EFFECTS OF PHYSICAL EDUCATION CLASSES ON STUDENTS' FUNCTIONAL ABILITIES

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DOI 10.7251/SIZEN2101073M
ISSN 1840-152X
UDK 796.012.1:616.1-053.5
http://sportizdravlje.rs.ba/
https://doisrpska.nub.rs/index.php/SIZ

REVIEW ARTICLE

Abstract: There are many publications that try to explain the impact of physical education on the functional abilities of students. The aim of this paper is to determine the extent to which physical education impacts the functional abilities of students. The method consisted of collecting relevant literature in the period 2005-2007, tabulation and further analysis. Physical education classes have positive effects on both functional and motor and morphological abilities, especially during puberty in students. In the endless sea of existing values that determine the functionality, ability and readiness of students, pulse (heart rate), lactate, VO2 max and anaerobic threshold are crucial for proper work, progress and above all the health of students.

Key words: physical education, functional abilities, student diagnostics, anaerobic and aerobic capacity, cardiovascular endurance.

INTRODUCTION

Physical education is an inseparable part of the cultural heritage of a nation and as such is an integral part of physical culture. Physical education as a part of general education must be a planned and systematic activity which offers physical exercise as a kind of specific need necessary for the development of the human personality. As a human activity, physical exercise is a reflection of the human inner being and as such cannot appear outside of man and his movements *(Smith et al., 2014)*.

Today, physical education is an integral part of institutionalized upbringing and education, family upbringing, but also the effort of the individual to improve and progress in accordance with current norms and values through their own activities, according to their own and social needs *(Demirel & Yildiran, 2013).*

Physical education is a complex pedagogical process in which there must be no mistakes. It must be performed correctly in order to achieve the results we all want, and that is the proper growth and development of students. Through physical exercises, physical abilities are fully and systematically developed, health is improved, and moral qualities are developed, eg. a complete personality is built.

In order to achieve this, the student must be trained. Therefore, the program of physical education should be precise, to know the exact goal, to give each component of the anthropological space its place and to predict to what level it should be developed.

"The goal of physical education is to meet the basic bio-psychosocial needs of students for physical activities, forming a proper understanding and attitude towards them and permanently encouraging students to incorporate physical activities into everyday life and way of life in general" *(Janssen & Le Blanc, 2010).*

An important role in the realization of this goal is played by the professor of physical education, who should be professionally trained to plan and implement classes in a modern way, to put all his creativity in the service of better and organized work in physical education classes. Professors should be aware of their knowledge and role and by their personal example influence students in the development of responsibility, by actively involving them in the process of planning, programming and control of their training. With this approach, students will be an important factor in teaching and will approach training much more responsibly, realizing that they are working for themselves and their well-being. The process of physical exercise strongly affects changes in human abilities and characteristics within the anthropological space. It should therefore be maximally adjusted to the interests and needs of students. The contents of the teaching process in the field of physical education are very attractive, the constant need of children to move facilitates their performance. On the other hand, the modern approach in children's education, including physical education, requires optimal material and personnel conditions. There are difficulties due to the current lack of these conditions, especially sports halls, playgrounds, equipment, etc. This leads to difficult teaching, reduced interest, and even avoidance of training among older students *(Krsmanović, 2006).*

According to the curriculum, physical education is taught in schools for two hours a week. However, this is certainly not enough to take into account the individual abilities of each student, i.e. to perform effective individualization of work in practice. When the already mentioned lack of material conditions is added to that, we should seriously consider increasing the number of classes to three hours a week. In order to successfully perform the so-called. Democratization of teaching, i.e. enabling each student to achieve maximum results within their capabilities, more time is needed for its implementation.

Human functional ability is very complex, in addition to the heart and blood vessels, it depends on a number of other factors, primarily the nervous-vegetative and endocrine systems. It is believed that there is no functional ability of the cardiovascular system common to all life situations, but a number of specific abilities for different activities and situations *(Starc & Strel, 2012).*

In the physiological sense, functional abilities are understood as aerobic and anaerobic abilities, because there are two basic ways of creating energy in the organism: aerobic and anaerobic *(Patel et al., 2017)*.

• In *aerobic,* energy is provided by the breakdown of glucose and free fatty acids by oxygen from the air. The amount of energy that the body is able to create per unit of time depends on the body's ability to carry oxygen to the cells. Oxygen transport depends mostly on the capabilities of the pulmonary system. The more

oxygen the organism is able to consume per unit time, the more energy will be created for work.

• *Anaerobic abilities* show maximum muscle tension, and the level of ability is determined by measuring the concentration of lactate in the blood. With increased muscle work, the amount of lactate increases (normal value in the blood ranges from 0.5 to 1.3 mmol / l). The higher concentration of lactate in the blood is inversely proportional to the degree of training of the individual and is measured by direct methods. There are two kinds of anaerobic sources, depending on which substance is used to generate energy: alactic and lactic. In the alactic fraction, energy is obtained from creatine phosphate, which enables work of maximum intensity, while in the lactic fraction, energy is obtained by metabolizing carbohydrates (glycogen) to lactic acid (lactate) for work of submaximal intensity.

METHODS

Search of literature

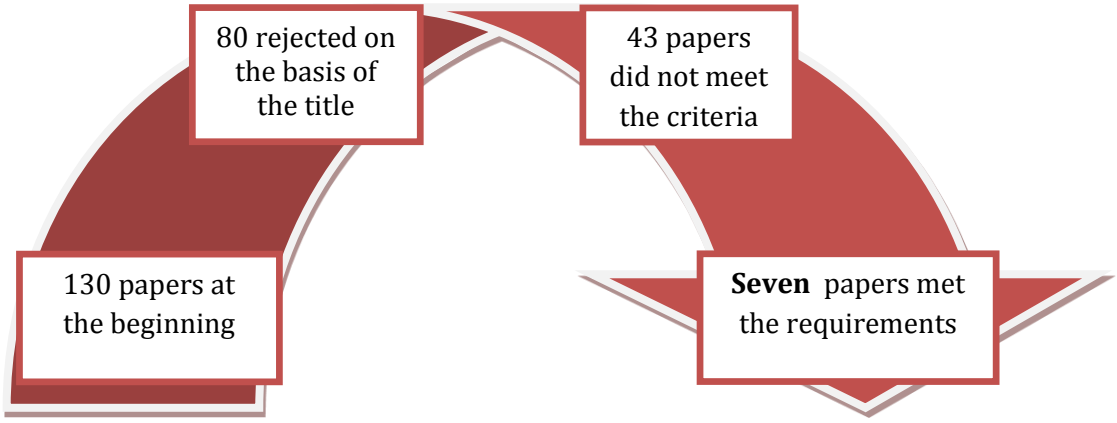
The following electronic databases were used to collect data on the effects of physical education classes on students' functional abilities: PubMed / Medline, SPONET, SCIndex, HRČAK, ScienceDirect, Google Scholar, journals in the field of sports sciences and relevant literature which responded to the problem posed. Collected were papers published between 2005 and 2007. The following keywords were used in the search: Physical education, Functional abilities, anthropological status, student diagnosis, anaerobic and aerobic capacity, cardiovascular endurance.

Selection of papers

The selection of papers was done on the basis of titles and keywords. Two selection criteria were set. The first criterion refers to the issue of research itself. The second criterion was the period from 2005 to 2007. Seven original scientific papers were selected from the mentioned period, which were close to the subject of research and met all the criteria for further consideration.

The procedure of data collection

In the period of two years (2005-2007), the selected papers were the ones that could most closely provide a solution to the research topic.



RESULTS

The results are shown in Table no. 1. The content of the table has information about the first author and the year of publication, the sample of respondents (number, age and gender), and the relationships examined, the results and conclusions of the topic that the authors dealt with. The table shows seven original scientific papers in the period 2005-2007.

First author and year of publication	Sample of respondents			Types of research	Results of research
	Number	age	Gender		
Beets & Pitetti (2005)	187	14-19	M/F	variables of motor and functional abilities	Functional abilities were measured by a 20-meter running test. The following analysis compared upper body strength (bench press), flexibility (torso flexion in a sitting position) and body mass index. Athletes were divided into two groups: those who participated in one to two sports sections (1-2) and those who participated in more than three (> 3), and athletes in the group with one participation (1) and the group with more of two (> 2) participation in sports sections. Both groups of athletes showed significantly better results in the 20-meter running test than the group of non-athletes (athletes r <.001; athletes r <.02).
Ljuština & Pribić (2007)	567	15-19	M	lung ventilation tests	Assessment of lung ventilation function was performed on a Vitalograph apparatus, and before performing the test, students were given detailed instructions on the examiner's technique. The test results show an increase in ventilation parameters with age and body height. The values obtained from this study differ from the reference results of other authors, which imposes the need to develop their own standards.
Debelnogić (2007)	111		M	vital lung capacity, Margaria test and maximum oxygen consumption	Three measuring instruments (vital lung capacity, Margaria test and maximum oxygen consumption) were used to assess functional abilities. The results of the research showed by canonical discriminant analysis that at the end of the experiment there was a statistically significant increase in the level of functional abilities in relation to the initial state.
Ruiz et al. (2007)	339	9-10	M/F	association of cardiorespiratory abilities and early etiology of cardiovascular diseases	Cardiorespiratory abilities were tested by bicycle ergometer test with maximum intensity, and the subjects were divided into two groups based on the results: a group of better ones. The results showed that the level of cardiorespiratory abilities has a positive effect on the risk factors of cardiovascular diseases in children.

Trablesi et al. (2007)	684	8-16	M/F	lung function and degree of maturity	Large differences in the distribution of height results depending on the degree of maturity in both sexes were observed. The results also showed a significant increase in the levels of pulmonary parameters (FVC, FVC1, RES, MEF50 and MMEF25-75) depending on the degree of maturity. Analysis of covariance adjusted to anthropometric parameters showed that the degree of maturity of the organism has a significant effect on some pulmonary parameters in both sexes.
Berndson et al. (2007)	219	8-16	M/F	maximum oxygen consumption (VO2max)	Tested on a bicycle ergometer at submaximal intensity, while data on participation in organized physical activities were obtained through interviews. Obese children had lower oxygen consumption than the reference group (r <.001). Older obese children participated less in organized physical activities than children in the reference group (r <001). In obese adolescents, participation in organized physical activities in leisure time was explained with 7% and VMI with 45% variance in oxygen consumption. Based on the obtained results, it was concluded that obese children are less active than children of the reference group (especially boys) and that the level of oxygen consumption is explained mainly by the body mass index.
Dencker et al. (2007)	248	8-11	M/F	differences in aerobic capacity	Maximum oxygen consumption (VO2max) was measured by indirect calorimetry during a test on a bicycle ergometer of maximum intensity. Regression analysis yielded results indicating that aerobic capacity depended on LBM, maximal heart rate (Max NR), sex, LVDD, and VRA. Lung function was not associated with VO2max. The study showed that body constitution is the main predictor of VO2max in children aged 8 to 11, while VPA and LVDD have modest effects.

DISCUSSION

Based on the interpreted results of the seven papers we have included in the research, we present the most important details of these authors.

Beets & Pitetti (2005), their study compared some variables of motor and functional abilities of high school students (14-19 years of age; 120 students and 67 students) who participate in regular physical education classes and in school sports sections and those who only attend classes. Functional abilities were measured by a 20-meter running test. The following analysis compared upper body strength (bench press), flexibility (torso flexion in a sitting position) and body mass index. Athletes were divided into two groups: those who participated in one to two sports

sections (1-2) and those who participated in more than three (> 3), and athletes in the group with one participation (1) and the group with more of two (> 2) participations in sports sections. These groups of athletes are compared to students who attend only regular physical education classes (non-athletes). Both groups of athletes showed significantly better results in the 20-meter running test than the group of non-athletes (athletes r <.001; athletes r <.02). Significant differences in upper body strength were observed between the group of athletes> 3 and non-athletes (p <006). There were no significant differences in flexibility and body mass index. Athletes did not differ significantly in strength (r = .79), flexibility (r = .579) and body mass index (r = .145).

Ljuština & Pribić (2007) conducted a study to determine the dependence of pulmonary ventilation tests - forced vital capacity, forced expiratory volume in the first second and forced expiratory flow between 25% and 75% of vital capacity according to age and height of young men aged 15 to 19 years from the population of Vojvodina. 567 students aged 15 to 19 were included. Assessment of lung ventilation function was performed on a Vitalograph device, and before performing the test, students were given detailed instructions on the examiner's technique. The test results show an increase in ventilation parameters with age and body height. The values obtained from this study differ from the reference results of other authors, which imposes the need to develop their own standards.

Debelnogić (2007) In his research on a sample of 111 primary school students in East Sarajevo, set the goal of determining the effects of training models on the development of dynamic strength in the fitness training of young athletes. Three measuring instruments (vital lung capacity, Margaria test and maximum oxygen consumption) were used to assess functional abilities. The results of the research showed by canonical discriminant analysis that at the end of the experiment there was a statistically significant increase in the level of functional abilities in relation to the initial state.

Wanting Ruiz et al. (2007) In order to improve the understanding of the relationship between cardiorespiratory abilities and the early etiology of cardiovascular disease, they investigated whether the level of these abilities affects traditional and recent risk factors for cardiovascular disease. The sample consisted of 339 children between 9 and 10 years of age, who participated in the Swedish branch of the European Heart Study in Young People. Cardiorespiratory abilities were tested by bicycle ergometer test with maximum intensity, and based on the results, the subjects were divided into two groups: the weaker group and the stronger group. Additional parameters were obtained by measuring triglycerides, cholesterol, S-reactive protein, homocysteine, blood pressure, body mass index, five skin folds and waist circumference. The assessment of the homeostasis model was obtained by measuring insulin and glucose levels. Boys and girls from the group with better results on the bicycle ergometer test had lower values of body mass index, skin folds, waist circumference and insulin levels. Girls from the better group had significantly lower levels of S-reactive protein than the weaker group. The level of triglycerides and homocysteine in girls from the weaker group showed a tendency to decrease compared to the better group. The results showed that the level of cardiorespiratory abilities has a positive effect on the risk factors of cardiovascular diseases in children.

Trablesi et al. (2007) determined the relationship between lung function parameters and degree of maturity in Tunisian children using anthropometric parameters. Pulmonary parameters were measured using a Minato spirometer in 684 healthy children (351 boys and 333 girls) aged between eight and 16 years. The degree of maturity was determined by Tanner's method. Large differences in the distribution of height results depending on the degree of maturity in both sexes were observed. The results also showed a significant increase in the levels of pulmonary parameters (FVC, FVC1, RES, MEF50 and MMEF25-75) depending on the degree of maturity. Analysis of covariance adjusted to anthropometric parameters showed that the degree of maturity has a significant effect on some pulmonary parameters in both sexes.

Berndson et al. (2007) aimed to identify differences based on gender and age in maximum oxygen consumption (VO2max) and participation in organized physical activities of obese children and adolescents in Sweden, as well as to compare the results with other children of the same age (reference group). The sample consisted of 219 respondents (102 boys and 117 girls, aged 8-16 years, body mass index 24.3-57.0 $kg.m^{-2}$) who were tested on a bicycle ergometer with submaximal intensity, while data on participation in organized physical activities were obtained through interviews. Obese children had lower oxygen consumption than the reference group ($r < .001$). Older obese children participated less in organized physical activities than children in the reference group ($r < 001$). In obese adolescents, participation in organized physical activities in leisure time was explained with 7% and VMI with 45% variance in oxygen consumption. Based on the obtained results, it was concluded that obese children are less active than children of the reference group (especially boys) and that the level of oxygen consumption is explained mainly by the body mass index.

Dencker et al. (2007) investigated differences in the aerobic abilities of boys and girls. The sample contained 248 children (140 boys and 108 girls), aged 8 to 11 years. Body constitution was determined by X-ray absorptiometry, and the measured variables were body fat level (TVF) and lean muscle mass (LVM). Maximum oxygen consumption (VO2max) was measured by indirect calorimetry during a test on a bicycle ergometer of maximum intensity. Daily physical activity was assessed with an accelerometer and the length of daily activities of maximum intensity (VPA). Left ventricular diastolic diameter (LVDD) was measured by echocardiography, while lung function was assessed by spirometry and plethysmography of the whole body. Boys had between 8% and 18% higher VO2max values than girls, depending on whether VO2max was expressed in absolute values or in proportion to body weight or if an allometric scale was used. Regression analysis yielded results indicating that aerobic capacity depended on LBM, maximal heart rate (Max NR), sex, LVDD, and VRA. When VO2max was observed in proportion to body mass, it depended on TVF, Max NR, sex, VRA, and LVDD. Lung function was not associated with VO2max. The study showed that body constitution is the main predictor of VO2max in children aged 8 to 11, while VPA and LVDD have modest effects.

CONCLUSION

To be active means to manifest one's abilities, endowments, wealth of human giftedness with which - although in different degrees every human being is endowed. Physical education classes have positive effects on both functional and motor and morphological abilities, especially during puberty in students. In his educational work, in the teaching of physical education, he must constantly answer the questions: *what*, *when*, *what*, *how much* and *for what*, but also *how to* practice different motor activities in order to contribute to the integral development of each student's personality, and on the motto that there is no greater inequality than equal treatment of the unequal.

Today, it can be stated with complete certainty that without regular monitoring of the parameters of students functional abilities, biochemical principles, legality and further studies of methods and recovery, it is impossible to imagine more serious progress in the efficiency and effectiveness of physical education classes.

In the endless number of existing values that determine the functionality, ability and readiness of students, pulse (heart rate), lactate, VO2 max and anaerobic threshold are certainly crucial for proper work, progress and above all the health of students.

REFERENCES

Beets, W. M., & Pitetti, H. K. (2005). Contribution of physical education and sport to health related fitness in high school students. *Journal of School Health, 75*(1), 25-30.

Berndtsson, G., Mattsson, E., Marcus, C., & Evers Larsson, U. (2007). Age and gender differences in VO2max in Sweden obese children and adolescents. *Acta Paediartica, 96*(4), 567-571 .

Debelnogić, M. (2007). *Efekti modela treninga na razvoj dinamičke snage u kondicionoj pripremi mladih sportista.* Doktorska disertacija. Pale: Fakultet fizičke kulture.

Demirel, D. H., & Yildiran, I. (2013). The philosophy of physical education and sport from ancient times to the enlightenment. *European Journal of Educational Research, 2*(4), 191-202.

Dencker, M., Thorsson, O., Karlsson, K.M., Linden, C., Eiberg, S., Wollmer, P. & Bo Andersen, L. (2007). Gender differences and determinants of aerobic fitness in children aged 8-11 years. *European Journal of Appiled Physiology, 99*(1), 19-26.

Krsmanović, C. (2006). *Metodika fizičkog vaspitanja.* Istočno Sarajevo: Univerzitet u Istočnom Sarajevu, Fakultet fizičke kulture.

Ljuština, R. i Pribić, T. (2007). Odnos testova plućne ventilacije prema uzrastu i visini mladića od 15 do 19 godina. *XLVI Kongres Antropološkog društva Jugoslavije sa međunarodnim učešćem.* Beograd: Antropološko društvo Jugoslavije.

Janssen, I., & Le Blanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in schoolaged children and youth. *International Journal of Behavioral nutrition and physical activity, 7*(1), 40.

Patel, H., Alkhawam, H., Madanieh, R., Shah, N., Kosmas, C. E., & Vittorio, T. J. (2017). Aerobic vs anaerobic exercise training effects on the cardiovascular system. *World journal of cardiology, 9*(2), 134–138.

Ruiz, R.J., Ortega, B.F., Meusel, D. & Sjostrom, M. (2007). Traditional and novel cardiovascular risk factors in school-aged children: A call for the further development of public health strategies with emphasis on fitness. *Journal of Public Health, 15*(3).

Smith, J. J., Eather, N., Morgan, P. J., Plotnikoff, R. C., Faigenbaum, A. D., & Lubans, D. R. (2014). The health benefits of muscular fitness for children and adolescents: a systematic review and meta-analysis. *Sports medicine, 44*(9), 1209-1223.

Starc, G., & Strel, J. (2012). Influence of the quality implementation of a physical education curriculum on the physical development and physical fitness of children. *BMC Public Health 12*, 61.

Trablesi, Y., Tabka, Z., Richalet, P.J., Gharbi, N., Bienvenu, A., Guenard, H. & Buvry, A. (2007). Spirometric values in Tunisian children: Relationship with pubertal status. *Annals of Human Biology, 34*(2), 195-205.

Received: 01.12.2020.
Approved: 20.12.2021.

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