and heavier of 11 kg. All sample subjects are in the normal weight class. Differences are also detectable about test results (Tab. 2)

Table 2. Bent Arm Hung and Standing Broad Jump tests results. Mean a standard deviation

SBJ		Age	BAH	
Female	Male		Female	Male
141.6±20.07	151.4±22	12	7.7±6.6	10.8±10.6
146±21.5	159.2±27.1	13	9.2±9.4	16.4±13.5
155.2±22.4	172.2±26.1	14	9.4±8.1	18.4±14.8
156.2±27.7	189.3±25.5	15	7.4±4.8	20.7±14.5
162.4±21.9	205.3±125.2	16	11.9±11.8	21.6±15.5

The females improved the SBJ performance from 141 cm to 162 cm. The best gap was between 13 and 14 years (about 9 cm). The variability was very high in every year class (on average 22.8 cm).

At 12, 13 and 15 years the performances are over their own height about 9 cm while at 14 and 16 years they improved the distance.

Regarding BAH test, scanty results are evident (on average 9 sec). Standard deviations are often similar as the corresponding results (Tab. 2).

On the other hand, all the males jumped over their own height. The best average performance was at 16 years while the

worst at 11 years. The coefficients of the variation are between 12% and 17%.

Also in BAH the best group was the 16 y while high variability are evident (above all at 12, 13, 14 years). The greater gap between male and female was within 15 years group while the lowest at 11 years.

Pearson correlation coefficients between anthropometric characteristic and test results are shown in Table 3 and 4.

Table 3. Correlation between test and anthropometric characteristics about the female sample

	SBJ	BAH	Height	Weight	BMI
SBJ		0.62	0.91	0.96	0.86
BAH			0.27	0.45	0.90
H				0.98	

Table 4. Correlation between test and anthropometric characteristics about the male sample

	SBJ	BAH	Height	Weight	BMI
SBJ		0.90	0.98	0.99	1
BAH			0.95	0.93	0.90
H				1	

In particular, SBJ was significantly correlated with the growth (height, weight and thus BMI) both for male and female. BAH test in the female group was correlated only with BMI value while for the males, also height and weight, are in good correlation (Tab. 3 and 4). All subjects showed a regular trend of growth (good correlation between height and weight).

Discussion

The main finding of this study was in collecting data from a wide sample of subjects to define the fitness baseline of young Italian sedentary students. Indeed, in Italy a single database is absent (specially in school environment). A second finding was a comparison with other countries results to discover differences or similar trends in fitness levels among young people. Indeed, large differences in performance (on average) of young people from different countries are often presented [9].

The SBJ test showed in both males and females a similar pattern to that of other young Europeans. In particular, the Italian boys (on average 175 cm) were similar to the Flemish vegetarian boys between 10 and 15 years [11] and were better than those (15-16 years old) from Belgium (about 10 cm on

average [12]). Also, Spanish boys (13, 14, 15 and 16 years old) shown similar results (range between 170 cm and 190 cm) during a multicenter study [6] while 12 years old boys from Zaragoza region (considered active and attending an extra-curricular physical activity) were more scanty [13].

The Italian girls performed jumps longer than the Flemish vegetarian (average difference of 15 cm [11]), and than 13-15 years old Spanish females (9 cm of difference) during a cardiovascular disease investigation [6]. At the same time they were low when compared with the same age non-obese Flemish (data reported between 160 to 165 cm [4]). Also BAH test reveals an Italian trend in line with other foreign students.

Although slightly lower, Italian boys generally performed the upper limbs endurance test as non-elite soccer players [12] from Belgium (maximum difference of 2.4 sec to 16 years).

Ortega et al. [6] have found similar results among 14, 15 and 16 year old Spanish boys while the 13-year-old were found more lower (up to 4 sec of difference).

Casajus [13] found 10 sec of performance in sedentary 12 year old while the Flemish non-obese boys were better than the Italians. The Italian girls performed test lower than 10 years old Belgium females belonging to a control group (not training [14]) but were better than the Spanish (mean difference 3.2 sec [13]).

The trend in Italian students was not regular but generally crescent (within age) while Deforche found constant performance (about 10 sec) in all non-obese girls aged between 12 to 18 years.

Although, the performances scored by Italians was similar than other European countries in other test (i.e. Sit and Reach and Sit and Up) the performances are lowest [9].

Conclusion

Italian status in the 21st century during economic development and cultural integration lost the sport consuetude (mostly at base or recreational level). Thus, become useful improvements of PE course in schools and a definition of specific close program.

Moreover the possibility about fields and indoor gyms and the family economic condition become crucial aspects to improve well being, sport practice habits and cultural inclination to active life style. Differences in physical activity gradients, genetic or socio-cultural aspects are important for a complete fitness definition.

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