UDC 612.1/.8:57.08 (044)

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Evaluation of complex objects

The paper proposes the results of evaluation of such a complex object as the human body and presents the possibility of using indicators of the cardiovascular system as an indicator of adaptive responses of the whole organism and an indicator of disease risk.

In recent decades, technical methods and tools for estimating complex objects are increasingly used in economics, biology, environmental medicine and others. The need to evaluate the structure of functional models to describe the structures of complex objects is an urgent task that allows to solve the problem of estimating both the current state of these systems and predict their state when changing factors. In determining the state of health in the first place is the study and assessment of the cardiovascular system, as it is the main link that determines and limits the delivery of oxygen to working organs, and in addition the cardiovascular system of modern man is extremely sensitive to any changes. As a result of numerous physiological studies of the adult population, the possibility of using changes in the set of functional indicators of the cardiovascular system as an indicator of adaptive responses of the whole organism and an indicator of the risk of disease has been proven. Therefore, the level of functioning of the cardiovascular system can be considered as a leading indicator that reflects the balance between the body and the environment. The level of functioning of the circulatory system is a regulated quantity, the stability of which is maintained by regulatory mechanisms through changes in both intersystem and intrasystem interactions and relationships [1].

The aim of the work was to increase the reliability of the assessment of functional reserves of the body taking into account the dynamics of changes in the mechanisms of heart rhythm regulation and changes in the circulatory response to external destabilization factors by applying the method of health prediction to determine possible relationships of autonomic regulation.

The problem considered in the work is the insufficient level of informativeness of the methods of analysis of the mechanisms of development of pathology of the circulatory system and the decrease in the efficiency of operators in performing professional activities [2].

As already mentioned, the response of the cardiovascular system can be used to assess the body's adaptive reserves and predict the effectiveness of professional duties. As a result of numerous physiological and clinical studies, the possibility of using measurement data of a set of functional indicators of the cardiovascular system as an indicator of adaptive responses of the whole organism and an indicator of disease risk has been proved. The use of such an approach is possible because the circulatory system serves as a link between all systems of the body, between the "control centers" and "controls" [3].

The adaptation of the organism to the action of various environmental factors is largely associated with the reactions of the cardiovascular system and its regulatory mechanisms. The heart is a very sensitive indicator of all changes in the body. The rhythm of its contractions, regulated by the sympathetic and parasympathetic divisions of the autonomic system, responds to any stressful actions [1].

During the experiment, the state of the cardiovascular system of patients of different ages was studied. The main parameters of cardiovascular system, which can "speak" about the state of its functioning, are considered. The main purpose of the study is to create a single system of rapid assessment and forecasting of human health by the state of its cardiovascular system. Experimental studies use 3 different methods to calculate the parameters of diagnosing and predicting human health: by functional parameters, by heart rate variability, by analyzing the autocorrelation function of the rhythmogram. The advantages and disadvantages of each of the above methods are analyzed, the comparison of these methods is carried out experimentally.

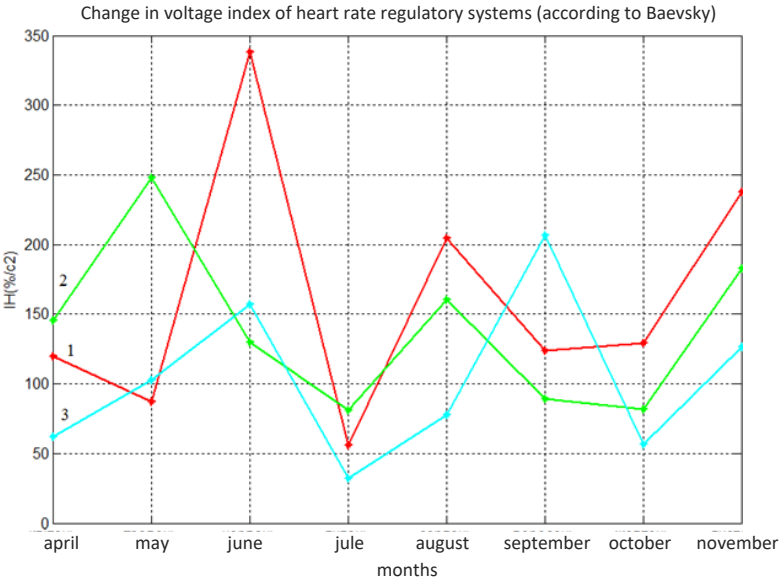

Fig. 1. Dynamics of voltage index change

The analysis of features of vegetative regulation of heart was also carried out. The basis for determining the indicators of heart rate variability is the assessment of successive intervals R – R of sinus origin, which provides quantitative information about the modulating effect on the heart of the parasympathetic and sympathetic divisions of the autonomic nervous system. Heart rhythm is subject to a hierarchical system of structures and mechanisms, including the cerebral and intracardiac levels [2].

The stress index shows which type of autonomic nervous system predominates in humans: sympathetic or parasympathetic. Normally, at rest, the heart rhythm is mainly regulated by the driver's own rhythm and the local influences that come from the sympathetic and parasympathetic ganglia, as well as the level of certain hormones in the blood (eg, adrenaline). In conditions that require increased readiness, speed of reaction, stress, the IN increases [2].

The graphs show the dynamics of the voltage index of the regulatory systems of the heart rate of the study participants during the year.

The method of estimating heart rate variability is based on the measurement of RR intervals, as well as on the comparison of indicators. They quantify variability. After the examination, the patient receives cardiointervalograms, which are a set of RR intervals that are displayed one after another. In stressful situations, as well as in pathological conditions, the diagram will be with a narrow base and a sharp top (excessive). The asymmetric diagram is observed at transients, disturbance of stationary process. The multi-vertex diagram indicates a non-sinus rhythm (extrasystoles, atrial fibrillation). Methods allow to estimate heart rate variability by means of the following parameters: fashion, amplitude of fashion and variational scope.

Analyzing the calculated value of the stress index of the study participants, we can conclude that all participants have the tension of the mechanisms of adaptation.

The use of methods for calculating the parameters of diagnosis and prediction of human health can be used to assess the quality and effectiveness of therapy, treatment correction. It can also be used in the expert assessment not only of the patient's health, but also the quality of the doctor's professional activity. The method can be used in health insurance for expert assessment of the insured person. In addition, the method can be effectively used in clinical and medical and social examination and patients at risk.

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