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Original article

FITNESS INDEX AND VO₂max OF PHYSICAL EDUCATION STUDENTS

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Abstract

Aim: Through physical activity, the development of cardiovascular endurance is an important prerequisite in health promotion capacity of every man. The aim of this study was comparison of aerobic fitness tested students from the Faculty of sport and physical education, from Belgrade University and Tirgu Mures from Romania.

Methods: The method that was used is Survey method of a non- research, concluding on the basis of the transverse section of the results. The instrument is UKK 2km, walking test. The total sample consisted of two groups, university students, N = 250 (N = 50 students of University of Tirgu Mures and N = 200 students of Belgrade University).

Results: Students from both groups have approximately the same average number of years, body height and weight, and BMI. The results show that men's Fitness index in both groups is in the average values, the values of the Swedish population norms (90-110). Also, the Romanian university students have average values of fitness index, while students at the University of Belgrade these values are slightly below average. VO₂max men in both groups are moving into the category of 'good', according to the criteria of the Cooper oxygen consumption, it is for this value in Romanian's women, while the VO₂max value of our students are in the average values.

Conclusions: The results showed that the differences between our men students and Romanian are insignificant, and to move in the average when it comes to fitness index, respectively, are slightly above average in terms of VO₂max. Our women students are slightly loose fit, and less physically prepared than Romanian students, while their VO₂max values are approximately the same. We can conclude that these students are physically active, their results in the average values, as a result of engaging in teaching activities, but also in recreational activities outside the university.

Keywords: aerobic fitness, students of physical education; UKK 2 km; state condition.

Introduction

The fundamental tasks of physical education are: the optimization of biological development of the human being, referring to the optimization of morpho-functional development, the optimization of motion skills and habits, the prevention and correction of attitude deficiencies, psychical development and the building up of human personality (Badau, 2006)

A number of studies point to the key role of physical activity in order to ensure proper physical and mental growth and development, environmental health, improvement of working capacity and quality of life. For it is precisely through physical activity, the development of aerobic fitness, or cardiovascular endurance important prerequisite.

Physical activity promoters are increasingly recognizing that to keep people active, they need to help them develop physical activity habits that fit their lifestyle (De Bess, Forsyth, 2009)

Promoting benefits and content of various

leisure physical activities through an extensive permanent and updated campaign, with modern scientific discoveries in the field of motric activities will contribute significantly to optimizing human potential improvement. (Badau, et al, 2012)

Understanding the factors that motivate health-enhancing physical activity has considerable merit given the role of this lifestyle behavior in combating disease and promoting quality of life (Wilson, Mack, Grattan, 2008) .

However, despite the large number of information available on the various benefits of physical activity in general, remain the most vulnerable people such as children, adolescents, persons exposed to stressful situations, and the elderly. If we consider only the categories of adolescents, this group, in addition to high school age, and belong to the students as well as older adolescents. Study represents a significant change in lifestyle, the qualitative organization of learning, and frequently change their place of residence. Adolescents, the majority, have stabilized work

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habits, social behavior in the area are still searching for their own identity and self-affirmation (Mitic, 2001).

Worldwide there has been a large shift towards less physically demanding work. This has been accompanied by increasing use of mechanized transportation, a greater prevalence of labor saving technology in the home, and less active recreational pursuits (World Health Organization. World Health Organization, 2008).

Personal lifestyle changes however can correct the lack of physical exercise. New research indicate integrating mindfulness to physical exercise interventions increase exercise adherence, self-efficacy and also has positive effects both psychologically and physiologically (Kennedy, Resnick, 2015).

This triangular approach: the benefits of practicing physical activities during leisure time, the temptations of modern life with the index of fitness and physical activity, is fully in line with the modern tendencies of investigating ways of optimization of the motric, functional and mental abilities specific to an active style of life. Motivation and students' orientation towards spending their free time in an active manner embody a feasible alternative in order to change mentalities and behaviors of the young generation. (Badau et al., 2012)

Under the beneficial influence of physical exercise, through a more intense activity, in the body the capillary reserves open and new ones are formed. Apart from capillary multiplication, muscular fibers develop leading to the appearance of a harmonious muscle mass and a good effort capacity (Badau et al., 2009) reaction, motion elegance, rhythm and musicality. The aerobic effort runs its course in a balance between the demand and consumption of oxygen "steady - state", which can be real or apparent. The apparent state of balance refers to a cardiac frequency of 130-170 beats/ minute. (Dumitru, 2004).

A very good cardio-vascular activity, where the heart becomes stronger during the effort, pumping a bigger blood quantity to the peripheral circulation which determines a performance increase during the physical exercise (Hardman, Stensel, 2009)

Because of this way of life and types of liabilities, it is often the case that students do not have enough time for physical activities, in so far as may be necessary for optimal balance and function. However, if we take into account only the students of the Faculty of sport and physical education in Belgrade University, and the University of Romania, the results show a different state. Because of the specific duties during the study, which are based on practical training, in addition to the theoretical, physical preparation of these students is

satisfactory. In addition to teaching, there are well-developed habits to become involved in sports or recreational activities, so that these students do not fall into the risk category when it comes to hypokinesia.

Testing the students of the Faculty of sport and physical education in Belgrade and the students of Human Movement Sciences Department of Targu Mures, Romania, and the Cooper's test UKK brisk walking 2 km, which treats aerobic fitness, known in the literature as a test to assess aerobic endurance (Laukkanen, 1992.), It was shown that the students' physical activity present in sufficient measure.

Method

The method that was used is Survey method of a non- research, concluding on the basis of the transverse section of the results.

The total sample consisted of two university students, N = 250, N = 50 students of Targu Mures University (30 male, 20 female students), and N = 200 students of Belgrade University (122 male, 78 female students). Students from both groups have approximately the same average number of years, body height and weight, and BMI.

The instrument of this study is UKK 2 km, brisk walking test, according to Dr. Kenneth Cooper, the 2 km long track. It is intended for testing of healthy adults aged 18 to 65 years.

The test is relatively simple and does not require major research skills, are generally performed under field conditions, to work on multiple subjects simultaneously, and gives quite a high reliability when it comes to testing amateurs.

Walking, as an activity, engage the large muscle groups, but not among the high-risk activities that could lead to the rapid fatigue.

Before preparing for the test subjects completed a standardized questionnaire, which answers the questions about their physical activity habits during the day, during leisure time or at the workplace, organized forms of sport or recreation in which it participates. Possession of sports equipment, as well as issues that was satisfied with their level of physical activity. Then the respondent indicates anthropometry measurements of height and weight on a digital scale, and where they get information on the percentage of muscle and fat tissue in the body,

Treated aerobic fitness test, known as aerobic endurance test, based on an indirect estimate of maximum oxygen consumption, which forms the basis of physical work capacity.

Test protocol demands respect for outside air temperature in the range of 5 - 25 ° C, moderate humidity, loose-fitting clothing, and warm-up 5 - 10 minutes prior to testing (stretching the muscles

of the legs and spine, brisk walking about 200 meters).

After walking the two miles in a clean and straight track, with rapid and vigorous walk, at the end of the test are recorded during walking and heart rate. Precise determination of fitness to perform index-a (general skills) as well as indirect estimation of maximum oxygen consumption, calculating BMI (body mass index) and the possibility of calculating the energy input required calories per day in relation to body composition (Ksale / KJ).

The survey aims to compare the state of fitness of the two groups of students. Testing was performed according to the protocol, and the data processed by the appropriate formulas. Fitness formula for calculating the index of the people aged 18 to 65 years (Stojiljkovic, 2005).

$$\text{Men} = 420 - (11.6 \text{ min} + 0.2 \text{ sec} + 0.56 \text{ HR} + 2.6 \text{ BMI}) + 0.2 \text{ years}$$

$$\text{Women} = 304 - (8.5 \text{ min} + 0.14 \text{ sec} + 0.32 \text{ HR} + 1.1 \text{ BMI}) + 0.4 \text{ years}$$

Achieved time in minutes and seconds (eg, 15:30 is split into 15 min and 30 sec), HR - heart rate at the end of the test within one minute;
 BMI-weight(kg)/height(m)squared;
 The age of patients .

Obtained values FITNESS INDEX

< 70 well below the average
 70 – 89 somewhat below average
 90 – 110 average
 110 – 130 something above average
 >130 well above average

FITNESS INDEX is the fitness level of the person from the test, compared with the average level of people the same age and sex, was calculated based on walking time, heart rate, body weight index and age. FITNESS INDEX 100 corresponds to an average maximum oxygen consumption between genders, individuals and years. Values below 100 presents a below average level of fitness, a value above which fitness levels are above average. The formula for calculating the maximal oxygen uptake – VO_{2max} (ml / min / kg):

$$\text{Men} = \text{VO}_2 \text{ max} = 184.9 - 4.65 \text{ time} - 0.22 \text{ HR} - 0.26 \text{ years} - 1.05 \text{ BMI}$$

$$\text{Women} = \text{VO}_2 \text{ max} = 116.2 - 2.98 \text{ time} - 0.11 \text{ HR} - 0.14 \text{ years} - 0.39 \text{ BMI}$$

Time to test it is translated as follows: 15 min and 30 sec = 15.5 min predicted VO_{2max} is the estimated consumption of VO_{2max} (ml / min / kg) calculated on the basis of time walking, heart rate, body weight index and age.

The value of maximum aerobic capacity is presented in Table 4. and 5. predicted HR max is the highest heart rate that can be achieved by testing, and estimated based on oxygen consumption and heart rate during a walk in the test. Maximum heart rate can be used to determine the person's target zone, with recommendations for further training.

Table 1. Categories according to FITNESS INDEX

Table 2. The maximum aerobic capacity VO _{2max} (ml / min / kg) – men					
Age	Decreased	Insufficient	Average	Good	Excellent
20 – 29	<25	25 – 33	34 - 42	43 – 52	>53
30 – 39	< 23	23 - 30	31 - 38	39 – 48	>49
40 – 49	< 20	20 - 26	27 - 35	36 – 44	>45
50 – 59	< 18	28 - 24	25 - 33	34 – 42	>43
60 - 69	< 16	16 – 22	23 - 30	31 - 40	>41

Table 3. The maximum aerobic capacity VO_{2max} (ml / min / kg) – women

Age	Decreased	Insufficient	Average	Good	Excellent
20 – 29	<24	24 – 30	31 - 37	38 - 48	> 49
30 – 39	< 20	20 - 27	28 - 33	34 – 44	>45
40 – 49	< 17	17 - 23	24 - 30	31 – 41	>42
50 – 59	< 15	15 - 20	21 - 27	28 – 37	>38
60 – 69	< 13	13 – 17	18 - 23	24 - 34	>35

Data for the fitness index and maximal oxygen consumption (average value), particularly for women and men, in relation to the period when they were tested, are shown in the lower part of Figure 1. and 2. of.

Results

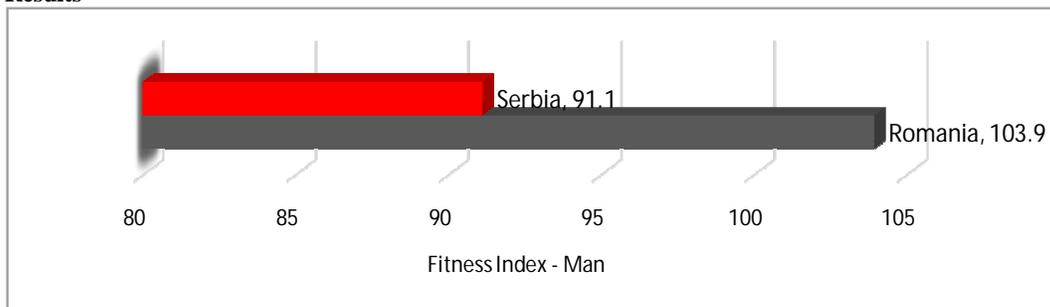


Fig. 1. Descriptive statistic of Fitness index for man

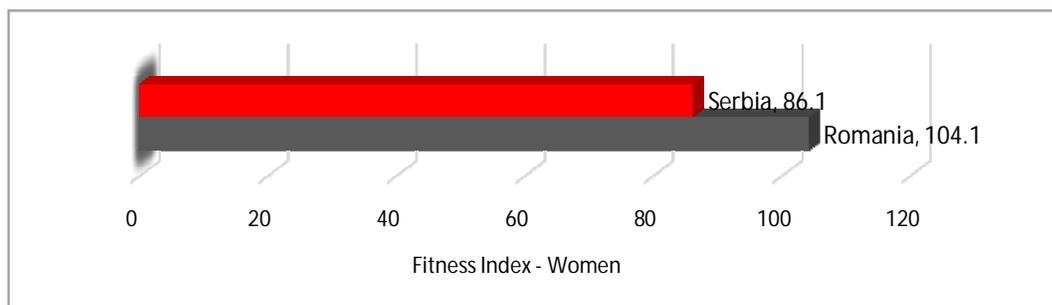


Fig. 2. Descriptive statistic of Fitness index for women

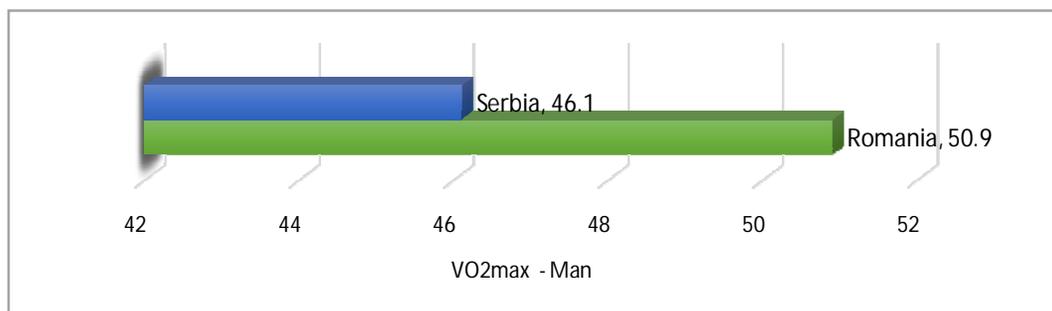


Fig. 3. Descriptive statistic of VO2max for man

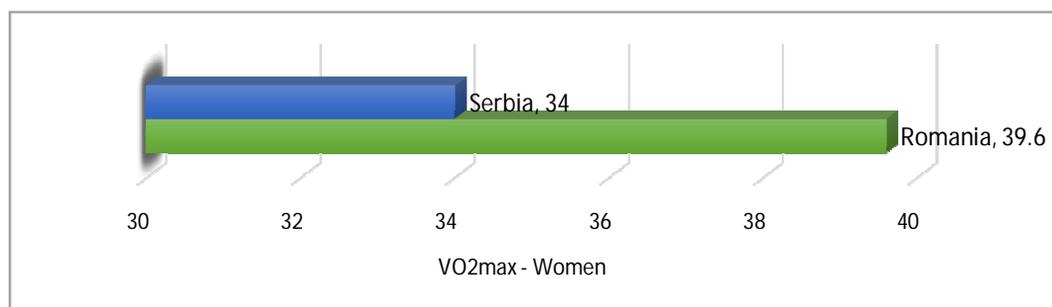


Fig. 4. Descriptive statistic of VO2max for women

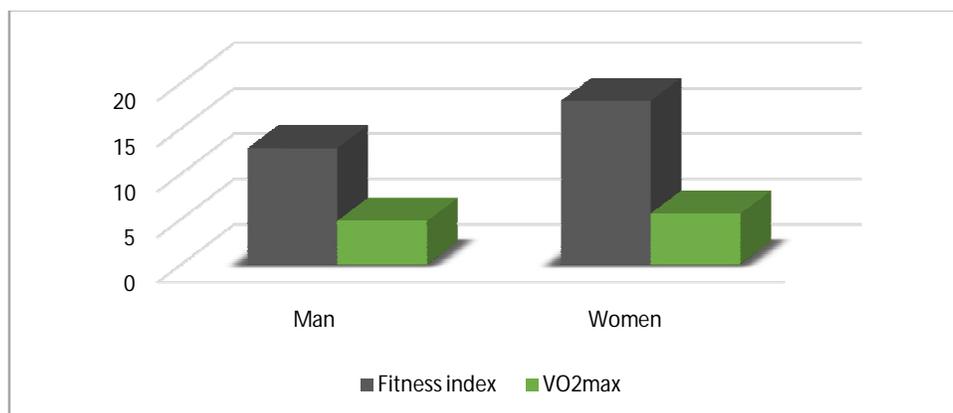


Fig 4. Descriptive statistic of differences between Romanian and serbian groups

On Figures 1. and 3 it can be seen that Fitness index of men students from Romania 103.9, while for our students 91.1. According to the values of the Swedish population norms these values fall within the average (90-110). Maximum oxygen consumption of both groups of men students in the category of 'good', according to the criteria of the Cooper's oxygen consumption, and for the Romanian students, the value is 50.9, while for our 46.1 ml / min / kg.

On Figures 2 and 4 it can be seen that Fitness index women students from Romania 104.1, while for our students 86.1. According to the values of the Swedish population norms in value, the Romanian students fall in average (90-110), but for our girls, and values slightly below average (70-89). Maximal oxygen Romanian students was 39.6, and our 34 ml / min / kg, which tablet to maximal aerobic capacity (ml / min / kg), according to Cooper, the category averages.

Discussion

The aim of this study was to compare the fitness index and maximal oxygen consumption two groups of subjects tested the Cooper test brisk walking on the path of 2 km. The participants are students of the Faculty of sport and physical education, University of Belgrade, University of Tirgu Mures, Romania. During both tests, the testing was performed according to the protocol in similar conditions. Number of respondents students of our University is slightly larger than the number of Romanian students of the University, while their average age, height and weight, and BMI are approximately equal.

The students, men in both groups, fitness index value is within the average range (103 and 91), which can be said of the Romanian university students (104). Our students show a poor physical fitness and stamina, which is slightly below the average (86).

Regarding the maximum consumption of oxygen, both groups of students have above average values (50 and 46 ml / min / kg), while both groups of students belonging to category that includes mean values (39 and 34 ml / min / kg).

Analysis of the obtained results it is evident that students in both groups in the mean values, when we are talking about Fitness index. Also, their VO2max values slightly above average, so that for both groups of men can say that they are in good shape. In our general state of fitness of female students is slightly below average, as opposed to the Romanian students who have an average value of fitness index, while VO2max value shows that girls from both groups in the mean values.

The results of this study indicated that students in both universities fit in the average values. A specific type of study, where in addition to lectures, there are practical, based on the diversity of physical activity for many sports, is surely influenced this end result. On the other hand, students at these colleges have developed a habit for sports and recreation, and prior to entering college, what is the impact on the commitment for future jobs, and probably kept the habit today, through extracurricular activities and recreation.

Not everyone benefits equally from exercise. There is tremendous variation in individual response to training; where most people will see a moderate increase in endurance from aerobic exercise, some individuals will as much as double their oxygen uptake, while others can never augment endurance (Bouchard, et all, 2007; Kolata, 2002). However, muscle hypertrophy from resistance training is primarily determined by diet and testosterone (Hubal et all, 2005). This genetic variation in improvement from training is one of the key physiological differences between elite athletes and the larger population (Brutsaert, Parra, 2006; Geddes, 2007).

The current life style, temptations and negative factors affecting the quality of life determined the decrease of the physical activity level among population, especially young people, which may have major long-term adverse effects on health and job performance.

Changing mindsets and behaviors for an active and healthy lifestyle should be the main goal of any current and future societies. A permanent personal concern was



identifying ways to promote a healthy and active lifestyle by identifying motivation and preferences for practicing physical exercise in relation to combating the negative effects induced by the health risk factors.

Scientific research in motric field contributes to knowledge about how our bodies perform, what is the relationships between components of motor capacity related to the factors of psychic, social etc.

Motric activity provides multiple new scientific discoveries in related fields which determine the optimization of human motric potential. directions for research with a strong social impact, it is in direct relation to the technological development and the

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