

# Ontogenetic features of physical fitness and functioning of the central nervous system of college students

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## Abstract

**Objective of the study** was to identify ontogenetic tendencies of physical readiness and psychophysiological parameters of the central nervous system in the process of teaching female students in college.

**Methods and structure of the study.** In the course of the work, the following were determined: the time of a simple reaction to light and sound, a complex reaction to light, that is, a choice reaction and a reaction to a moving object in groups of college students aged 16-20. Physical tests were used to assess physical fitness.

**Results and conclusions.** The maximum increase in the time of the sensorimotor reaction at the age of 17 was revealed in girls during college education, which indicates the depletion of the adaptive capabilities of the CNS. At the age of 18, the parameters of the sensorimotor reaction to light and sound stabilize, and by the age of 20, there is some gradual decrease. By the end of training, there is a decrease in physical fitness indicators, which can adversely affect the state of health and motor functions of the body. According to preliminary data, physical fitness and psychophysiological parameters of the functioning of the central nervous system have different age dynamics during the training of college students.

**Keywords:** college students, health, ontogenesis, sensorimotor reaction, central nervous system.

**Introduction.** During the learning process, students experience various forms of external influences on their bodies [2, 5]. These are changes in the social environment and the regime of work and rest, and of course an increase in the teaching load. A special role in adaptive reactions to these changes is played by the nervous system, on the functioning of which the regulation of our entire body depends. Physical readiness, according to scientists, is a marker of the state of health of an individual [4]. Monitoring of changes in the functioning of the central nervous system in the learning process is very important for further assessment and prediction of the development of students' organisms [6]. It should be taken into account that at the age of 16-17 years, students complete the functional development of the central nervous system and physical development, which is also assessed by indicators of physical fitness. How this restructuring is completed depends on the efficiency of the individual's central nervous system, it becomes possible to predict his state of health, which can ultimately affect

the quality of life [7]. In this connection, it is necessary to study the influence of various external and internal factors in the process of ontogenesis on the health of students in order to identify, control and level possible deviations in the functioning of the nervous system in [1, 8].

**Objective of the study** was to identify age-related changes in physical fitness and psychophysiological parameters of the central nervous system in the process of teaching female students in college.

**Methods and structure of the study.** The scientific work was carried out on the basis of the College of Hotel Business of the Moscow Branch of the Russian International Academy of Tourism. It involved girls 16-20 years old, who were divided into five groups according to age 16 (n=18), 17 (n=23), 18 (n=24), 19 (n=19) and 20 (n=17).

To determine the features of the functioning of the central nervous system (CNS), we used the Hardware and Software Complex "Sports Psychophysiologicalist", produced by LLC "Scientific and Methodological Cent-

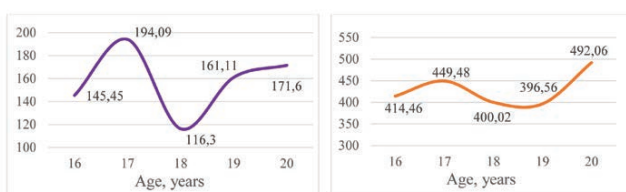
er Analyst" in the city of Omsk. With the help of which the psychophysiological characteristics of female students were studied: the time of a simple reaction to light and sound, the time of reaction to a moving object and the reaction time of choice [3]. Physical fitness was assessed using physical tests: running 200 m (min), 30 m (s), long jump from a place (cm), raising and lowering the torso from a prone position (number of times).

**Results of the study and their discussion.** When considering the results of the time of a simple reaction to a light stimulus, an increase in this indicator was found in female students of 17 years old compared to the result of female students of 16 years old, then there is a significant decrease by 18 years old and an increase at 19, 20 years old (Figure 1). The presented dynamics is also preserved in terms of a simple reaction to sound, reaction time to a moving object and a choice reaction (Figure 1, 2).



**Figure 1.** Simple reaction time to light (left) and sound (right), ms

The results of the study indicate a decrease in the indicators of the activity of the central nervous system in the second year of study, which may indicate an increase in the load on the central nervous system as a result of the adaptation of the leading systems of the body to external changing environmental conditions during this period and, as a result, the deterioration of the adaptive abilities of the body of female students. In the third year of study, the minimum values of reaction time were recorded, which indicates the highest level of functioning of the central nervous system among the studied age groups. In the last year of study (19, 20 years) there is an increase in the time of sensorimotor reactions, that is, there is a decrease in the adaptive capabilities of the CNS. This may be due to the specifics of the learning process in the last year: a decrease in physical activity, large volumes of industrial practice, pre-diploma practice, preparation for the defense of the final qualifying work. All these factors can negatively affect the psychomotor reactions of the body.



**Figure 2.** Response time to a moving object (left) and selection response (right), ms

Age features of female students' physical readiness are presented in Table. 1. In the 2000-meter run, which reflects the development of general endurance, the best results were demonstrated by female students aged 17-18, and then we observe a deterioration in this indicator. Although this physical quality, according to the sensitive periods of the development of physical qualities, should develop further. In tests for the development of speed, abdominal strength and speed-strength abilities, the best results were shown by girls aged 17 years. By the age of 20, the results became noticeably worse. That is, by the end of training, girls experience a decrease in physical abilities.

**Conclusions.** As a result of the study, the maximum increase in the time of the sensorimotor reaction at the age of 17 in girls while studying at college was revealed, which indicates the depletion of the adaptive capabilities of the central nervous system, especially in terms of reaction time to a moving object, where the fall was 33.4%. At the age of 18, the indicators of the sensorimotor reaction to light and sound stabilize, and by the age of 20, there is some gradual decrease. At the same time, there is an improvement in physical indicators at the age of 17-18, and by the age of 20, physical fitness gradually decreases, which indirectly indicates a decrease in physical activity against the background of an increase in the intensity of the educational process. That is, the time of the sensorimotor reaction can be considered as a marker of the functioning of the central nervous system of the body. A decrease in physical fitness indicators by the end of training can adversely affect the state of health and motor functions of the body. Physical readiness and psychophysiological parameters of the CNS functioning, according to preliminary data, have different age dynamics during the period of college students' education.

In our opinion, it is necessary to recommend students to reconsider the mode of work and rest, to additionally engage in health-improving forms of physical culture in order to level the negative learning process on the central nervous system and improve their health in general.

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*Age features of female students' physical fitness*

Age, years	Physical tests			
	2000 m run	30 m running	Standing long jump	Raising and lowering the body from a supine position
16	11,17±1,32	5,10±0,08	176,22±4,85	71,14±4,78
17	11,12±1,08	5,09±0,06	178,04±4,54	74,37±5,11
18	11,05±1,01	5,10±0,06	174,18±4,96	72,54±5,02
19	11,24±1,17	5,11±0,07	169,47±4,55	67,65±4,45
20	11,47±1,24	5,34±0,10	165,07±3,87	60,78±4,28

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