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# TO THE ISSUE OF THE MECHANISM OF ADAPTATION DEVELOPMENT TO THE PSYCHOEMOTIONAL STRESS OF TRAINING IN FEMALE MEDICAL STUDENTS OF GENERAL AND SPORTS GROUPS

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## ABSTRACT

The article presents the experimental data and their discussion on the study of adaptation to psychoemotional stress, which is developed in the dynamics of 3-year training at the medical university in female students of general and sports groups. It is shown that regardless to the degree of physical training, the manifestation of adaptive processes depends on intellectual working capacity (for proof tests), which is based on the features of the brain integrative activity (studied by indicators of its central level: stabilometric reaction, degree of functional asymmetry). However, compared with female students of the general group, in female students of the sports group the intellectual working capacity is higher that is provided by vagotonic state of the cardiorespiratory system and economical use of energy supply of the organism. This causes a decrease in the functional "price" of adaptation to stress of training in those who are systematically engaged in physical training.

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The modern development of medicine causes constantly increasing demands on the doctors' training. This, in its turn, increases the informative intensity and the learning process intensity of medical students. This circumstance inevitably leads to the formation of a prolonged psychoemotional stress state [1, 2], which negatively affects students' health and the quality of their professional training.

**The aim** of the study was to identify the effect on the development speed of the adaptive capabilities of medical students' organisms, along with the individual characteristics of the brain integrative activity and its cardiorespiratory ensuring the degree of physical training of the organisms. Therefore, studies were conducted with the voluntary consent of students of the general group and students-athletes of the Kharkiv National Medical University.

In the experiment, 91 female students took part (56 – general group, 35 – sports group). The experimental data obtained during the examination of female students of the 1st course at the beginning of the school year were the control data; the same students were examined at the end of the 1st, 2nd and 3rd courses (experimental groups). Intellectual working capacity and persistence of

attention as an indicator of the physiological basis of adaptation to training load were studied using a proof test: in condition of the test, the total percentage of correction work performed within 2 minutes of the test and the number of errors per minute were recorded. The brain integrative activity and hemispheric asymmetry were studied stabilometrically and in the condition of the right-hand and left-hand power relationship test while holding the tennis ball [3]. Cardiorespiratory support of adaptive reactions was assessed by measuring blood pressure and respiratory rate, as well as in the condition of Stange and Gence tests [4]. Received data were processed by parametric and non-parametric methods of mathematical statistical processing (the coefficients of reliability according to Fisher and Student).

#### Research results and their discussing.

According to the proof test, the female students of the general group in the initial state (control group) were divided into 3 groups: 1st group – up to 30% of the volume of the proof test performance (low intellectual working capacity), 2nd group - from 30% to 40% of the volume of the proof test performance (average intellectual working capacity), the 3rd group – more than 40% of the volume of proof test performance (high intellectual working capacity). Over the next 3 years of training, the number of the 1st group decreased in comparison with the number of the 2nd and 3rd groups ( $p < 0.05$ ). Improved intellectual working capacity is accompanied by increased hemispheric lateralization, namely: before the start of classes (control group), female students of the 1st and 2nd groups have functional asymmetry only in 10% and 13%, respectively, in the 3rd group – up to 38%. However, in the dynamics of 3 years of training in the condition of constant psychoemotional stress, there is an increase in this indicator compared with the initial in 7 times, by the end of the 3rd year of training - 3.5 times even in comparison to the 3rd group of female students. The dynamic nature of changes in the functional lateralization of the cerebral cortex, namely the prevalence of the left hemisphere, especially in girls with a low level of intellectual working capacity, was also revealed while studying the response of stabilometry.

According to the amount of the proof test performance, female students of the sports group were divided only into 2 groups: 2nd group (average intellectual working capacity) – 11.4% (4 students), 3rd group (high intellectual working capacity) – 88.6% (31 female students) i.e in comparison with the general group in which during all 3 years of training the number of female students with high intellectual working capacity did not exceed on the average  $58 \pm 1.5\%$ , the number of the 3rd group is 30.6% more. Besides, an increase in the volume of correction work performance in 19.4% is noted in relation to students of the general group, and also the number of made errors is decreased in 17.5%. The amount of performed work is better in female students of the 2nd group, because the amount of made errors is in 22.4% less than in female students in the general group. The analysis of performed correction work on the test minutes showed that female students-athletes show more sustainability of attention. This determines the least number of errors both in the 1st and the 2nd minute of the test (up to 3%). The study of hemispheric lateralization according to the data of stabilometry and test of the hand power relationship has shown that in female students-athletes the functional asymmetry in the initial state is minimal (only 6–8%), however, compared with students of the general group it is shown more than in 30% ( $p < 0.05$ ).

The study of the vegetative support of cortical processes in the development of adaptation revealed the following data (Tab. 1). According to the functional indicators of the blood circulation system the decrease in the relative general norms of all values of blood pressure is determined in the 2nd group – in 13.3% and in the 3rd group – in 7.5% ( $p < 0.05$ ). In comparison with the general group of female students the percentage of reduction is 2 times more (vago-tonia), pulse rate does not change significantly and respiration rate tends to increase. Therefore, the Hildebrand index, as an indicator of the degree of cardiorespiratory linking, decreases in comparison with female students of the general group, and the duration of Stange and Gence tests increases.

Table 1. Characteristics of functional indicators cardiorespiratory system in athletes-girls in a state of rest

Functional Indexes	Average working capacity	High working capacity
	Absolute number	Absolute number
1	2	3
Arterial pressure systolic, mm Hg	$104,0 \pm 4,73$	$110 \pm 1,47$

Continuation of table 1.

1	2	3
Arterial pressure diastolic, mm Hg	69,0 ± 5,15	74,0 ± 1,32
Arterial pressure average, mm Hg	80,3 ± 4,48	86,0 ± 1,25
Arterial pulse pressure, mm Hg	35,0 ± 5,0	37,0 ± 1,16
Heart rate	70,0 ± 0,71	76,0 ± 2,22
Respiration rate	18,0 ± 0,41	17,4 ± 0,69
Stange test, sec	56,0 ± 3,34	49,6 ± 3,86
Gence test, sec	49,6 ± 3,86	32,8 ± 2,33

The received data point that in trained organism the adaptive processes are developed by vagotonic mechanism, which ensures the economical use of oxygen by the organism.

#### Conclusions.

1) In the development of adaptation to psych-emotional stress, the leading role belongs to the initial level of intellectual working capacity, which is based on pronounced hemispheric asymmetry.

2) Physical training is one of the factors which "facilitate" the development adaptation to "stress of training".

3) Adaptation to constantly increasing psychoemotional stress in the dynamics of training at the medical university is achieved by more "economical" functional changes in work of the cardiorespiratory systems of the sports group students than the general group students.

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