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Studying the State of External Respiration in Adolescents Under the Conditions of The Republic of Uzbekistan

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Abstract: It has been established that the voluntary increase in lung ventilation during rest is carried out by students within a fairly wide range, both due to the acceleration of breathing and due to the increase in respiratory volume. Assessment of adolescent body reactions to muscle loads in sports activities revealed the presence of conditions of relative hypoxia and hypercapnia. This likely served as the basis for the formation of mechanisms for stable adaptation to changes in the body's internal environment while significantly increasing the effectiveness of pulmonary ventilation.

Keywords: Adaptation, adolescent body, functional reserves, environment, respiratory volume, reaction assessment.

Introduction: The rate of change in body size, the functional characteristics of organs and systems, does not remain constant throughout the individual development of the organism, but changes regularly [1]. Studying the activity of various functional systems of children and adolescents in changing environmental conditions is relevant not only because the developing child's organism is highly susceptible to its influence, but also because these influences largely determine the course of its further development. Stressful stimuli of the external environment, including muscle work, change the magnitude and nature of the adaptive reactions of the child's body.

The process of the formation of individual functional systems of the organism in ontogenesis goes through several phases, and the quality of ensuring a beneficial result for the organism depends on how mature the specific executive mechanisms in specific functional systems are. The interaction of a child's body with the environment has its own peculiarities and patterns. The process of formation of individual functional systems of the body in ontogenesis goes through several phases, and the quality of ensuring a beneficial result for the body will depend on how mature certain executive mechanisms in specific functional systems are. The interaction of a child's body with the environment has its own peculiarities and patterns. [1]

The main characteristic of the child's body is the continuity of morphological and functional development, which is carried out in accordance with the genetic program of the individual's development, embedded in their hereditary apparatus. However, a child's organism, which is in the process of development, is more susceptible to the influence of various factors, quickly and sharply responds to changes in the environment. Growth and differentiation processes in the child's body determine their high sensitivity to changes in environmental influences, and the realization of potential opportunities is carried out directly depending on environmental conditions. Studying the problem of the functional state of the respiratory system under mental activity conditions is one of the leading areas in age-related physiology. Its solution is necessary for

understanding the patterns of the child's body's adaptation to changing internal and external environmental conditions, compensatory reactions, and functional restructuring related to the body's growth and age. Assessing the adequacy of the mental loads used requires a deep understanding of the age-related characteristics of the respiratory system's function, its mechanisms, and regulation, which contributes to the proper organization of the regime in children's institutions, the dosage of physical loads, and the development of tools and methods for preventing lung diseases in children.

The purpose of our research is to study the influence of learning load intensity on the functional state of the respiratory system in middle school-aged students. During the work, 100 schoolchildren aged 15-17 years were examined. R. Karakalpakstan): 50 girls and 50 boys.

Despite numerous studies on the problems of studying the adaptation systems of modern children, however, a number of issues have not been discussed or comprehensively considered within a narrow range of ontogenesis. In recent years, most of the works of modern researchers have been devoted to the physical development of children [3] and the results of complex functional studies are presented much less. Currently, the ecological conditions of the Southern Aral Sea region (including the Republic of Karakalpakstan) have significantly deteriorated in recent years. According to a number of specialists [1, 2], the state of public health continues to deteriorate significantly across a range of indicators. The greatest changes occurred in the health indicators of children, who, due to the imperfection of the body's defense forces, were the first among other population groups to react to the unfavorable environmental situation in the region.

The peculiarities of physiological shifts occurring in the respiratory system under static stress, the rapid onset of fatigue, make them an important object of study, especially in the adaptation process of schoolchildren. The analysis of the obtained data shows that in schoolchildren studying in the Republic of Karakalpakstan at the beginning of the academic year, after the veloergometric load, all the studied parameters of the external respiratory system changed insignificantly. After the conducted dynamic exertion in boys at the beginning of the academic year, it was revealed that the maximum respiratory volume increased due to an increase in respiratory frequency. During the conducted research, it was also established that isometric work at the beginning of the academic year led to a decrease in the values of most external respiratory indicators in boys of the first year of study. A decrease in the value of minute respiratory volume (MRP) to 8.57+0.61 l/min ($p<0.01$) was observed due to the establishment of respiratory rate (RR).Studying the mechanisms of adolescent organism adaptation to dynamically changing environmental factors is one of the priority tasks of physiological science. Functional reserves of the organism are understood as the adaptive and compensatory ability of an organ, system, and organism as a whole, developed during evolution, to significantly increase the intensity of its activity compared to a state of relative rest [1, 2]. At the same time, the effectiveness of adaptation can be significantly increased by using additional functional loads on the body as a whole or on its individual functional systems, for example, breathing at rest and during muscle work. Analysis of body mass parameters showed that the lowest level was recorded in adolescents from the Karauzak district - 55.64±0.76 kg, and the highest weight was noted in adolescents from the city of Nukus - 65.7±0.82 kg. As a result of the conducted research, it was revealed that the voluntary increase in lung ventilation at rest is carried out by students engaged in sports within a fairly wide range, both due to the acceleration of respiration and due to the increase in respiratory volume.

It can be assumed that voluntary hyperventilation, accompanied by a significant increase in the activity of the respiratory muscles and an inevitable shift of gas homeostasis towards hypocapnia, causes, on the one hand, an increase in regulatory influences, primarily of a voluntary nature, on the external respiratory system, and on the other hand, the desire of natural regulatory mechanisms to optimize the functioning of the external respiratory apparatus in adolescents living in the conditions of Karakalpakstan. Voluntary hyperventilation, as well as voluntary hypoventilation, is carried out during physical exertion, leading to a decrease in the optimal functioning of the body's systems. It seems to us that this is a reflection of competitive regulatory influences, on the one hand - neurohumoral mechanisms of respiratory regulation, and on the other - mechanisms of voluntary control of pulmonary ventilation.

As the conducted studies showed, assessing the reactions of the adolescent body to muscle loads in sports activities revealed the presence of conditions of relative hypoxia and hypercapnia. This likely served as the basis for the formation of mechanisms for stable adaptation to changes in the body's internal environment while significantly increasing the effectiveness of pulmonary ventilation.

Thus, we note that voluntary influences on the respiratory function of external respiration, apparently, to a certain extent disrupt the coordination of the activity of various body systems and lead to a

disruption of their optimal functioning. It has also been established that the systematic use of voluntary hypoventilation in the training process of adolescent sports training allows for a significant increase in the level of aerobic performance and maximum physical performance.

For ventilation to occur, the child's body needs more effort to overcome resistance in the respiratory tract. For a general understanding of external respiratory work, we can cite information that the total work of respiratory muscles at rest in 8-year-old children is 0.38 kgm/min, and the elastic work component is 72.2%. The decrease in respiratory muscles' elastic work indicators at different ages is mainly associated with increased lung tissue extensibility, which in 8-year-old schoolchildren is 46.7 ml/cm3 of water, and in 13–14-year-old children - 120.8 ml/cm3 of water [3, 5]. The study revealed that the isometric load had a different effect on the cardiovascular system of girls and boys.

In girls, there is a significant increase in stroke and minute blood volume, as well as an increase in systolic, diastolic, and pulse blood pressure indicators. In boys, these changes were less pronounced. These differences, in our opinion, can be explained by the peculiarities of the reaction of heart rate variability indicators in girls and boys to isometric load. In boys, their dynamics clearly indicated the predominance of the parasympathetic regulatory channel. Thus, it can be noted that in adolescents born and living in unfavorable environmental conditions of the Republic of Karakalpakstan, a slight excess of indicators in the functioning of the adaptive respiratory system was revealed.

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