

## The relation between subjective health-assessment and cardiorespiratory fitness in adolescents

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### ABSTRACT

**Introduction:** Health perception is a complex issue and determined by various factors. When assessing health there are positive, negative and intermediate measurements, as well as health indicators including the following criteria: subjective, objective and social.

**Purpose:** To determine the relationship between subjective health assessment, physical fitness and cardiorespiratory fitness.

**Materials and Methods:** The study included 1.000 high school adolescents from Poland and Ukraine. Two questionnaires were used in the study: an original questionnaire, and a standardized 20 m shuttle run test with PACER (Progressive Aerobic Cardiovascular Endurance Run), enabling indirect assess of VO<sub>2</sub> max.

**Results:** Significant differences between subjective health assessment, physical fitness and cardiorespiratory fitness were found. The best health self-assessment and physical fitness, the best cardiorespiratory fitness results were obtained among adolescents. Polish youth better assessed their health in comparison to the peers from Ukraine.

**Conclusions:** There is a relation between subjective health assessment and the objective parameters. When measuring health state of individuals or groups it is worth consider a subjective criterion of health.

**Key words:** health self-assessment, health measurements, cardiorespiratory fitness

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## **INTRODUCTION**

Lack of the material referent results with different definitions of health. For each individual, health has its own meaning, and is rather an idea, a picture or a desired value. Therefore, it is difficult to measure it [1]. Biosocial attitude toward health caused an extend of the scope and measurements, including all aspects and health condition, positive measurements and subjective health indicators [2,3].

With accordance to the World Health Organization's recommendations, the measurements of the subjective health indicators, including different contexts, different age and social groups are the subject of many studies [4-7]. Subjective health self-assessment is very essential as it helps to describe health and wellbeing from the perspective of the study group. The results of Polish Centre for Public Opinion Research (CBOS) show that along with age the health self-assessment changes for worse [8]. Besides the subjective criteria of health, there is objective one, which are based on the physiology phenomenon such as heart function and physical fitness [9]. Higher level of cardiorespiratory fitness (CRF) is associated with a higher number of ideal cardiovascular health components in adolescents [10]. Low level of CRF is strongly associated with obesity in youth [11]. Cardiorespiratory fitness as well as BMI- Body Mass Index and its components are essential measurements of positive health [12]. Lower level of cardiorespiratory fitness is associated with lower bone mineral content in adolescents [13]. High values of maximum oxygen consumption are very important as they indicate for a good functioning of circulatory and respiratory systems, which enables to perform submaximal efforts with less fatigue [14].

The purpose of this study was to determine the relationship between subjective health assessment and cardiorespiratory fitness.

## **MATERIALS AND METHODS**

The study included Polish and Ukrainian adolescents at the age of 16-18. The study material was a part of research project "Shaping pro-health attitudes among adolescents on Polish-Ukrainian borderland" (No. PBU/0832/12/MP10) conducted within an umbrella project "Cross-Border Cooperation for Health Tourism of Polish-Ukrainian Borderland" (No. PBU/0832/12) co-financed from the European Union Cross-border Cooperation Programme Poland-Belarus-Ukraine 2007-2013.

The study was conducted in May 2014. The Committee for Bioethics, University of Rzeszow approved this study (No. 1/06/2014, dated

June, 11, 2014). The study included 1.000 high-school students from Poland and Ukraine, The Polish students were from Krosno and included 265 boys and 235 girls. The average height for the Polish boys is 177.3 cm tall and average body mass is 69.3 kg. The average height for the Polish girls is 165.4 cm tall and the average body mass is 56.3 kg. The Ukrainian students were from Lviv and included 200 males and 300 females. The average height for the Ukrainian males is 176.2 cm tall and the average body mass is 65.6 kg. The average height for the Ukrainian females is 164.3 cm tall and the average body mass is 55 kg. Body mass was measured with scales Tanita TBF 300, and height was measured with anthropometry Martina.

The original questionnaire included questions regarding: subjective health self-assessment (poor/bad, average, good, very good) and subjective physical fitness self-assessment (low, average, high). Cardiorespiratory fitness (CRF) was measured with a use of the standardized 20m shuttle run test with PACER (Progressive Aerobic Cardiovascular Endurance Run), enabling indirect assess  $VO_2max$  (ml/min/kg). The 20m shuttle runs back and forth with an increasing intensity, announced by time signal till the refusal (tiredness) or run pace decrease in contradiction to time signal [15]. Indirect value of  $VO_2max$  was measured with accordance to Ramsbottom [16]. Test enables to test a large quantity of people and the reliability coefficient (repeatability of results) results with recommendations and willingness to use this tool among adults ( $r=0.95-0.975$ ), children and adolescents ( $r = 0.89$ ) [17,18].

Statistical analysis of the obtained data was done with the use of chi-square test and Kruskal-Wallis test (statistical significance  $p<0.05$ ). Data analysis was performed using Statistica 10.0 (StatSoft Inc.).

## **RESULTS**

More than a half of the study group were girls (53.5%). The majority of Polish (70.8%) and Ukrainian (56.4%) adolescents were in age of 17 years old.

No significant differences in height between the Polish and Ukrainian youth including, both genders were found. Significant difference in the body mass between the Polish and Ukrainian youth was found only in the group of boys. Polish boys (69.3kg) were heavier for approximately 4 kg. Therefore, the average BMI  $kg/m^2$  among Polish boys was 22.1 and differed significantly ( $p=0.0009$ ) from the Ukrainian 21.1.

Polish youth definitely better assessed their health in comparison to the peers from Ukraine (very good health: 33.5% vs. 19.2%,  $p=0.0000$ ). No significant differences in subjective physical fitness between the Polish and Ukrainian were found.

Every fifth person assessed one's physical fitness as high. The values of description's statistic (mean, median, centile 25 and 75) of cardiorespiratory parameters against health and physical fitness self-assessment according to the gender are presented in

the tables (Tables 1-2). Significant statistical difference in physical fitness in the study groups was assessed with the use of Kruskal-Wallis test.

**Table 1.** Relation between subjective health state and cardiorespiratory fitness among boys and girls

Health state of boys	Cardiorespiratory fitness of boys							
	Distance (m)				VO <sub>2</sub> max ml/kg/min			
	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>
poor/bad	1400	1460	1080	1740	45.0	46.2	39.5	51.1
average	1294	1280	1040	1560	43.1	42.9	38.8	48.0
good	1382	1400	1120	1660	44.6	45.2	40.2	49.5
very good	1605	1600	1330	1960	48.4	48.6	44.1	54.6
<b>p</b>	0.0000***				0.0000***			
Health state of girls	Cardiorespiratory fitness of girls							
	Distance (m)				VO <sub>2</sub> max ml/kg/min			
	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>
poor/bad	1060	1120	640	1420	38.8	40.2	30.6	45.6
average	726	680	520	900	32.3	31.4	28.0	35.8
good	846	800	640	1000	34.7	34.0	30.6	38.1
very good	996	980	720	1200	37.6	37.8	32.1	41.5
<b>p</b>	0.0000***				0.0000***			

p –Kruskal-Wallis test

**Table 2.** Relation between physical fitness and cardiorespiratory fitness among boys and girls

Physical fitness of boys	Cardiorespiratory fitness of boys							
	Distance (m)				VO <sub>2</sub> max ml/kg/min			
	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>
low	1109	1080	960	1440	39.7	39.5	37.5	45.9
average	1356	1360	1080	1670	44.2	44.6	39.5	49.7
medium	1430	1420	1160	1720	45.5	45.6	40.9	50.8
high	1605	1640	1360	2000	48.3	49.2	44.6	55.1
<b>p</b>	0.0000***				0.0000***			
Physical fitness of girls	Cardiorespiratory fitness of girls							
	Distance (m)				VO <sub>2</sub> max ml/kg/min			
	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>	$\bar{x}$	Me	c <sub>25</sub>	c <sub>75</sub>
low	701	720	520	800	31.9	32.1	28.0	34.0
average	791	760	560	960	33.6	33.3	28.8	37.5
medium	875	830	660	1040	35.3	34.4	31.0	38.8
high	1023	940	760	1200	38.1	37.1	33.3	41.5
<b>p</b>	0.0000***				0.0000***			

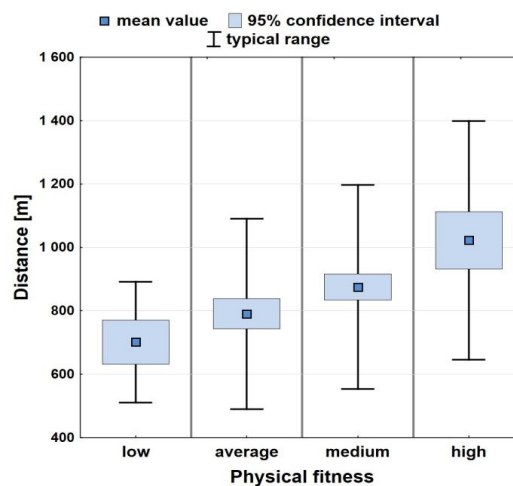
p – Kruskal-Wallis test

Significant dependencies were found between health self-assessment and cardiorespiratory fitness. The best health self-assessment and physical fitness, the best cardiorespiratory fitness results were obtained in both groups of girls and boys. Slightly different

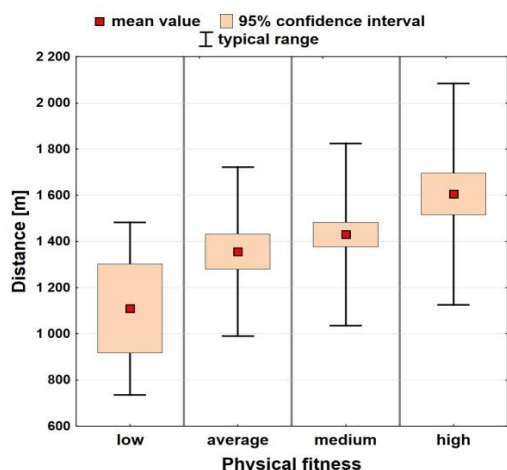
results were found in the group of students assessing their health as poor. Probably it results from the small size of the group, which in turn is related to high randomness in mean value evaluation. Therefore, the figures (Fig. 1-4) of run distance do not include the health assessment (poor/bad) in both groups.



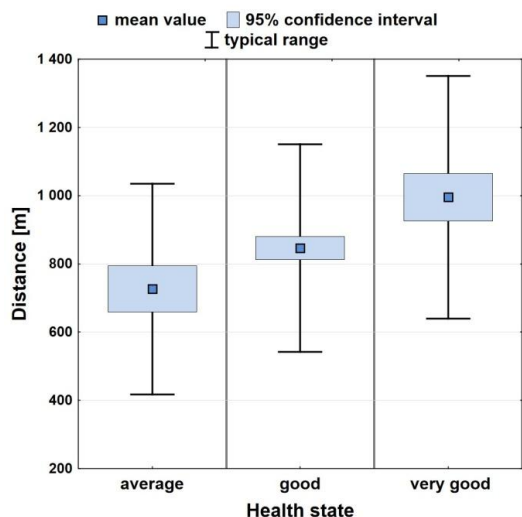
**Fig. 1.** Mean value of run distance in the group of boys with 95% confidence interval against subjective one's health



**Fig. 4.** Mean value of run distance in the group of girls with 95% confidence interval against subjective one's physical fitness



**Fig. 2.** Mean value of run distance in the group of boys with 95% confidence interval against subjective one's physical fitness



**Fig. 3.** Mean value of run distance in the group of girls with 95% confidence interval against subjective one's health

## DISCUSSION

Subjective health indicators enable individuals to make a reflection on one's health and identification of problems related to health. One of the limitations regarding health self-assessment is age, for example, in case of small children. On the other hand, the advantage is the ability to conduct the study on large groups. The results of study conducted by Health Behavior in School-Aged Children (HBSC) from 2010 that among people in age between 11 and 18 years old, in the opinion of the majority of the Polish adolescents their health if good or very good. Data from the same study also show that worse health self-assessment considers girls than boys (differences in the gender increase along with the age) and older than younger [2]. From the other hand negative changes in physical fitness resulting in worse physical fitness and cardiorespiratory fitness among young Polish generation between 1989 and 1990, as well as in later period of time are observed [19]. Between 2008-2011 within the conducted project ADOPOLNOR, aiming on complex assessment of health state and quality of life of young people on Wielkopolska region, above all, physical fitness measurements were obtained. It results from this study that the level of physical fitness in comparison to the general population, is very low, particularly among 16-19 years old. Among almost one-third of the study group, and considering some features among a half, low physical fitness and cardiorespiratory fitness was observed [20]. It follows from the fact that despite good health, the condition of young generation measured by physical fitness is worse.

Health constitutes the basis to gain life aims, intentions, desires and ambitions. The worse subjective health state, the lower physical fitness,

fewer plans for the future, lower level of life satisfaction and decreased quality of life [21].

Our results indicate that this relation is reflected by cardiopulmonary fitness parameters. The worsened health assessment and physical fitness, the worsened results of cardiorespiratory fitness both among boys and girls. The results of nationwide study conducted between 2013 and 2014 among children: 13-17 years old, prove the mentioned above correlations. Subjective physical fitness and vitality self-assessment were strongly correlated with physical activity. Among youth whom assessed their vitality and physical activity on low, involvement, MVPA-moderate-to-vigorous physical activity was significantly lower than among youth whom higher assessed their fitness and vitality [22].

## CONCLUSIONS

There is a relation between subjective health assessment and the objective parameters. When measuring health state of individuals or groups it is worth consider a subjective criterion of health.

## Conflicts of interest

None.

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