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BIOREGULATORY SYSTEMS AND HUMAN HEALTH

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The subject of the study is the transition processes of the regulatory systems of the human body during bioresonance therapy. The purpose of the work is to study the transient processes in various regulatory systems of the human body during bioresonance effects on the body using the Brimton hardware and software complex. Analysis of the transient processes during the impact on the human body during BRT allows us to establish the moment of "harmonization" of the studied body systems and objectify the assessment of its condition.

Key words: bioresonance therapy, transition processes, heterogeneity index, system, regulation.

Introduction. Bioenergetic methods of diagnosis, treatment and prevention of many human diseases in clinical medicine have undoubtedly proven their effectiveness. When using these methods, as a rule, descriptive methods based on the subjective feelings of patients and their objective condition are used to evaluate the results of therapy. The current state of medicine requires evidence-based assessment methods.

Currently, the most widely used research methods are ultrasound examination of various organs, computed tomography, nuclear magnetic resonance, etc. All these studies, undoubtedly, provide information for the doctor about the condition of the organ, as does a pathologist, but do not provide a complete picture of the function of the organ, the degree of dysfunction of the organ. For surgery, naturally, this is indispensable research at the present stage of development of medicine. But "surgeons correct the mistakes of therapists," therapy is designed to prevent the development of diseases and, especially, profound changes in organs and systems. Preventive medicine now exists only in theory. There are no systematic approaches to disease prevention, and there are no methods for assessing the state of the body's regulatory systems as a whole.

Any organism is a self-regulating system. All biological systems are in a state of dynamic equilibrium.

Currently, the behavior of various self-regulating systems and their transient processes, both in technology and in biological systems, has been widely studied, which is described by the general theory of systems [1–4]. But, in relation to a biological object, criteria for an integral assessment of the state of the organism currently do not exist.

The regulatory system reacts to any impact in such a way that the "regulator" is turned on, which tries to bring the system to a state of initial dynamic equilibrium. This period is called the transition period. The process begins when the system leaves dynamic equilibrium. Upon reaching the maximum amplitude of disequilibrium, the system restores the previous equilibrium (after an impulse effect) or a new equilibrium (as a result of a stepwise effect).

In general terms: when a disturbing factor influences the system, the latter will be taken out of the state of dynamic equilibrium.

Under the control of the “regulator”, due to its inertia, the return to its stationary state will occur through a periodic damping process, with periods of “overshoot”. At the same time, such a disturbing factor can lead to a new stationary state of the system, depending on the direction of the influence [1–4] The transition process is a generalized reflection of the response of any system to an impact.

The general characteristics of energy conversion efficiency at the cellular level have been studied. Thermodynamics of biological processes, one of the branches of theoretical biophysics, is designed to answer these questions.

Thermodynamics examines the general laws of transformation of energy in the form of heat and work between bodies. In open biological systems, there is a constant process of energy exchange with the external environment. Internal metabolic processes are also accompanied by the transformation of one form of energy into another. It is enough to recall the mechanical processes, the transformation of the energy of a light quantum into the energy of electronic excitation of pigment molecules, and then into the energy of chemical bonds of reduced compounds in photosynthesis. Another example is the conversion of electrochemical transmembrane potential energy into ATP energy in biological membranes. [1].

In classical thermodynamics, mainly equilibrium states of a system are considered, in which the parameters do not change over time.

However, in open systems, reactions and corresponding energy transformations occur constantly, and therefore it is necessary to know the rate of energy transformation at each moment in time. This means that in energy calculations the time factor must also be taken into account. To do this, it is necessary to somehow combine thermodynamic and kinetic approaches in describing the properties of an open system. [2].

An experimental test of the first law was carried out in special calorimeters, where the heat released by the body in metabolic processes, during evaporation, and also together with excretory products was measured.

It turned out that the heat released by the body fully corresponds to the energy absorbed along with nutrients. The validity of the first law means that the organism itself is not an independent source of any new energy.

The second law of thermodynamics provides a criterion for the direction of spontaneous irreversible processes. Any change in the state of the system is described by a corresponding change in a special state function – entropy, which is determined by the total amount of reduced heat absorbed by the system [1, 2]. Entropy can be interpreted as a measure of the uncertainty, disorder, or complexity of some system, such as an experience or test, which may have different outcomes, and therefore the amount of information. Thus, another interpretation of entropy is the information capacity of the system. [5].

The application of the second law to biological systems in its classical formulation leads, as it seems at first glance, to the paradoxical conclusion that life processes occur in violation of the principles of thermodynamics. In fact, the complication and increase in order of organisms during the period of their growth are accompanied by an apparent decrease, and not an increase in entropy, as should follow from the second law [1,2,3].

However, an increase in entropy in irreversible spontaneous processes occurs in isolated systems, while biological systems are open. The problem, therefore, is to, firstly, understand how the change in entropy is related to the parameters of processes in an open system, and secondly, to find out whether it is possible to predict the general direction of irreversible processes in an open system from changes in its entropy. The main difficulty in solving this problem is that we must take into account the change in all thermodynamic quantities over time directly during processes in an open system. Thus, the thermodynamic signs of stability of stationary states coincide with the corresponding mathematical signs and can serve as their additional characteristics. However, far from equilibrium, there are no general thermodynamic criteria for the direction of motion of an open system, since its behavior is determined by dynamic properties and regulatory mechanisms, and not by general statistical laws, as in the second law of classical thermodynamics. This feature also makes it difficult to use the concepts of entropy and information when describing the general properties of biological systems [1, 2].

In the literature, we did not find data on the use in clinical practice of methods for assessing the state of the body’s regulatory systems from the point of view of the described theoretical approaches when using bioenergetic methods for diagnosing, treating and preventing human diseases.

Previously, we conducted a study to study the dynamics of transition processes after sessions of bioresonance therapy (BRT) and found that during BRT, a certain phasicity in transition processes is observed, but criteria for assessing the state of the body’s regulatory systems during BRT were not developed [3].

The purpose of the study is to study transient processes in various regulatory systems of the human body during bioresonance effects on the body using the “Brimton” hardware and software complex.

Research objectives

1. To study the dynamics of indicators of regulatory systems during bioresonance therapy sessions.

2. Develop integral indicators for assessing the behavior of regulatory systems.

3. Develop criteria for assessing the state of the body’s regulatory systems.

Materials and methods

Data analysis of the recorded signals was carried out by the developed “cloud” complex “Brimton” (Germany), which is designed to assess the various probabilistic pathological load of the patient according to the spectral characteristics of its electromagnetic signal. These indicators are visualized in the program interface after recording and special processing of the general electromagnetic signal of a biological object using a mathematical algorithm. The program is designed for use by both one doctor and an entire clinic, since all data is stored centrally on a remote server and, no matter where you log into your account, all saved data is always available in the program at any time.

This program works with a special sensor through which the signal is recorded, and also influences the patient using a compiled frequency recipe and thus corrects his condition.

The program has the ability to analyze the recorded signal using various diagnostic markers, which number more than 6,000, as well as comparative analysis to monitor the dynamics of the process.

The obtained data is displayed in tables or graphs, which allows the doctor to come to a certain conclusion, on the basis of which, subsequently, a prescription for BRT can be created.

The program has a page where the patient's current complaints are recorded, the degree of severity of which is set on a 5-point scale. Data from the "recovery sheet" can be useful both for assessing the effectiveness of the correction over time and for conducting analysis.

The software product allows you to create a prescription for BRT using correction markers (more than 15,000), including Rife and Hilda Clark frequencies in combination with them or in pure form, at the discretion of the doctor. The system saves the created recipe for this record, which allows you to retrospectively see which markers were used or repeat the effect if necessary.

The most important task of BRT is to bring the body to the level of self-regulation and return the body to the frequency range inherent to the human body. The main idea of using resonance in medicine is that with the correct selection of the frequency and form of therapeutic (electromagnetic) effects, it is possible to enhance normal (physiological) and weaken pathological fluctuations in the human body. Thus, bioresonance effects can be aimed both at neutralizing pathological ones and at restoring physiological fluctuations disturbed in pathological conditions, i.e. to suppress interference (noise) in the body's information field.

Besides, in the process of creating the program, we developed a system for objective assessment of the transition state in the process of conducting BRT. It allows you to visualize transient process data automatically, depending on the doctor's requests.

Currently, a computer program has been developed and used to enable remote work with patients. The device is "linked" to the patient through this program, and then communication occurs through a remote server. This device is designed to record a patient's electromagnetic signal and transmit it via the Internet to the server of the basic software package, and then receive a correction prescription drawn up by a doctor without the patient's physical presence at the doctor's office. Using a basic software package, the doctor analyzes the received data and compiles a program for the intervention, and it is downloaded into the memory of the remote program via the Internet for playback in the future, at the request of the patient at any convenient time.

The doctor sends notifications and instructions to this device, and the patient, in turn, can follow the instructions that appear on the screen.

The program has the ability to visualize the degree of deviation of the analyzed indicators from the average "norm".

Using the example of patient N's indicators, we can trace the dynamics of normalization of indicators for different systems (Table 1). At the same time, "1" is above the average statistical data, "0" is within the "norm", "-1" is below the norm or in the "health" zone.

Table 1

Dynamics of normalization of indicators for different systems

	Sessions						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Viruses	**0**	**1**	**1**	**1**	**1**	**0**	**0**
Bacteria	**1**	**1**	**1**	**1**	**0**	**0**	**0**
Mycoses	**1**	**1**	**1**	**0**	**0**	**0**	**0**
Central nervous system	**1**	**1**	**1**	**1**	**0**	**-1**	**0**
The cardiovascular system	**1**	**1**	**1**	**0**	**1**	**0**	**0**
Respiratory system	**1**	**1**	**1**	**0**	**0**	**-1**	**0**
Hepatobiliary system	**1**	**1**	**1**	**0**	**0**	**0**	**0**
Digestive system	**1**	**1**	**1**	**0**	**1**	**0**	**0**
Male genitourinary system	**1**	**1**	**1**	**0**	**0**	**-1**	**-1**
Musculoskeletal system	**1**	**1**	**1**	**0**	**1**	**0**	**0**
Endocrine system	**1**	**1**	**1**	**0**	**1**	**1**	**0**

Using the software package, the patient's signal was recorded in the frequency range 20 – 22000 Hz, which was converted into an electronic marker containing the information characteristics of the object under study using a mathematical software tool. When exposed to an object, the marker's digital signal was converted to analog. Therapeutic and diagnostic markers were obtained and created earlier and are located in the complex database.

BRT was carried out at intervals of 3 – 4 days. The number of sessions depended on the patient's complaints and condition.

A total of 508 patients were examined, aged from 1 to 88 years, of which 194 were men (38.2%) and 314 women (61.8%). In addition, a group of patients (53 people, 10.4%) with functional disorders was identified, in whom no pathology of internal organs was detected by other examination methods.

We studied transition processes in various regulatory systems of the human body, as well as the dynamics of complaints and symptoms of patients during BRT, studied changes in markers of the systems: hepatobiliary system (HBS), gastrointestinal tract (GIT), genitourinary system (GUS), musculoskeletal system (MS), cardiovascular system (CVS), respiratory system (RS), endocrine system (ES), central nervous system (CNS).

Data from markers of viruses, bacteria, mycoses, as well as the above-mentioned markers of systems (CNS, CVS, MS, GBS, GIT, MPS, ODA, ES) were analyzed. During the entire course of treatment, complaints and symptoms of patients were recorded according to their number and severity. A strongly expressed symptom was assessed as 4 points, moderately expressed – 3 points, mildly expressed – 2, periodic – 1 and absent – 0 points.

Transitional processes were assessed dynamically by changes in markers to their previous values, which made it possible to bring all indicators of different patients to the same values for comparison. [N=$\frac{\Delta n}{(n-1)}$] (1)

Statistical processing of the material was carried out using Excel applications.

In order to determine the degree of influence of location and methods of influence on the course of transient processes, data from other medical institutions using this technique were separately analyzed. These are European institutions in the Baltics, Poland and Germany, Crimea, Seychelles and other institutions in Ukraine.

Results and its discussion

In the structure of patient complaints, complaints related to pathology of the joints and spine prevailed – 36%, the central nervous system – 22%, the gastrointestinal tract and hepato-biliary system – 18%, the respiratory system – 16% and other organs and systems – 8%.

The average number of sessions performed was 8.0±0.5 (p <0.01).

The dynamics of the number of complaints and symptoms, and the degree of their severity are shown in Table 2 and Figure 1.

Table 2

Dynamics of the number of complaints and symptoms, and their severity

Sessions	1	2	3	4	5	6	7	8
Complaints and symptoms								
Abs.	8.0±0.04	5.5±0.16	3.1±0.1	3.0±0.1	2.2±0.14	1.5±0.11	1.3±0.1	0.9±0.13
P	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05
Degree of severity of complaints and symptoms								

points	12.5±0.2	6.7±0.24	3.6±0.14	2.8±0.13	2.0±0.21	1.5±0.4	1.2±0.11	0.8±0.1
P	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05

A rapid decrease in the number of complaints and the severity of the pain symptom in points occurred by the 3-4th session, and by the 8th session they practically disappeared or were of a temporary, non-permanent nature.

By the 3rd-4th session, as a rule, the patients' well-being temporarily deteriorated, and pain symptoms that they had in the past appeared. Subjectively, patients noted a return to their previous, earlier state of the disease. Such deterioration of the condition could occur over a period of several hours to one day; as a rule, it occurred on the second day after the BRT session. During the same period, peaks in marker values were observed.

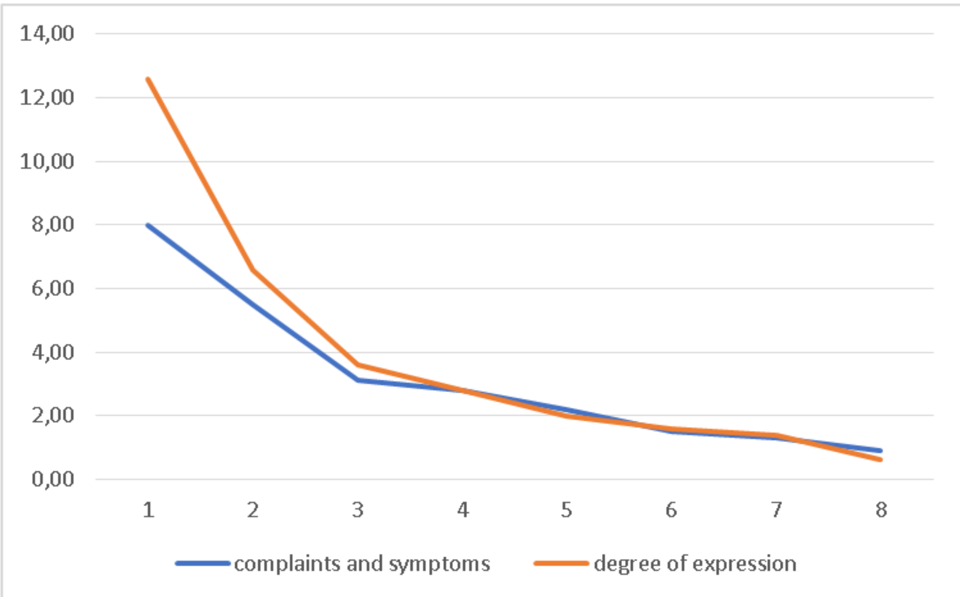

Figure 1. Dynamics of the number of complaints and symptoms and their severity

Changes in markers in each patient were individual in nature, but at the same time, general trends in their dynamics can be identified.

As the data obtained indicate, from sessions 3 to 6, the reaction of markers of all studied systems was multidirectional (Fig. 2).

A peculiar restructuring of all the systems under study took place.

After exposure in the BRT mode, at the beginning there is a tendency to transition to a state of maximum disorder or chaos of systems, a multidirectional reaction to the influence. After the sixth session of BRT, the reaction of all systems to the influence was unidirectional, synchronous, and systems were harmonized.

The period when all systems work synchronously corresponds to a subjective improvement in the patients' well-being. In patients who had no complaints about their health, the behavior of the systems in response to the influence was always synchronous, unidirectional, or, as one might say, "harmonized."

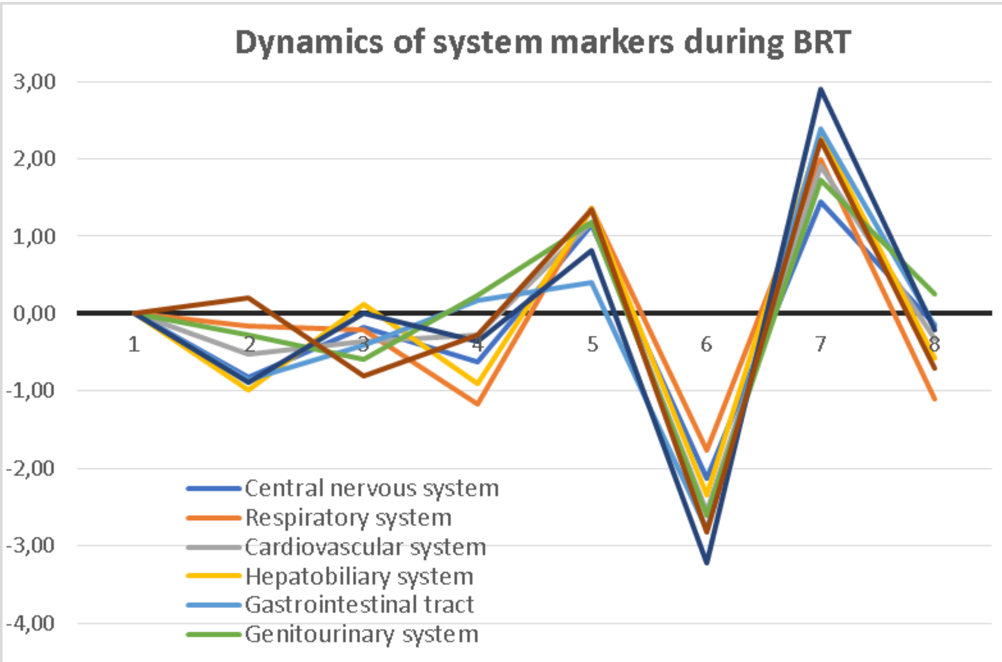

Figure 2. Dynamics of system markers during BRT

We have developed an integral indicator of the degree of heterogeneity of systems – the system heterogeneity index (SHI). This index reflects the degree of variation of the systems under study and is reduced to a comparable form using formula (1).

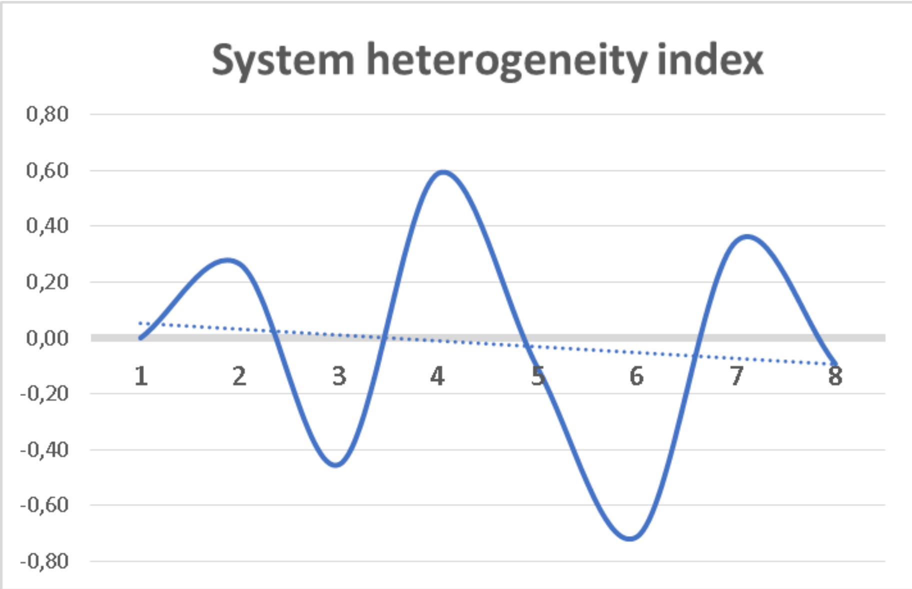

Fig. 3. Dynamics of the system heterogeneity index

As the harmonization of systems increases, the heterogeneity index tends to “0”. This is more pronounced in the group of people mainly with functional impairments, without visible pathology of the internal organs.

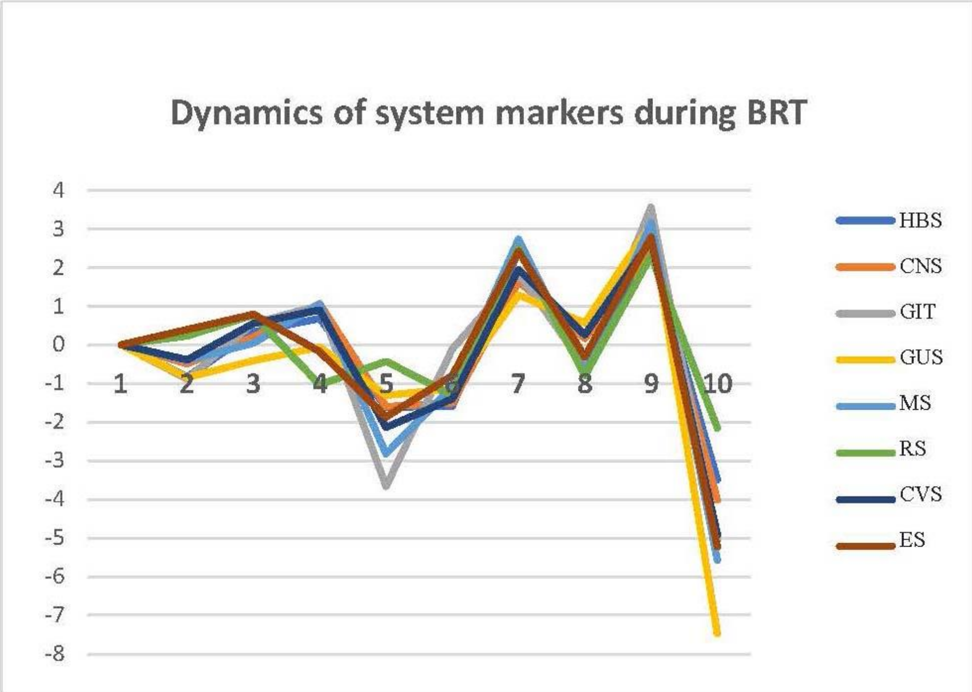

Fig. 4. Dynamics of system markers during BRT in patients with functional disorders

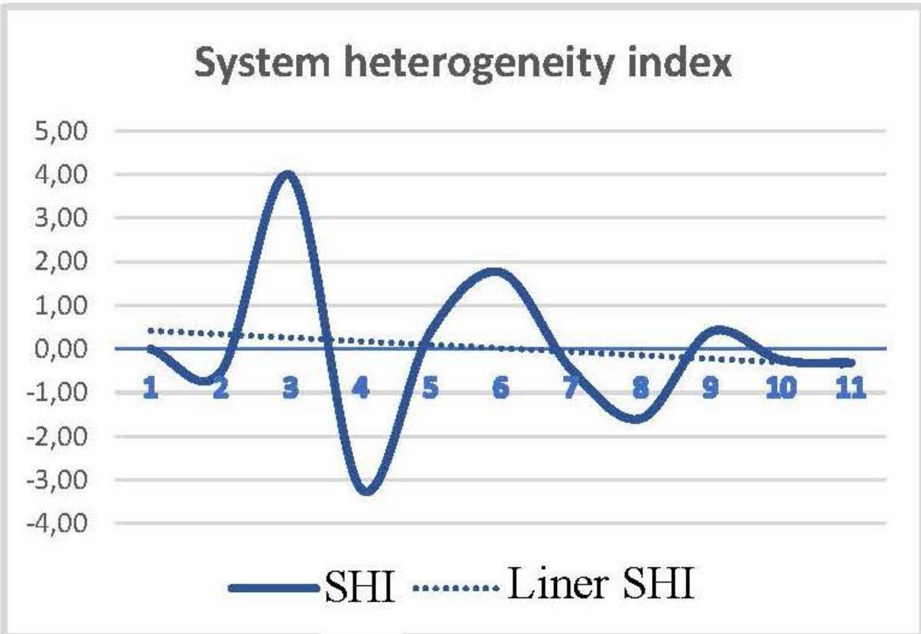

Fig. 5. Dynamics of the system heterogeneity index in patients with functional disorders

As evidenced by the data shown in Figures 4 and 5, after the sixth BRT session, the harmonization of systems is maintained, and the heterogeneity index approaches “0”.

The Student’s t-test was calculated to determine the significance of differences in system markers during BRT. As evidenced by the data shown in Figure 6, before the fifth session, the differences between all markers are significant (Student’s t-test >1.96), after the onset of harmonization of the systems, the differences are unreliable, as it should be.

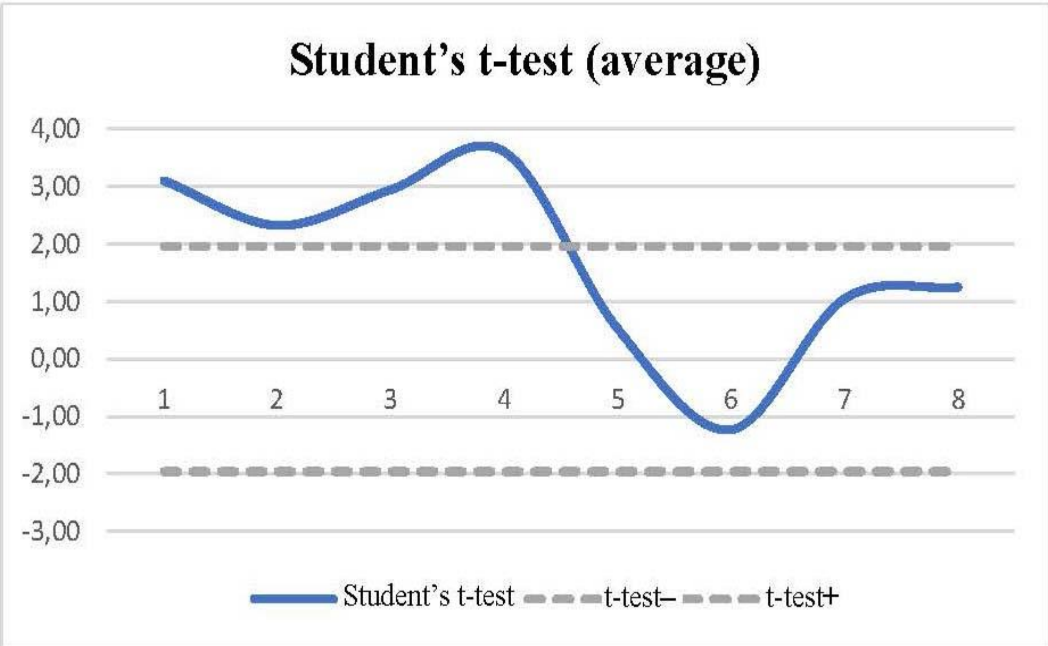

Figure 6. Student’s t-test for system markers in BRT

As was previously established by many studies [6-9], the basis of the structural-system organization, functioning and management is the fractal. This means that the human body has the property of self-similarity at different levels of the system hierarchy and indicates the “holographic” nature of its information systems. Fractality is similarity, but not identity. Fractality can also be functional, in which the forms may not coincide at all. A biological organism consists of multiple structural and functional links connected into a single multi-level network, where the information component of each individual cell affects both all other subforms (tissues, organs, systems, etc.) and the organism as a whole.

Based on the above, each regulatory system is a fractal of the entire organism. When a system malfunctions, we observe a pathological condition or disease. As our studies have shown, in this state of the disease, all systems react to external disturbances in their own rhythm and direction, the functional fractality of the system is disrupted, which manifests itself in an increase in the heterogeneity of the system as a whole.

When the functionality of any system that was originally built into it is restored, the latter reacts to any disturbance of the system in the same way as the body as a whole. That is, the same, uniform, synchronous response of all systems under study is observed (Fig. 4, sessions 7-10).

As it was noted, “true health is not the absence of external manifestations of illness, but a state of internal harmony, when the structure of the body is conflict-free and functions optimally. The body develops according to a basic program, and if this functional basis is distorted, then changing its state is possible only under one condition: it is necessary to influence the entire organism, leveling its structural shape and restoring the basic matrix of functional life processes. Otherwise, the deformed scheme of influences will lead to the fact that again and again information failures will manifest themselves as a violation of harmony, as a disease.” [7].

Data from other medical institutions using this technique were separately analyzed. In institutions where BRT is mainly used, and other physiotherapeutic methods are not used, the dynamics of system markers was the same, regardless of the location of the institution. (Fig. 7).

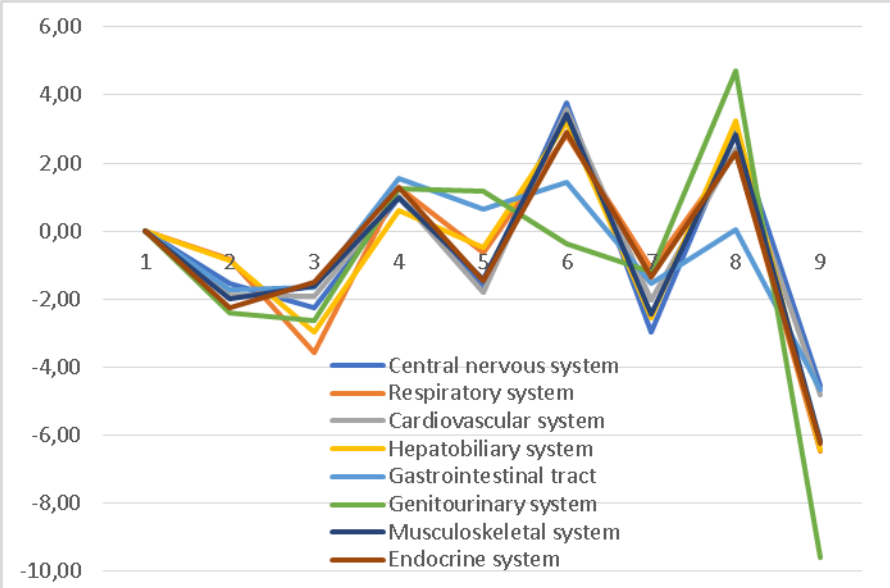

Fig.7. Dynamics of system markers (BRT only)

In institutions where, in addition to BRT, other treatment methods are used (physiotherapy, drug treatment, etc.), chaos of systems or heterogeneity of systems is observed for a longer time and the moment of harmonization occurs on average after 8 BRT sessions. (Fig. 8).

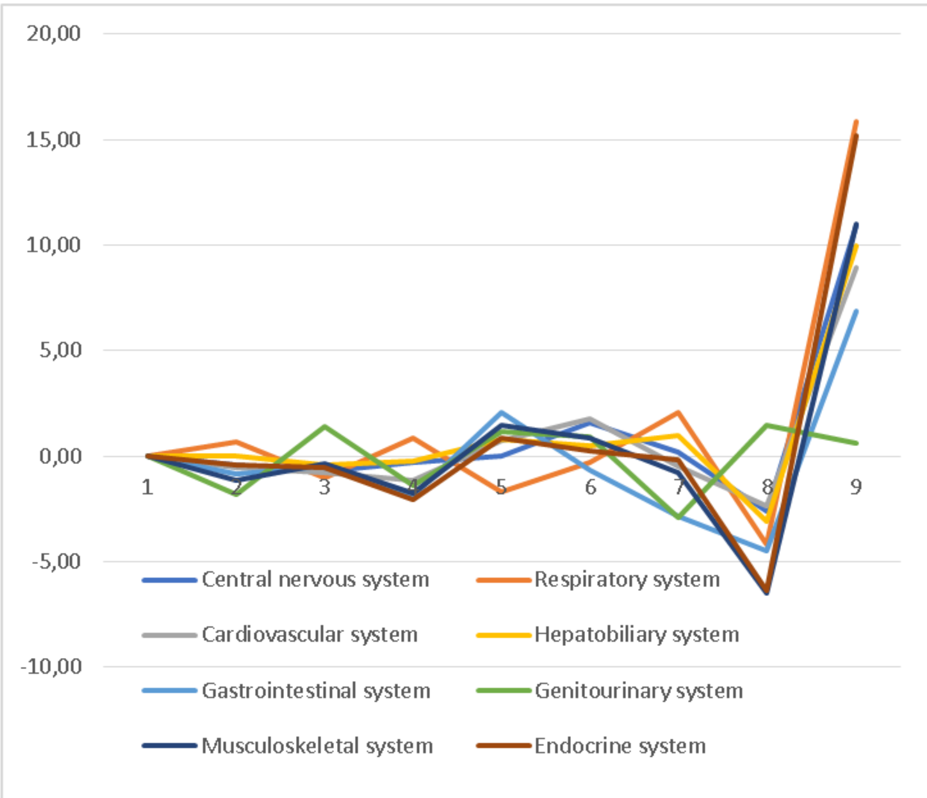

Fig. 8. Dynamics of system markers (BRT + physiotherapy)

Thus, the study showed that the analysis of transient processes of various body systems during BRT with the Brimton software and hardware complex makes it possible to objectify and evaluate the state of the patient’s regulatory systems. This achieves the optimal number of BRT sessions and achieves the most positive result.

Transitional processes are observed in any system after any impact on the body, so in dynamics, obviously, a similar reaction to the impact will be observed – at the beginning “chaos”, then a transition to harmonic equilibrium.

Conclusions.

1. Analysis of transient processes during sessions of influence on the human body during BRT allows us to establish the moment of “harmonization” of the studied body systems and objectify the assessment of its condition.

2. An integral indicator for assessing the behavior of regulatory systems is the system heterogeneity index, which reflects the degree of harmonization of the body’s regulatory systems.

3. The criterion for assessing the state of the body’s regulatory systems is the assessment of the transition process of regulatory systems and the degree of their harmonization.

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