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Original scientific paper

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DIFFERENCES IN HEALTH-RELATED PHYSICAL FITNESS STATUS AMONG ELEMENTARY SCHOOL GIRLS IN CROATIA

INTRODUCTION

Health-related physical fitness refers to cardiorespiratory fitness, muscular strength, speed-agility and body composition (Moliner-Urdiales et al., 2010). Although the components of health-related fitness to a significant degree depend on constitutional/genetic differences (Bouchard, 1993a), they are affected by habitual physical activity and are related to health status (Bouchard, 1993b). A lifestyle of regular physical activity presumably contributes to a more efficient functioning of various systems, weight maintenance, reduced risk of mortality (Erikssen et al., 1998) and overall improvement of the quality of life (Bouchard, 1994). There is increasing evidence that high levels of fitness during childhood and adolescence have a positive influence on adult health status (Malina, 2001).

It is frequently assumed that physical activity is an integral part of growing up, but many studies show that children and adolescents are often physically inactive (Armstrong et al., 1990; Heath et al., 1994; Malina, 2001). Recent studies also show evidence of greater inactivity among girls in both vigorous and medial activities (Trost et al., 1996). Also, males have better physical fitness levels than females for both chronological and biological age groups (Ortega, 2008).

The aim of the present study was to determine the levels of several health-related physical fitness components among Croatian elementary school girls from fifth to eighth grade.

METHODS

Subjects

The sample for this study consisted of 790 fifth grade girls, 917 sixth grade girls, 1,041 seventh and 868 eighth grade girls, students of elementary schools in Croatia. A total of 3,616 school girls were chosen to participate in the present study, as a representative sample of all parts of Croatia. The schools were selected from various

geographical areas depending on their level of urbanization. All participants were healthy and participated regularly in two obligatory PE classes per week. The data were collected from February until the end of April 2009. Prior to the participation in the study, a written informed consent was obtained from every participant's parent and a permission to conduct the study from the school principals. This paper presents the results of a larger study with the aim of validating tests and measurements for assessing kinanthropometric characteristics of school children in Croatia.

Instruments and Procedure

Methods for evaluating health-related physical fitness may vary according to the structure of the study. The AAHPERD (AAHPERD, 1984) test battery designed for the assessment of health-related physical fitness in children was used as guidance in determining our test battery with slight modifications in consolidation with the Eurofit test battery (Adam et al., 1988). Body height, body weight and body mass index (BMI) were used as anthropometric measures. Five components of physical fitness were tested (four motor and one cardiovascular health-related fitness test). These included 20-meter dash (as a measure of movement speed), standing long jump (as a measure of explosive power), sit and reach (as a measure of lower back/upper thigh flexibility), dynamic sit-ups completed in 60 seconds (as a measure of abdominal strength and endurance) and distance run (as a measure of cardiorespiratory endurance).

Anthropometric assessment:

Standing height was measured to the nearest 0.5 cm with the Martin-type anthrop meter for the standing posture. Weight was measured to the nearest 0.1 kg using portable digital scales (Omron BF500 Body composition monitor). The measurements were made while the children were wearing light clothes and no shoes. BMI was calculated as weight in kilograms divided by the square of height in meters ($BMI = kg/m^2$).

Physical fitness:

The 20-meter dash was performed from the standing start position. The test measured the time elapsed to the nearest 0.1 second from the starting signal to crossing the finish line. Three trials were administrated alternating with the resting pause. The mean value was calculated and included in the analysis. This test measured the explosive power of the lower extremities, which indicates the ability of maximum movement speed.

The standing long jump (SLJ), as a measurement of explosive power, was measured to the nearest cm as the distance from the standing start to the point of

landing heels. Three trials were administered and the mean value was included in the analysis.

The sit and reach (SAR) measured the distance of the performed stretch to the nearest cm. Before the test, the shoes were removed and the subjects were instructed to slowly reach forward with their knees fully extended as far as possible with palms facing downward. This test represents flexibility in the lower back and upper thighs. Three trials were administered and the mean value was taken in the analysis.

The maximum number of sit-ups achieved in 60 seconds was recorded. The subjects were instructed to keep their arms across the chest while curling up to a sitting position until their elbows touched their thighs. This test gave us insight into abdominal strength and endurance. One trial was given.

A distance run (600 meters) was measured as the time elapsed to the nearest second from the starting signal to crossing the finish line. This test presents an example of cardiorespiratory endurance. The time necessary to cover the proposed distance was recorded in minutes and seconds. One trial was administered.

DATA ANALYSIS

A data analysis was conducted using the Statistical Package for Social Sciences (v18.0, SPSS Inc., Chicago, IL). The descriptive statistics were computed for all the experimental data and separately for each grade (mean, standard deviation, range, skewness and kurtosis). In addition, the Kolmogorov-Smirnov test was used for testing the normality of distribution before further analysis. The differences between the children's physical fitness profiles from grade to grade were determined using analysis of variance ANOVA with Bonferroni correction. The statistical significance was estimated at the level of $p \leq .000625$.

RESULTS

Table 1 shows the health-related physical fitness means and standard deviations stratified by grades. Overall, one way ANOVA showed that all of the health-related physical fitness variables showed statistical significance and higher results in older girls.

Pair wise comparison analysis in body height, as well as in body weight, between all grades showed statistical differences ($p < 0.000$). In BMI there was statistical significance between sixth and seventh grade ($p = 0.04$), but no statistical significance between fifth and sixth grade ($p = 0.211$) nor seventh and eighth grade ($p = 0.252$). Ability of maximum movement speed, represented by the 20 meter dash, showed statistical difference between fifth and sixth ($p = 0.000$), and sixth and seventh grade

($p=0.04$) but no difference was found between seventh and eighth grade ($p=1.000$). In standing long jump differences were found between fifth and sixth, and sixth and seventh grade, respectively ($p=0.000$, $p=0.006$), but no difference between seventh and eighth grade ($p=0.454$). Sit and reach test showed no statistical significance only between sixth and seventh grade ($p=1.000$) as opposed to difference in fifth and sixth ($p=0.000$), and seventh and eighth grade ($p=0.000$). Statistical significance was obtained between all grades in maximum number of sit-ups ($p<0.03$). Distance run test showed significant differences between fifth and sixth grade ($p=0.01$) and seventh and eighth grade ($p=0.000$) but there was no difference between sixth and seventh grade ($p=0.456$).

Table 1. ANOVA results and health-related physical fitness means and standard deviations stratified by grades

Variable	X ± SD				P value
	Fifth grade	Sixth grade	Seventh grade	Eighth grade	
Height (cm)	152.17 ± 7.80	157.79 ± 7.26	162.46 ± 6.63	164.67 ± 6.46	0.000
Body mass (kg)	46.04 ± 10.85	50.07 ± 11.49	54.51 ± 10.70	56.84 ± 9.97	0.000
BMI (kg/m ²)	19.79 ± 3.79	20.14 ± 3.76	20.67 ± 3.45	20.99 ± 3.22	0.000
Dash (sec)	4.22 ± 0.48	4.12 ± 0.44	4.05 ± 0.45	4.04 ± 0.45	0.000
SLJ (cm)	15.35 ± 22.01	158.29 ± 22.93	161.59 ± 22.22	163.39 ± 22.75	0.000
SAR (cm)	43.07 ± 8.00	44.62 ± 7.76	44.90 ± 8.45	46.47 ± 8.66	0.000
Sit-up (n/60sec)	35.17 ± 8.64	37.71 ± 8.58	39.37 ± 8.56	40.45 ± 9.58	0.000
600 m (sec)	212.96 ± 58.83	202.50 ± 53.69	207.04 ± 58.70	195.73 ± 56.55	0.000

BMI - Body mass index, Dash - 20-meter dash, SLJ - standing long jump, SAR - sit and reach, Sit-up - number of sit-ups completed in 60 seconds, 600 m - distance run

DISCUSSION

The results obtained in this study show that the performance on all of the physical fitness variables is generally higher in older girls despite recent study evidences of populations' sedentary behaviour. In this study, school girls were grouped by grades, irrespective of their chronological age and biological development, so some misclassification for children and adolescents in relation to their biological development may occur. Therefore, it is of interest to examine the associations between health-related physical fitness components and biological age in young girls.

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ABSTRACT

Health-related physical fitness refers to cardiorespiratory fitness, muscular strength, speed-agility and body composition. There is evidence of greater inactivity among girls in both vigorous and medial activities, as well as lower physical fitness levels. The aim of the present study was to determine the levels of several health-related physical fitness components among Croatian elementary school girls from fifth till eighth grade. A total of 3,616 school girls were tested for anthropometry and physical fitness. The results obtained in this study show that the performance in all of the physical fitness variables is generally higher in older girls.

Key words: *physical fitness, health-related, school girls*