

# Future specialists in physical culture and sports cardiovascular system functional condition evaluation

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## Abstract

**Purpose:** to investigate and evaluate future specialists in physical education and sports cardiovascular system adaptive potential.

**Material:** 28 first (bachelor) level students aged 17-18, doing their degree in 017 "Physical Culture and Sports" (experimental group of 12 participants) and in 227 "Physical Therapy, Ergotherapy" (experimental group of 16 participants) from Poltava National Technical University specialism took part in the research. All the participants gave their written consent for participating in the research. Students' cardiovascular adaptive potential was defined according to R. Baevsky methods.

**Results:** 71.3% of boys and 69.2% of girls showed high level of the body functionality. Adaptive mechanisms tension features revealed 28.4% of female students and 26.6% of male students. Persons with failure of adaptation have not been found.

**Conclusions:** The measurement of the cardiovascular system adaptive potential enables evaluating the level of students' physical health condition. Consideration of students' cardiovascular system adaptive potential indicators contributes to implementation of a differentiated approach to teaching Sports and Pedagogic disciplines. The above increases the quality of the occupational training of the future specialists in Physical Culture and Sports provided that their adaptive capacities are developed.

**Keywords:** adaptation, adaptive potential, specialists, Physical Culture, Sports, cardiovascular system, physical condition.

## Introduction

The reform of the higher education system in Ukraine includes a number of transformations. They are aimed at changing the quality of education at higher education institutions (HEI). Given this educational process organization in contemporary HEI brings students a number of new requirements. Because the previous experience of the usual ways of performing educational activities, acquired by them earlier, becomes inadequate to the changed settings. Specifically, the difference in organization of the educational process in secondary schools and HEI creates a kind of a barrier. It needs to be addressed by the first-year students to actively engage in the new forms of activity. The main purpose is the goal being their professional and personal development along with health maintenance [1, p. 83]. We note the increase in demand for the level of competitiveness, adaptability and mobility of the future specialists with higher education in the modern labour market. This introduces a series of internal emotional contradictions. Consequently, leads to a complex convergence of subjective and objective factors affecting their physical condition, and therefore health. Ago the problem of student youth adaptation to the growing requirements to their professional training in modern HEIs is becoming increasingly important.

Domestic and foreign scientists' investigations have reveal various aspects of the adaptation capabilities formation. In the publications of H. Bezverkhnia et al.

[2] it has been proved that the adaptive potential of a person depends on their somatotype. T. Kutseryb et al. [3] associate the development of adaptation with the specifics of the one's health. V. Bobrytska [4], investigates the influence of socio-psychological, didactic, professional and physiological aspects of the adaptation of future specialists with higher education on their health condition R. Baevsky [5], N. Bogdanovskya [6] and others point out that the level of adaptation is related to the cardiovascular system condition.

First-year Bachelor's degree students at the higher education are a focus group whose dynamics of health as an indicator of individual's adaptive. This is because traditional forms of educational process organisation are combined with physical activity. The cycle of professional training of future specialists in Physical Culture and Sports includes a number of sports and pedagogical disciplines. This requires a lot of physical activity for students. It is known that "the effectiveness of exercising physically depends greatly on the degree of physical activity appropriateness to the health condition, physical development, functional abilities, age and individual characteristics of the body of persons engaged in physical culture" [7, p. 19]. In this context, the study of future specialists in Physical Culture and Sports adaptive potential, as compared to the specialists-to-be in the other spheres, is gaining paramount importance.

Physical condition of athletes and persons engaged in physical education is reviewed by are considered

by many researchers [3, 8, 9]. Some scientists believe physical condition the features complex formedness of addressing the morpho-functional body condition [7, 10]. Some consider it as the ability of functional systems to mobilize the body reserve capacity when performing physical activity [5, 6]. Others are convinced that the is development of body resistance to adverse environmental factors [2].

Some compensation occurs for the impact of static and dynamic forms of training. This expected to contribute to the adaptive potential of the future specialists in Physical Culture and Sports, as compared to specialists in other areas. However, we assume that the inadequate taking into account specifics of the physical load on the body of the first-year student may cause a reverse effect. For example, being an increase in the expression of negative physiological reactions of a body.

The intense physical activity can cause physical discomfort and psycho-emotional stress. Lead to disruptions in adaptation, that is, to the occurrence of disadaptational syndrome. This is accompanied by sleep disorders, fatigue, denial to further physical exercises, etc. Ago must be taken into account be paid to personal, age and gender peculiarities of the students when scheming the health and fitness process [7].

#### *Hypothesis*

We consider the cardiovascular system adaptive potential as one of the integral indicators of the boys and girls physical condition. Taking into account its indicators will promote the optimal choice of physical education means and methods. This will help to choose of rational motor regimes and the formation of student's long-standing motivation to self-improvement. We are convinces that this will improve the quality of professional training of the future specialists in Physical Culture and Sports.

*The objective of the research* is to assess the health condition, including physical condition of the future specialists in Physical Culture and Sports, based on the cardiovascular system adaptive capacity measurement.

### **Material and Methods**

#### *Participants*

There were 28 first (bachelor) level students aged 17-18 from Poltava National Technical University. Experimental group included 12 students of specialty 017 "Physical culture and sport". Control group included 16 students of specialty 227 "Physical Therapy, Ergotherapy". All participants gave written consent to participate in the study. The study was conducted during the period from September 2017 to March 2018. Both experimental and control groups were formed by the equivalent pairs method. The students of the experimental group (EG) were taught sports and pedagogical disciplines on the basis taking into account the indicators of the students' cardiovascular system adaptive potential. The students of the control group (CG) were trained according to traditional system.

#### *Research conduction*

The cardiovascular system adaptive potential was measured according to R. Baevsky's [5] method at rest and using limited physical activity load.

Calculations were carried out using the following formula:

$$\text{APB, a.p.} = 0,011 \times \text{HR} + 0,014 \times \text{BP}_s + 0,008 \times \text{AT}_d + 0,014 \times \text{A} + 0,009 \times \text{BW} - 0,009 \times \text{BL} - 0,273 \quad (1),$$

where APB is adaptive potential of the cardiovascular system of R. Baevsky; HR - heart rate, beats/min;  $\text{BP}_s$  - systolic blood pressure, mm Hg;  $\text{AT}_d$  - diastolic arterial pressure, mm Hg; BW - body weight, kg; BL - body length, cm; A - age, years; 0.27; 0.014; 0.011; 0.009; 0.008 - coefficients of the equation of multiple regression.

Evaluation of the results was performed with regard to the levels of adaptive capacity (R. Baevsky's [5]), namely:

1. Satisfactory adaptation (APB figures were less than 2,1 a.p.).
2. The tension of adaptation mechanisms (from 2,11 to 3,2 a.p.).
3. Poor adaptation capacity (from 3,21 to 4,3 a.p.).
4. Disrupted adaptation (APB figure exceed 4,3 a.p.).

*Statistical Analysis.* Spearman correlation analysis was applied to reveal the difference between criteria of cardiovascular system adaptive potential of control and experimental students' groups. Arithmetic mean determination enabled comparing the indicators obtained and estimate adaptive abilities level of researched groups participants in general. The IBM SPSS Statistics Base 20 program was used to analyze the statistics.

### **Results**

While applying the above method, at the empirical stage of the experiment, we identified the students' traditional parameters of the central hemodynamic. This is heart rate, systolic and diastolic blood pressure. We identified these metrics in the condition of relative restraint, after the dynamic and static loading. Was taken into account well the students length and weight of the body and the actual age. The calculations performed enabled defining the level of research participants' cardiovascular system adaptive capacity of (Table 1).

**Table 1.** Average statistical figures and evaluation APB ( $X \pm m$ )

Groups	APB ( $X \pm m$ )	
	Aged 17	Aged 18
Experimental (n=12)	1,89±0,03*	1,91±0,03*
Control (n=16)	2,01±0,04**	2,04±0,04**

*Comment:* APB – adaptive potential of Baevsky's. The reliability of the difference between group figures: \* -  $p < 0,05$ , \*\* -  $p < 0,01$ .

A comparative analysis of results indicates that CGs are characterized by higher values of APB than those for

EG. Students aged 18 demonstrate higher rates of APB. The percentage-based distribution of participants with different APB grading is highlighted in Fig. 1.

The data in Fig. 1, 70,2 % of EG and 67,4 % of CG showed a high level of body functionality (APB $\leq$ 2,1). These students are characterized by a high physical working capacity and ability to adapt easily to changing conditions of the external environment. Signs of adaptation mechanisms tension (APB 2,11-3,2) have revealed 21,3 % of people in EG and 20,9 % of CG. The percentage figures for unsatisfactory adaptation (APB 3,21-4,3) of EG and CG makes 8,5 % i 11,7 % respectively. Individuals (APB $>$ 4.3) with disrupted adaptation were not found.

In order to monitor the experiment participant's health condition in March 2018, the re-measurement of the cardiovascular system adaptive capacity of was performed in the study groups.

The dynamics of the results is presented at Fig. 2.

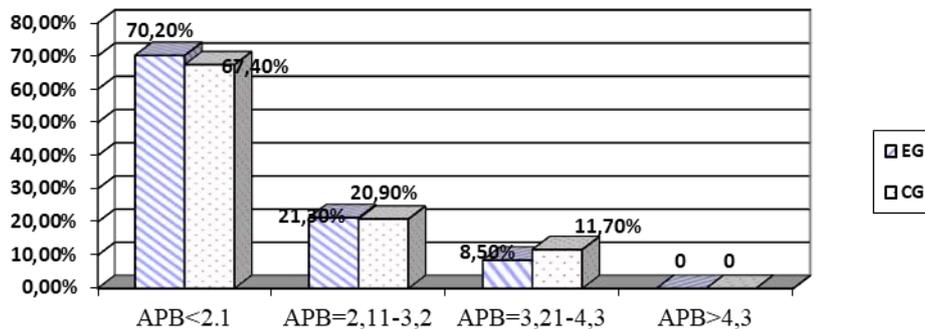
The indicators of a satisfactory level of adaptation among the EG students increased by 3.6%. The level of adaptation tension of this group increased by 2.8% due to the decrease of the level of unsatisfactory adaptation by 6.4%. Compared to the figures for EG, students of CG had 4.3% fewer people with satisfactory levels of adaptation and 7.3% more people with an unsatisfactory level of adaptation. The obtained results testify to the

optimal level of EG student's cardiovascular activity. They confirm the expediency of assessing the physical condition of freshmen students. So, you need to take into account into account the results obtained in the process of future specialists in Physical Culture and Sports professional training.

Systolic blood pressure at the end of the experiment did not reveal significant difference according to standard deviation indices. He is  $122,46 \pm 1,12$  mm of mercury versus  $125,8 \pm 1,13$  12 mm of mercury, i.e.  $t = 0,94$ . At the beginning of the experiment EG people diastolic blood pressure indicators made  $76,1 \pm 1,4$  mm of mercury. At the end of it -  $72,3 \pm 1,2$  mm of mercury, no significant differences in the indicators revealed ( $t = 0,97$ ).

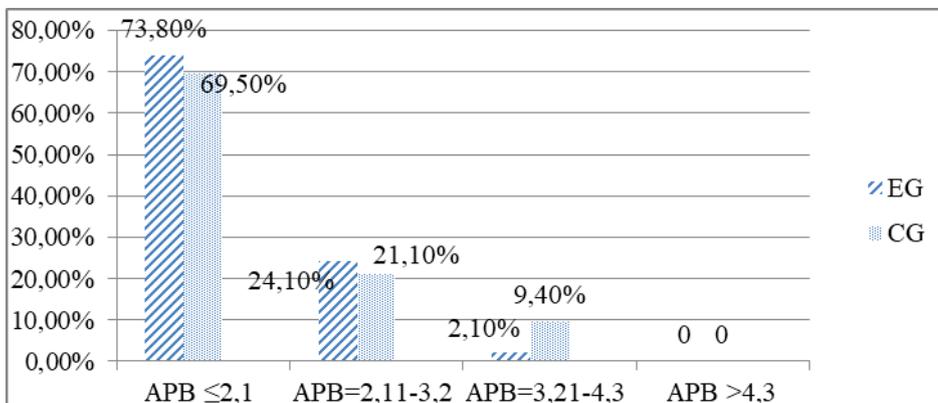
Apparently, the obtained results testify to the optimal level of the EG students' cardiovascular activity. These results confirm the expediency of assessing the physical condition of freshmen students. It is advisable to consider this in the process of the future specialists in Physical Education and Sports professional training.

We had a conversation with the students. It has been found that concentration of the student's attention on their own achievements encourages them to continually improve themselves. Due to this, there is an increase in motivation of the future specialists in Physical Culture and Sports professional growth. The reasoning of this



**Fig. 1.** Results of measuring the level of adaptive capabilities of the students at the beginning of the experiment, %.

*Comment:* APB – adaptive potential of Baevsky's. EG – experimental group. CG – control group.



**Fig. 2.** The results of measurement of the adaptive capacity level of the future specialists of Physical Education and Sports after the experiment, %.

*Comment:* APB – adaptive potential of Baevsky's. EG – experimental group. CG – control group.

idea is grounded in the inferences of V. Bobrytska [4]. The researcher notes “In order to meet their own needs being strategic life goals, the individual tries to work out a multi-purpose poly-motivational program of activity, letting the motives go through the filter of values being social attitude reinforced in the consciousness” [4, p. 127].

We can see, it is much easier for the students of the specialism 017 “Physical Culture and Sports” to mobilize their body adaptive. This is evident from the data for the students obtaining degree in the of 227 “Physical Therapy, Ergotherapy” specialism. This put the emphasis on the appropriateness of the pedagogical design and the scheming of a physical education and fitness process at a higher education institution. The purpose is to improve the level of physical condition and personal health of the students. You will find recommendations below suitable for optimizing the student youth motor activity, namely:

- performing not less than 60 minutes of physical activity every day and 12-15 hours a week;
- performing physical exercises from moderate to high intensity;
- relevance of physical activity to the body functional capabilities;
- aerobic exercises systematic performing (walking, jogging, swimming, cycling, etc.) [17, 18, 19].

Thus, the diversification of motor activity will contribute to achieving the optimal level of physical fitness of the future specialists in Physical Culture and Sports.

### Discussion

The conducted research might be regarded as an addition to a number of scientific inferences [2, 7, 16] concerning the study of student youth physical condition. The information on the expediency of measuring the cardiovascular system adaptive capacity as an important indicator of the student's level of physical condition is completed. It is justified that the level of cardiovascular system adaptive potential depends on the morphological and physiological features of boys and girls. This should be taken into account in the process the future specialists in Physical Education and Sports professional training.

While performing the experiment the data were validated [5, 11]. This showing that the number of people

representing both genders with tensions in adaptation mechanisms increases as those people get older. We associate this with a decrease in motor activity and the level of students' physical condition. In this regard, we recommend diversifying the types of motor activity, as well as intensifying the intensity and duration of physical activity. Due to this we recommend to diversify the physical activities types and increase intensiveness and time of physical exercises.

The obtained results of the study broaden the data about peculiarities of adaptation capabilities development [8, 17, 21]. It is proved that students' positive motivation to self-improvement significantly mobilizes their functional capabilities. We would like to explain the fact with individuality of functional adaptive system developing. What are important, people with tensed adaptation mechanisms or its unsatisfactory level are able to reveal high functional capabilities under increased activity motivation. Such motivation can include needs and interests stimulating students to mastering necessary knowledge and skills aimed. They will be useful at their own body adaptive resources increase.

Percentage allocation analysis of gradation shows that in the main group there are more students with satisfactory cardiovascular system adaptation (73,8%). This is more than in the control group (69,5%). It proves the idea about influence of systematic physical exercises on improvement of the body adaptive processes.

### Conclusions

1. Adaptive potential defining according to R. Baevsky's enables evaluating the student's cardiovascular system functional condition. It allows you to use it the results to control the physical loading influence.

2. Consideration of the student's cardiovascular system adaptive potential indicators contributes to the implementation of a differentiated approach to teaching sports and pedagogical disciplines. It increases the quality of the future specialists in Physical Culture and Sports professional training in terms of developing their adaptive capacities.

### Conflict of interest

The authors declare no conflict of interest.

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