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STUDYING THE DEVELOPMENT OF THE CARDIAC SYSTEM IN SCHOOL-AGE CHILDREN

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Abstract:
The article describes the role of physical activity on the physiology of the cardiovascular system, that the measure of health is the level of activity of the main physiological systems and functional reserves of the body. Changes in heart rate under various loads and age characteristics.

Keywords: health, reaction, adaptation, cardiac system, transient insufficiency, parasympathetic nervous system, sympathetic nervous system.

Introduction

Health reflects the process of continuous adaptation of the body to environmental conditions, and the measure of health is the level of activity of the main physiological systems and functional reserves of the body. The definition of reserve capabilities allows for the pre-nosological diagnosis of adaptive reactions in conditions of continuous updating and changing requirements in the process of school education. The purpose of the study was to study the functional capabilities of the cardiac system of schoolchildren.

The period of development of schoolchildren from 10 to 15 years is accompanied by significant changes in the activity of all physiological systems, including the cardiovascular, endocrine and central nervous systems. In the process of growth, the nervous regulatory mechanisms of the heart are improved, the tone of the parasympathetic nervous system increases. These changes are because students continue to differentiate the departments of the ANS, segmental vegetative centers and higher departments of the ANS are formed, the myelination of conductors and the density of vegetative plexuses are completed.

The activity of the heart and blood vessels in adolescence has its own characteristics, largely related to changes in hormonal status and the autonomic nervous system. It is during this period that rapid processes of growth and maturation occur in the body of adolescents, which may be accompanied by an imbalance in the formation of various departments of the cardiovascular system, because of which prerequisites for the formation of both functional and organic disorders may arise.

Let's pay attention to the morphofunctional features of the cardiovascular system of adolescents. The mass of the heart and the size of the chambers of the heart grow faster than the diameter of the blood vessels. If the volume of the heart increases by almost 12 times by the age of 14 compared to newborns, then the diameter of the aorta is only 3 times. The lumen of the vessels is relatively small also because, as a result of an abrupt increase in body length, the vessels are stretched. As a result, there is a relative stenosis (narrowing) of the aorta and pulmonary trunk.

In adolescents aged 12-16, the lumen of the aorta and pulmonary artery is already the same, and at an older age the aorta becomes wider than the pulmonary artery. The lumen of the veins becomes twice as large as the lumen of the arteries.

The growth of the myocardium (heart muscle) outstrips the growth and development of connective tissue. In other words, the growth of the heart valves does not keep pace with the growth of the myocardium and their "transient insufficiency" is formed. It is enhanced by the immaturity of the regulation of the papillary muscles of the myocardium, which leads to the asynchrony of their work. These features also affect the nature of blood flow and, ultimately, contribute to the appearance of functional noises. Due to the phenomenon of acceleration, many adolescents have signs of lagging behind the pace of heart development from an increase in body size, a so-called "small" or "drip" heart is formed. At the same time, low systolic blood volume, tachycardia, low blood pressure, and functional systolic noise are observed. If the growth of the heart outstrips the growth of the body, a "large" or "hypertrophied" heart is formed, in which there is an increase in systolic blood volume and minute blood volume, low heart rate, increased blood pressure, functional systolic noise. Thus, disharmonious development is the reason for the formation of a "teenage or juvenile" heart. In harmoniously developing adolescents of medium body size, the proportions between the values of the heart, vascular lumen, and height and body weight are optimal, which provide the greatest functional capabilities of the cardiovascular system.

During puberty, the cardiovascular system acquires pronounced adrenergic regulation features. Respiratory arrhythmia increases: a gradual increase in the heart rate during inhalation and its decrease during exhalation. The tone of the vagus nerve centers increases significantly, and therefore bradycardia and slowing of atrioventricular conduction can be provoked in adolescents. With a reduced tone of the vagus nerve, tachycardia is usually noted. As is known, the endocrine system plays an important role in the regulation of the cardiovascular system of adolescents.

For example, the gonadotropic function of the pituitary gland and the level of sex hormones contribute to the proper evolution of the heart. The endocrine factor also affects the amount of blood pressure. Thus, with an increase in the level of adrenocorticotropic hormone in the blood, precapillary spasm is noted, and during puberty, an increase in peripheral resistance and, accordingly, blood pressure.

In adolescence, the sexual morphofunctional differences of the cardiovascular system increase, which begin to be detected at the age of 4. The myocardium of adolescent boys, as a rule, has greater functional capabilities than in girls, and the values of systolic/diastolic blood pressure in boys aged 14-16 are on average higher than 115.0/62.5 than in girls 104.5/57.3. However, usually in girls, due to the menstrual cycle, there is a premenstrual rise in systolic blood pressure and a decrease in frequency heart rate. The value of blood pressure in girls reaches the adult level earlier than in boys (about 3.5 years after the appearance of the first menstruation).

A feature of the cardiovascular system in adolescents is a temporary violation of its nervous regulation. This is due to the restructuring of the endocrine and nervous systems and is expressed by a heart rhythm disorder, an increase or decrease in heart rate. Deep changes occurring in the cardiovascular system increase the risk of vegetative vascular dystonia and adolescent hypertension. This should be taken into account when determining the school load of teenagers.

In boys, aged 16-17, the regulation of the cardiovascular system is characterized by the greatest plasticity of adaptive mechanisms that allow increasing the oxygen efficiency of energy supply. It should be noted that the oxygen supply system is an interaction of at least three systems: external respiration, blood and circulation. Moreover, the circulatory system and, above all, the ability of the heart to increase the minute volume of blood mainly determine oxygen transport capabilities. As the cardiovascular system grows and develops, so do its reactions to physical activity in children and adolescents. The age–related features of these reactions are clearly manifested both in the formulation of special functional tests aimed at identifying the state of the cardiovascular system, and in the process of performing physical exercises, socially useful, productive work. Children and adolescents respond to dynamic physical activity by increasing their heart rate and maximum blood pressure (stroke volume). The younger the children, the more, even with less physical exertion, they respond with an increase in heart rate, a smaller increase in stroke volume, providing approximately the same increase in minute volume.

Children and adolescents who are systematically engaged in physical culture, constantly performing socially useful work with strict rationing of physical activity, train the heart, increase its functional capabilities.

The upcoming fitness determines the maximum efficiency of the heart, an increase in its reserve capabilities, an increase in efficiency and endurance. This is clearly evident in the reactions of trained children and adolescents compared to untrained peers. The conditions of the intra-school environment and the organization of educational activities are priority factors in shaping the health of schoolchildren. Physical activity in the training mode is one of the measures to prevent cardiovascular disorders in students, in particular the development of hypertension. The important role that the heart plays in the body dictates the need for preventive measures to promote its normal function, strengthen it, and protect it from diseases.

The main problem of the organization of the educational process is the frequent discrepancy between age–related morphofunctional rearrangements in the body of students and the nature of the educational load, which often leads to cardiovascular and other functional disorders, fatigue, functional overstrain, decreased performance and the occurrence of diseases of the cardiovascular system.

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