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ASSESSMENT OF HEART RATE VARIABILITY AS HEALTH CRITERIA IN CHILDREN OF PRIMARY SCHOOL AGE

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Relevance. Of particular relevance today is the importance of heart rate variability. Heart rate - the force of contractions, regulated by the sympathetic and parasympathetic divisions of the autonomic nervous system, which is very sensitive to any stressful effects. Differences in clinical manifestations in children are explained by the heterogeneity of the child population, which manifests itself in variations in the strength of stress reactions - adaptation failure, in differences in the terms of "maturation" of functional systems. In children, depending on age, the polymodal nature of responsible reactions are clearly manifested: part shows hypersensitivity to them, part - complete anergy, stability or tolerance, and part meets the average reaction rate, an explanation for this existence of hereditary polymorphism in the human population [1,2]. There are non-specific syndromes that are associated with tension and exhaustion of physiological adaptation mechanisms. From the theory of adaptation, nonspecific protective reactions of the body are primary and arise in response to any damaging effect. Up to a certain point, these reactions remain hidden and appear when adaptation is disrupted, when ecological disadaptation syndromes are found in all their diversity. Based on the generalization of the data accumulated by different authors, Yu.P. Gichev (2000) schematically displayed the sequence of the main environmentally conditioned pre-morbid and pathological changes in the body during prolonged exposure to chemical environmental pollution (OS): pollution OS—> pollution of the internal environment of the body —> tension of adaptation processes —> depletion of physiological reserves —> insufficiency of regenerative-plastic potential and violation of recovery processes —> formation of premorbid conditions —> accelerated aging, disease.

To assess the adaptive activity of the body, the circulatory system is increasingly used, which is an indicator of its state and plays a leading role in ensuring adaptation processes. This role is determined primarily by its transport function for cells and tissues. The energy mechanism occupies a central place in the processes of adaptation.

The cardiovascular system is one of the first to respond to changes in homeostasis that develop under the influence of harmful factors. This may be one of the explanations for the frequent latent asymptomatic course of cardiovascular disease in children in the Aral Sea region. At the same time, not only signs of impaired development of the cardiovascular system are diagnosed, but also changes in the neuro-regulatory mechanisms and metabolic processes, as well as inadequate responses to physical activity. It has been shown that under the influence of technogenic factors, the violation of the mechanisms of regulation of the cardiovascular system in children can be accompanied by the development of a syndrome of autonomic dysfunctions, with the most frequently recorded signs of

sympathicotonia with hypersympathicotonic reactivity, the frequency of functional cardiopathies in children is 3 times higher and occurs in the children's population in ecological unfavorable areas, and the identified features of the functioning of the cardiovascular system are attributed to the indicator of the adaptive capabilities of the child's body as a whole. Prenosological states include states of stress and overstrain of adaptation mechanisms in the absence of pronounced specific deviations. The predominance of specific changes over non-specific ones with unsatisfactory adaptation indicates a state of pre-illness. When adaptation fails, there is a transition from pre-illness to illness. Thus, the assessment of the functional state of the body is quite complicated and requires a comprehensive examination of all organs and systems, which cannot always be carried out in full.

Purpose of the study. Assess heart rate variability and adaptation of the external environment of children of primary school age living in the Aral Sea region.

Methods and research. For the study, 36 practical healthy children from 7-11 years old living in the Khorezm region were selected, and cardiointegrography was also performed. The vegetative status and functional state of the body were assessed by mathematical analysis of cardio intervals based on a 5-minute ECG recording. The recording was carried out in the II standard lead using an electrograph (EC 12T-01-"R-D"). The test is removed for 1 minute in the second standard lead in the wedge position and 1 minute in the ortho position. ECG processing according to the method of R.M.Baevsky. Heart rate variability (HRV) is understood as the variability in the duration of R-R intervals of successive cycles of heartbeats over certain periods of time, the severity of changes in heart rate relative to the average level of heart rate. Statistical processing of the obtained results was carried out in the WINDOWS system using the spreadsheet program (EXCEL) and performed using the Statistica 6.0 software package. Correlation analysis and Student's t-test were used (Lakin G.F., 1990; Avtandilov G.G., 1990; Rebrova O.Yu., 2002).

Results and discussions. A study was made of heart rate variability in 36 children of primary school age living in the Khorezm region. The measurements were carried out in the first half of the day, the subjects were in conditions of relative functional rest. The tone of the autonomic nervous system was determined by the severity of the stress index (SI), calculated by the analysis of heart rate variability.

To study the initial vegetative tone in children, an analysis of the results of CIG was carried out. At the same time, the average values, their individual fluctuations, and confidence intervals of the average values were determined. The indicators of CIG in the vertical position were studied in children to determine the autonomic reactivity and a comparative analysis of the indicators of IN during the transition from the horizontal to the vertical position was carried out (Table No. 1).

Table №1

Analysis of the results of CIG in children of primary school age

	Horizontal	Upright
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Indicators	A				M				SI
	MO	O	X	Δ	MO	O	X	Δ	
te	2	0	0	97	2	0	0	131	
st	1,75±3,4	,63±0,0	,20±0,0	,98±32,88	1,94±2,7	,54±0,0	,18±0,0	,33±50,86	
subject	4	3	6		2	4	6		

The result obtained showed that heart rate and mode reflect the average and most probable level of functioning of the circulatory system and depend on internal and external factors that can decrease and increase these indicators.

According to our data from the study of CIG - Mo and SI, four types of vegetative tone were determined, including states of eutonia, vagotonia, sympathicotonia and hypersympathicotonia (diagram No. 1).

Diagram No.1

The results of autonomic tone in children of primary school age according to Mo

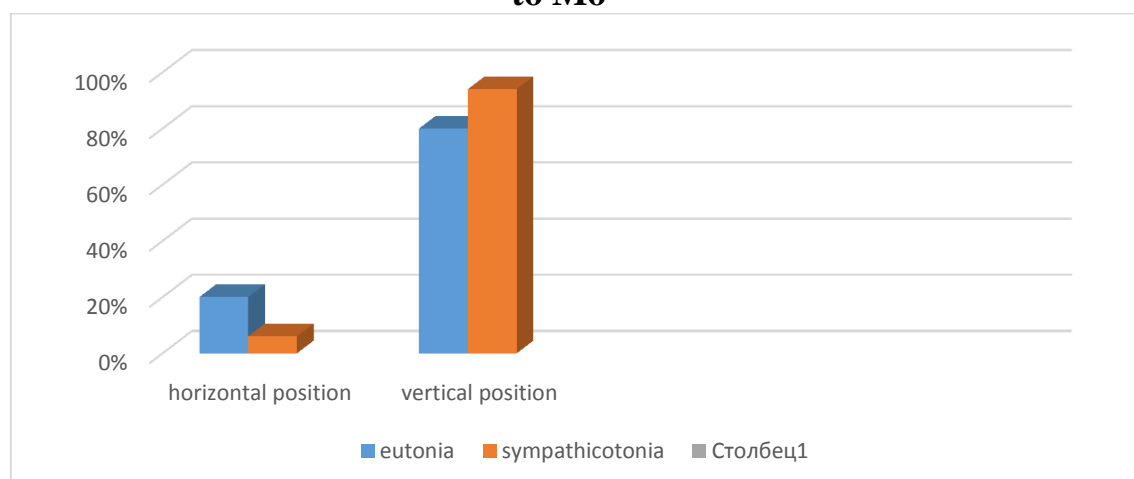


Diagram No. 1 shows that, in a horizontal position, eutonia was in 20% of children, sympathicotonia - in 80% of children, and vagotonia and hypersympathicotonia were not detected. In the upright position, the state of eutonia was found in 6% of children, sympathicotonia - in 94% of children, vagotonia and hypersympathicotonia were also not detected. Summarizing the results obtained, it was revealed that, in the vertical position, the load on the ANS increases, which showed a high percentage of sympathicotonia (94%).

When analyzing individual indicators of SI in this group of children, the nature of the distribution of IN values revealed that the absolute

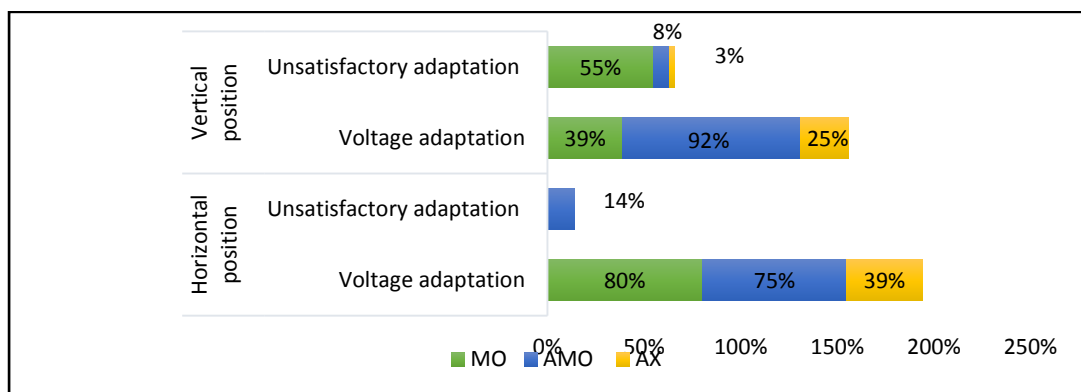
most schoolchildren have values that can be used to judge the normal adaptation of the central circuit of heart rate regulation to physical and educational loads. The tension index showed that, in the horizontal position, parasympathicotonia-33%, eutonia-61%, sympathicotonia-6%, and in the vertical position parasympathicotonia-22%, eutonia-47%, sympathicotonia-31%.

To assess the state of adaptation in children in CIG, obtained with a horizontal position, Mo-80% - intense adaptation, AMo-14% - unsatisfactory adaptation and

75% intense adaptation, AX-39% - intense adaptation was observed. In the vertical position Mo-55% stress, 39% intense adaptation, AMo-8% unsatisfactory adaptation, 92% intense adaptation, AX-3% unsatisfactory adaptation, 25% have intense adaptation (diagram No. 2).

Diagram No.2

Assessment of adaptation in children



To assess the functional state of the body, the stress index was determined, at which 33% in the horizontal position had a reduced functional ability, and the tension of the regulatory mechanism - 6%, in the vertical position, a decrease in functionality - 22% and the tension of the regulatory mechanism - 28%.

Thus, when analyzing the indicators of heart rate variability and adaptation of children, it should be noted that changes in the activity of the behavior of the humoral channel of regulation and parasympathetic and sympathetic influences on the heart rate are undulating.

Conclusions: In the future, the studies carried out will make it possible to create, taking into account living in an unfavorable environment, an effective concept of building mental and physical loads in order to ensure an adequate level of health. It is also possible to estimate functional state of the cardiovascular system in order to predict the state of regulatory systems and the degree of their tension.

Based on the data obtained, the method of HRV analysis during an active orthostatic test in the process of prenosological screening of schoolchildren makes it possible to assess the adaptive capabilities of the body, taking into account the age-related characteristics of the autonomic regulation of blood circulation, and to identify groups of people with changes in the functional state of the body and an increased risk of developing diseases.

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