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## REPORT

about the Research in 2001-2002

**Problem 01.02.00:** Methodology and Technology of invigoration of different population orders.

**Subject 01.02.06:** Development of mass sport-invigorative technologies for the establishment of the Russian Federation “Health of the Nation” program and for the invigoration of different age and sex population groups.

**Particular Subject:** The research of the universal computer medical-diagnostic and prophylactic program “Virtual Scanner” efficiency (1) for the establishment of the Russian Federation “Health of the Nation” program and (2) for the invigoration of different population groups.

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## REPORT

Scientific report: "Research into the efficiency of the universal computer medical-diagnostic and prophylactic program "Virtual Scanner" for the establishment of the Russian Federation "Health of the Nation" program and for invigoration of different population groups" according to the Problem 01.02.00: "Methodology and Technology of invigoration of different population orders" of Consolidated 5-years Research Plan of Physical Training, Sports and Tourism State Committee of Russian Federation, is set out in 23 pages of typescript, consists of 2 Chapters, 6 Tables, 4 figures, Conclusion and Finding.

To succeed in the main Research object "Research of the efficiency of the universal computer medical-diagnostic and prophylactic program "Virtual Scanner" for the establishment of the Russian Federation "Health of the Nation" program and invigoration of different population groups during 2001-2002 period, the following main tasks were accomplished:

- Analysis and review of scientific literature data about computer and medical technologies.
- Research of diagnostic and therapeutic "Virtual Scanner" system efficiency.
- Research of "Virtual Scanner" system therapeutic impact upon the functional condition of different organism systems and upon the physical activity of almost healthy people.

To cope with all those tasks special research took place with the help of 20 almost healthy volunteers, each of them passed fivefold complex check-up using electroencephalography, polymyography, cardiovascular, ergometry, clinical and statistic methods. There were 2800 total measurements taken, and 105440 initial and calculated parameters were received and analysed, which characterize the functional condition of different organism systems.

On the basis of those researches the following important results and conclusions were obtained:

1. Special clinical research, carried out with plenty of patients (370 people – diagnostics; 1672 people – treatment), **proved the high degree of accuracy of diagnosis (on average 82.4% of coincidences with clinical diagnosis) and high efficiency of treatment (on average 93.2% of recovery cases and considerable improvements)** with the help of "Virtual Scanner" system.
2. According to the data of electroencephalographical and polymyographical research it was established that **"Virtual Scanner" therapeutic sessions lead to the fast recovery and essential increase of adaptability** (for 20.5%:  $P < 0.001$ ) and percentage of alpha-rhythm (for 31.6%:  $D < 0.001$ ) in summary electroencephalography (EEG), and also to the improvement of general functional condition of Central Nervous System (for 7.2%:  $D < 0.001$ ) due to increase of Development Rate and the force of Inhibiting processes (DRI) (for 18.8%:  $D < 0.001$ ), functional Activity of Inhibiting Systems (AIS) for 15.2% ( $D < 0.01$ ), substantial progress of Balance of Nerve Processes (BNP) toward inhibiting (for 19.4%:  $D < 0.001$ ) accordingly, increase of inhibiting control by Central Nervous System, which is one of the most important conditions for the establishment of control of the regulating functions of the cerebrum.
3. Increase of control and regulating functions of cerebrum activity under the influence of "Virtual Scanner" therapeutic sessions leads to the substantial increase of stress rate (for

33.7%:  $D < 0.001$ ), the maximum force (for 27.6%  $D < 0.001$ ), relaxation rate (for 30.4%:  $D < 0.001$ ) and general functional condition of NMS (for 30%:  $D < 0.001$ ).

4. The pronounced positive changes in Central Nervous System and NeuroMuscular System entailed with the same pronounced positive dynamics of physical activity and functional condition of the cardiovascular system. After 20 sessions of “Virtual Scanner” system in comparison to the Initial Data, the Frequency of Cordial Clonus in quiescence decreases considerably (FCCq) for 8.9% ( $D < 0.001$ ), and in period of rehabilitation (FCCr) – for 5% ( $D < 0.01$ ). Efficiency and high-speed endurance increase to 13.2% ( $D < 0.001$ ) and 12.8% ( $D < 0.01$ ) accordingly. Heart Activity Efficiency Factor (HAEF), Pulse Recovery Rate (PRR) and General Efficiency (GE) of organism systems increase accordingly for 15.6% ( $D < 0.001$ ), 20% ( $D < 0.001$ ) and 17.5% ( $D < 0.001$ ).
5. After 5, 10 and 20 “Virtual Scanner” treatment sessions the substantial decrease of the characteristic, which shows the Possibility of Injury (IP) and Musculoskeletal system diseases, and also the heart overstress accordingly for 15% ( $D < 0.001$ ), 16.8% ( $D < 0.001$ ) and 18.1% ( $D < 0.001$ ). **That allows concluding that “Virtual Scanner” therapeutic sessions can become an effective overstress, injury and musculoskeletal system diseases preventive measure, and also of cordial over stresses at hard physical and psycho-emotional load.**
6. **Considerable improvement of retractive and relaxation muscle characteristics, increased physical activity, heart functioning efficiency, coordination in different organs and systems activity, which limit physical efficiency and also the reduction of Injury Possibility, musculoskeletal system diseases and cordial over stresses is explained by improvement of overall condition of the functional Central Nervous System** and, accordingly, of its control and regulator functions under the influence of “Virtual Scanner” sessions.
7. The “Virtual Scanner” is a high-performance system and absolutely suitable for wide application not only in public health service (for treatment and prophylaxis of different pathological processes), but in any kinds of sport or professional human activity that requires effective correction of psychofunctional abnormalities, normalization of regulator systems control functions, improvement of inhibition of Central Nervous System control, increasing of retractive and relaxation muscle characteristics, economy and effectivity of CardioVascular System activity, mental and physical activity, stress stability and human survival rate in complex and extreme conditions of activity or environment.
8. Taking into account the minimal time spent for all-around diagnosis (less than 10-15 minutes) and treatment (or so called informational correction) (session lasts 15-20 minutes), and also the main object of informational correction – normalization of regulator and management of cerebrum functions, it is expected the “Virtual Scanner” system to find in the nearest future the deserved application in all areas of human activity concerned with hard physical and psycho-emotional load, increased requirements to regulating and movement coordination systems, physical efficiency, endurance, stability to different stress-generative or confusing factors (sport, choreography, ballet, rescuers, firemen, landing troops, emergency platoons, aviation, cosmonautics and others).

## 1. Analysis of “Virtual Scanner” System Medical-Diagnostic Efficiency

Many years' of science research including practical results show that the Virtual Scanner reveals not only the formed but also the earliest signs of regulation and control of cerebral function abnormalities, failures in operation of different functional systems, organs and tissues, i.e. to carry out fast (in 10-15 minutes) and exact diagnosis of pre-pathological conditions at the pre-clinical level, when the human being doesn't feel any sign of one or another disease.

Here is the data of Medical Department National Enterprise “Moscow Mint” (N.P. Skvortsova and others, 1999) and of “Metallurg” Sanatorium (V.P. Yerkhov and others, 2001), combined in the Table 1. The investigation of accuracy rating and diagnostics efficiency of “Virtual Scanner” system was carried out with the help of plenty of patients.

Table 1

### Comparative analysis of “Virtual Scanner” system diagnostic efficiency

№	Diagnosis	№ of Patients	Confirmed	Effectiveness
1	Vegetative-vascular Distony	14	10	71,4 %
2	Encephalopathy	4	4	100,0 %
3	Cerebrovascular Disorders	28	22	78,6 %
4	Acute Bronchitis	12	10	83,3 %
5	Chronic Bronchitis	11	9	81,8 %
6	Acute Rhinitis	16	13	81,5 %
7	Tonsillitis	13	11	84,6 %
8	Chronic Otitis	3	3	100,0 %
9	Ankilosing Spondilitis	6	5	83,3 %
10	Vertebral Osteoarthritis	34	30	88,2 %
11	Intercostal Neuralgia	11	8	72,7 %
12	Polyneuropathies	11	9	81,8 %
13	Ischaemic Heart Disease	9	7	77,8 %
14	Hypertension	33	27	81,8 %
15	Chronic Pyelonephritis	6	5	83,3 %
16	Nephrolithiasis	11	9	81,8 %
17	Chronic Gastritis	29	24	82,8 %
18	Peptic Ulcer Diseases	22	19	86,4 %
19	Chronic Pancreatitis	16	12	75,0 %
20	Chronic Hepatitis	5	4	80,0 %
21	Chronic Cholecystitis	46	39	84,8 %
22	Cholelithiasis	13	10	76,9 %
23	Diabetes Mellitus	17	15	88,2 %
	Bcero	370	305	82,4 %

To evaluate the compliance of the revealed pathology by “Virtual Scanner” to the official clinical diagnosis the patients were submitted for laboratory, biochemical, cardiology, functional, roentgenologic and ultrasonic tests. **Due to the findings the authors make the conclusion that “Virtual Scanner” system is more informative and able to identify and reveal disease, especially of the pre-pathological conditions, than the existing clinical diagnostic methods.**

In this case we could talk about the so-called hyper-diagnostics or the excessive diagnostics. However the conclusions of these authors are proved with data of other researchers, who gave plenty of examples when the diagnosis, diagnosed with the help of “Virtual Scanner” system, was revealed by clinical methods only after several weeks or even months. **It means that the virtual scanner really diagnoses the pre-pathological conditions and diseases at the earliest pre-clinical stage, when only some abnormalities of control and regulatory functions exist that can't be determined by current clinical methods.**

Fundamentally the new approaches are laid in construction of functional abnormalities correction system and also by treatment of different diseases with the help of “Virtual Scanner” system. The main methodological principle of virtual scanning is based on the principles of outer world and internal environment reflecting adequacy by the cerebrum functions. At that the cerebrum builds two groups of matrixes or images: images, describing and detailing the outer environment, i.e. the outer world; and images, describing and detailing the internal environment, i.e. the human organism, in fact. Coordination of these matrix groups is fulfilled by cerebral functions that are able to define the mutual relations of matrixes to each other and always find matrixes the most close to each other in characteristics depending on requirements of one or another situation.

During the diagnostic process the “Virtual Scanner” system analyses the fulfillment of special test by the patient on the computer simulator. The task is the following. At first the patient is presented the image (the picture) on the monitor for several seconds, and he has to remember it. Then the colour spectrum is fully broken and the patient has to restore it. During diagnostics in automatic mode one can see usually from 3 to 5 images one after another. The speed and reproduction quality of images by the patient lets to evaluate the main cerebrum functions and then to create the biomathematics model of the patient similar to the body scheme, built by the cerebrum.

The Virtual Scanner reproduces the set of matrixes in the computer, which are typical for the investigated patient. This process is called the Personal Biological Modelling. The basis of the virtual technology is the evaluation and comparison of matrixes, the same way as the cerebrum does, and, also, the transfer of received data to the standard medical terms.

During treatment the virtual scanning technology lets to correct the signals and, accordingly, the cerebral functions, brings them up to the evolutionary standard. The correction is fulfilled by the purposeful generating and presenting to the patient on the monitor of individually calculated colour sets in the delta-rhythm range, that are presented in the changing colour tints, coming to the Central Nervous System via visual analyser. In that way, by means of **Virtual Reality Technology** it is possible to reproduce the required characteristics of one or another matrix, and the cerebrum can be quickly tuned to these characteristics and restore its management functions. As a result there is a unique possibility of the natural non-medicinal influence on the pathological process/source and treatment of diseases which are caused by failures in the function of higher regulatory systems.

Efficiency of treating different diseases with the help of the “Virtual Scanner” system is shown in Table 2, where the research materials of some large sanatoriums, medical-diagnostic centres and hospitals, such as Kislovodsk Central Sanatorium of Ministry of Defence of RF, Orenburg Regional Clinic, Kislovodsk Mud-bath Clinic/Health Spa, Krasnoyarsk City Ambulance Hospital, Novosibirsk Regional Centre of Medical Prophylaxis, Novosibirsk Musical College, Medical Centre of “Drujba” Oil-trunk Pipeline Corporation, Pyatigorsk Sanatorium “Rodnik”, Moscow Molecular Technology Laboratory “Mirra-Lux”, Nalchik Medical Centre



“Aesculapius”, Odessa Medical Centre “Gigiya”, Yessentuki Sanatorium “Metallurg” (and others) are summarised.

Table 2

**Efficiency of different diseases treatment with the help of medical-diagnostic system “Virtual Scanner”**

<b>№</b>	<b>Diagnosis</b>	<b>№ of patients</b>	<b>№ of therapy courses</b>	<b>Effectiveness</b>
1	Chronic Fatigue Syndrome	43	1	97,7%
2	Depressive and Anxiety Disorders	54	1-2	96,3
3	Organic Disorders/Diseases of CNS	26	1-2	95,0%
4	Vegetative-vascular Distony	96	1-2	85,0%
5	Cerebrovascular Disorders	46	1+ massage	97,8%
6	Spinal Circulation Disorders	57	1+ massage	100%
7	Cerebral Palsy	12	1+ medications	100%
8	Chronic Bronchitis	37	1-2	100%
9	Bronchial Asthma	12	2	91,7%
10	Chronic Tonsillitis	7	1	100%
11	Chronic Otitis	8	1	100%
12	Ischaemic Heart Disease	63	1-2	90,5%
13	Chronic Cardiac Insufficiency	11	1-2	81,8%
14	Cardiac Arrhythmias	12	1-2	83,0%
15	Myocarditis	30	1-3	93,3%
16	Hypertension	120	1-2	87,5%
17	Chronic and Acute Gastritis	105	1-2	98,1%
18	Chronic Duodenitis	29	1	100%
19	Peptic Ulcer Diseases	75	1-2	100%
20	Chronic Hepatitis	53	1-2	92,5%
21	Chronic Cholecystitis	58	1-2	98,3%
22	Dyskinesia Biliary Ducts	52	2	100%
23	Cholelithiasis	15	1-2	86,7%
24	Chronic Pancreatitis	49	1	85,7%
25	Nephrolithiasis	42	2	86,5%
26	Pyelonephritis	26	2	84,6%
27	Hydronephrosis	2	2	100%
28	Cystitis	12	3	83,0%
29	Prostatitis	70	2	94,3%
30	Disorders of Thyroid Gland	73	1	93,2%
31	Hypofunction of Adrenal Cortex	21	1-2	61,9%
32	Ovarian Cyst	14	1	86,0%
33	Mastopathy	18	2-3 + medications	83,0%
34	Gynaecological Diseases	40	1	100%
35	Diabetes Mellitus	31	1-2	100%
36	Musculoskeletal System Disorders	19	1 + medications	100%
37	Vertebral Osteoarthritis	168	1-3	93,5%
38	Gout	26	1	100%
39	Ankylosing Spondilitis	40	1-2	95,0%
		<b>1672/1678</b>		<b>93,2%</b>

Totally one (1s.), two (2s.) or three (3s.) treatment courses were taken by 1672 patients with the help of “Virtual Scanner” system. Some of them received additional kinds of treatment (+ therapy), including massage, pharmacological medications and so on. **Treatment was considered as effective in case if the patient condition after the full course of treatment was diagnosed as fully recovered, considerably improved and improved.** The research, given in Table 2, showed the high effectivity of “Virtual Scanner” treatment sessions. The therapy effect was observed on average in 93.2% cases out of 1672 patients. And, as most specialists will notice, the positive changes for better in the state of health appeared after the first 4-5 treatment sessions. Negative consequences and deterioration of patient’s state of health were not discovered.

Interesting enough are the examples of some individual cases of diseases and the results of their treatment, carried out by the specialists of Orenburg Regional Clinic (V.I. Voynov, 2000):

1. Dudakova Masha, 16 years old, was observed at endocrinology department with the diagnosis: Diabetes, 1 type, heavy form, labile process. Diabetic encephalopathy, polyneuropathy, retinopathy; concentration of sugar in blood was up to 28.4 mmol/l; she got insulin – 24 units of prolonged and 28 units of simple one. She passed the colour therapy for the cerebrum. As a result, after 5 sessions the level of sugar in the blood lowed to the 7-9 mmol/l.
2. Rekhviashvili S., 23 years old, was observed at endocrinology department with the diagnosis: Diabetes, 1 type, heavy form. Diabetic encephalopathy, polyneuropathy, microangiopathy. Narcotic dependence, concentration of sugar in blood was up to 10-17 mmol/l, he got insulin up to 40 units per day. After 5 sessions of colour therapy the level of sugar in the blood lowed to 5 mmol/l, and it was accompanied by hypoglycaemia, and then it was set at level of 7-8 mmol/l. It let to low the insulin dose. The abstinent syndrome decreased.
3. Mamayev Alesha, 9 years old. Diagnosis: Enuresis (involuntary urination 3-4 times per night). The boy got treatment for the cerebrum and urinary bladder. After the fourth session the involuntary urination was observed once in 4 days.
4. Brekhova Natasha, 14.5 years old. Complaints for absence of menstruation during 1.5 years against the background of nervous anorexia, hypothyroidism. After 2 series of cerebrum treatment the menstruation was recommenced in 3 weeks.
5. Patient M., 23 years old. Complaints about repeated sexual weakness against the background of narcotic dependence at the stage of remission, abstinent disorder was reasonably expressed. After cerebrum course of treatment the libido and potency were restored, abstinent disorder decreased.
6. Vinkova Ye.M., 50 years old. She was observed at the physician with the diagnosis: Myocardious myocardic cardiosclerosis with rhythm disorders: extrasystoly, sino-tachycardia. During the diagnostics with the help of “Virtual Scanner” system the data was confirmed, and besides that the calcium deficit was revealed. After cerebrum, heart and the microelements metathesis course of treatment the patient condition noticeably improved, the heart rhythm disorders fully disappeared.
7. Pikaleva O.V., 45 years old. In the result of diagnosis with the “Virtual Scanner” system the pathologic signals from liver and gall bladder were obtained. During the ultrasonic

investigation the gallstone disease and calculus cholecystitis were diagnosed for the 1<sup>st</sup> time.

8. Brekhova O.V., 37 years old. After testing with the help of “Virtual Scanner” system the thyroid gland pathology was revealed, and also the Diabetes. Laboratory methods confirmed the diagnosis. With the help of that system the Diabetes and lowering of the thyroid gland functioning was revealed for the first time.

Treatment with the help of “Virtual Scanner” system of so-called difficult diseases such as disseminated sclerosis, concomitant mental disorders, vegetative syndromes at organic lesion of cerebrum and some other diseases, the treatment of which didn't lead to the positive results with the help of usual treatment methods, is of special interest.

1. Patient S., 42 years old. Endogenous depression, 2 group of disablement, doesn't work, doesn't do even simple house work. During 8 months he took 2 courses of informational colour therapy for the cerebrum. Patient began working not only at home, but also, at the state farm. The suicidal tendencies fully disappeared.
2. Patient Ts., 54 years old. Diagnosis: disseminated sclerosis, 1 group of disablement. Complaints: general weakness, shaky walk, moved only with the help of others, irritability, disturbed sleep, bad appetite, weight deficit, depression. After the first course of general informational correction he began walking without any help, put on weight (2kg in 1 month), had good appetite and normal sleep. After the second course of cerebrum treatment he began doing simple work at home.
3. Patient K., 60 years old. Diagnosis: neuritis of facial nerve and of the second branch of trifacial nerve. Complaints for skin desensitisation of the right face part, speech infringement, and headaches. After the fourth session of the general informational correction the speech became better, and at the end of treatment course it was fully restored, headaches disappeared.

Wide use of “Virtual Scanner” system at all levels of the educational institutions is being implemented now and in future programmes. **Application of this system in the medical practice by institutions and clinics greatly increases the quality of medical care due to the complex system of check up and treatment, which significantly reduces the time of data processing, and also gives the possibility to do screening-check up in an efficient, versatile manner which enables the deep analysis of findings both at the diagnostic and treatment stages.** More than 100 psychosomatic nosological diseases can be treated by the “Virtual Scanner” system. In some publications the special effect upon the treatment of gynaecological disorders is recorded. There were stated some cases when informational correction helped to overcome the narcotic dependence, to get rid of skin diseases (psoriasis, eczema, neurodermatitis), which are difficult to treat by the traditional means of treatment. **In many publications it is noticed that informational correction gives more effective and quick result than usual technologies.** Special effect is noticed at their combined use. It should be noted that regardless of the reason of the Virtual Scanner treatment that practically all patients experienced an improvement of their state of health, normalised sleep patterns and appetite, improved mental and physical activity, and loss of “chronic tiredness” syndrome.

Based on the abovementioned the high effectiveness of “Virtual Scanner” system and its absolute adaptability to the wide use in public health service is clearly evident.

## 2. Pilot Research of “Virtual Scanner” System Efficiency for Improvement of Physical Activity and Functional Condition of Different Organism Systems

### 2.1. Basis of working hypothesis, definition of object and research tasks

Complex population situation, existing in Russia during the last 10-15 years, requires the development of new and high-performance diagnostic, medical and prophylactic technologies, suitable for mass use and capable to fulfil powerful breakthrough in solving and improving the problems of the nation's health. The universal computer system “Virtual Scanner” is the neo-technology, designed by I.G. Grakov (1998, 2000, 2001) on the base of the concept about natural biological answer to the wave influence (Grakov B.S., Grakov I.G., 1985), and also on the base of the modern scientific conception about the leading role of higher regulator systems, cerebrum in particular (Bekhtereva N.P., 1974, 1980, 1997), and inhibiting-relaxation processes (Vysochin K.V., 1988) in the most important display of the whole organism vital activity, such as adaptation, work capacity, stability to the extreme environmental influences and etiopathogenesis of different pathological conditions, injuries and diseases.

Today, due to the wide experimental and theoretical researches (Anokhin P.K., 1975, 1979; Sudakov K.V., 1971; Medvedev V.I., 1982; Vasilevskiy N.N., 1979) the statement is proved that adaptation mechanisms are provided with both rigid and flexible programs of function regulation. According to Vasilevskiy N.N. (1984) adaptation mechanisms are to be studied as combined control systems with rigid and flexible programs, and also as tracing systems, necessary for generating of starting signal and extracting of certain sequence of signals and programs, forming the flexible regulation group. **Exactly the abnormality of regulation role of Central Nervous System and the hormonal system that is under its control, that the numerous experiments show (Gorizontov P.D., 1973; Medvedev V.I., 1982; Sapov I.A., Novikov V.S., 1984; Vasilevskiy N.N., 1984), can be the main reason for weakening of protecting mechanisms and pathological development.** The researches of Bekhtereva N.P. (1974, 1980) played an important role in understanding of neuropathological processes essence. She stated the conception of steady pathological condition while cerebrum lesion. Under existing conditions not only the completion of lesion structures takes place, but producing of new intra-central relations, fixed in the corresponding long-time memory matrix, and that makes that new (pathological process) stable and steadiness. On the basis of these ideas Kryjanovskiy G.N. (1980, 1984) developed the idea of pathological Functional System as one of the most prevalent mechanisms, constituting the basement for many kinds of Central Nervous System pathologies. In contrast to the physiological Functional System, described in details by Anokhin P.K., pathological Functional Systems are such nerve organisations, the result of which activity has not the adaptive but, on the contrary, disadaptive meaning. It appears in the fact that the activity of pathological Functional System doesn't correspond neither to the active irritant nor to the changing of situation, neither motivating reasons of human or animal behaviour, nor organism requirements. Moreover, the result of pathological Functional Systems activity can have the direct pathogenic effect, causing the following development of present or new pathological process. Pathological Functional Systems, also, cause the inhibiting of other systems, especially of those that are in interfering relations with them. That effect has an important pathogenetic significance, because it is connected to the disintegration of Central Nervous System activity in the pathologic conditions and to the suppression of compensating and recovery mechanisms.

A special place among physiological Functional Systems is devoted for the General, nonspecific Inhibiting-Relaxation Functional System of urgent organism adaptation and Protection (IRFSP) from extreme influence of physical hypoxia, hypothermal and other stresses that lead to the serious abnormalities of homeostasis and, first of all, to the Oxygen and carbon dioxide ratio distortion in the organism. The principle of IRFSP functioning is the following.

Along with the hypoxia and homeostasis abnormalities, the activation of inhibiting processes, excitability decrease, normalization of nerve processes and improvement of Central Nervous System regulation functions take place. And at the periphery all that results in considerable (sometimes up to 70%) increasing of speed of voluntary simultaneous weakening of all skeletal muscles. IRFSP activation, e.g. together with hard physical load, is accompanied by a mix of psychoemotional tension and muscle hypertonus, considerable improvement of regulation and movement coordination; the increase of economy and effectivity of Central Nervous System, nerve-muscle, cardiovascular, respiratory, neuro-endocrine and other systems; improvement of muscle blood-delivery and of energy-supply for muscular activity; increase of recovery processes rate and of energy resources resynthesis; and finally, to the normalization of homeostasis and to effect of extraordinary increase of physical activity or the “second wind” phenomenon (Vysochin Yu.V., 1983, 1988, 2000).

**“Virtual Scanner” system, realised on the base of original virtual scanner technology, fulfils the on-line and complex diagnostics, treatment and prophylaxis of various functional abnormalities or any organ or system diseases due to the normalisation of control and regulation of cerebral functions (Grakov I.G. and others, 2000).** It has no weak points, which are inherent to the most of methods, used in medicine and physiology (which let us only to estimate the structure or function of single organ, tissue or system, but they don't inform us about regulatory aspects of object under test activity and its mutual relations with other organs and systems). Virtual Reality Technology gives us the possibility to investigate all levels of the whole organism organisation – from higher regulatory systems to the metathetical processes at the cellular level.

**The main methodological principle of virtual scanning is the principle of adequate reflection of outer world and internal organism environment by cerebral functions.** Any incoming cerebral signal has its own characteristics (energy, frequency and spatio-temporal). On the basis of that signal a certain image is made, or the matrix that has the corresponding characteristics. Set of all matrixes forms the “body scheme”, i.e. the bio-mathematic organism model. Cerebrum brings the available “body scheme” into accord with sample one with the help of its main functions (sensing, imagination, associative thinking, memory, motivation, decision-making, and others), providing by that the homeostasis retaining and effective activity of all functional systems, organs and tissues. Under the influence of different unfavourable factors and extreme influences, especially with the increased excitability or weakness of inhibiting Central Nervous System systems, there can appear the so-called operation errors, i.e. the temporary or steady abnormalities in higher regulatory systems activity. For example, the consequence of such failures in movement regulatory system, which lead to discoordination in work of muscles-antagonists, is the injury of musculoskeletal system (for sportsmen and ballet dancers), (Vysochin Yu.V., 1974, 1980, 1988, 2001). After long influence of unfavourable factors the cerebrum generates the invalid directive signal, which doesn't correspond to the “body scheme”, as a result of which the pathological area is formed in some system, organ or tissue, and then the disease is developed. In turn, under the influence of afferent signals the areas of pathological excitation appear at the lesion areas of the corresponding parts of cerebrum, and then the pathological Functional System is formed. That way the exclusive vicious circle is formed, which turns the acute disease to the chronic one.

Taking into account the great therapeutic effect, attainable (as it was shown already) due to the normalization of control and regulatory cerebrum functions, it would be logical to assume that therapeutic sessions of “Virtual Scanner” system (judging from the results of our previous researches (Vysochin Yu.V., 1988 – 2000)) have to lead to the increase of functional activity of inhibiting systems and normalization of nerve Central Nervous System processes balance, improving of relaxation characteristics of neuro-muscular system and, as a result, to the increase

of energy consumption economy, recovery processes rate and physical activity not only for the ill people, but, also, for the people with good health.

## **2.2 Organisation and Methods of Research**

In order to check the working hypothesis the series of experiments were made with the help of 20 people in good health at the age from 20 to 60 years old with usual movement activity. Complex researches were made with the help of different physiological, neurophysiological and ergometric methods. Method of computer electroencephalography estimates the rhythm structure of electroencephalography (EEG) and the adaptability level (Soroko S.I. and others, 1995). Method of computer polymyography is based on the synchronous graphic registration of bioelectrical activity and muscles strain (quadriceps of both legs huckle) at their voluntary tension and relaxation in isometric mode. It help us to estimate the clonus rate, maximum force and relax rate of muscles under test, moving reaction rate at muscles strain and relax, development rate and the force of excitative and inhibiting Central Nervous System processes, balance of such nerve processes as excitation – inhibiting and other characteristics (Vysochin Yu.V., 1974, 1979, 1988). Method of computer veloergometry with the continuous registration of Heart Beating Frequency (HBF). With the help of these methods the dynamics of functional condition of Central Nervous System, neuro-muscular and cardiovascular systems, and also of the Physical Activity (PhA) under the influence of therapeutic sessions with the help of “Virtual Scanner” system.

After preliminary diagnostics with the help of “Virtual Scanner” system every tested person was prescribed to pass the individual therapy course (rhythmic colour correction) for the cerebrum. Complex tests of participants were held before (initial data), and also after 5, 10 and 20 therapeutic sessions with the help of “Virtual Scanner” system. Therapeutic sessions were 2 times a day, and their duration was 15-20 minutes. The remarkable feature of those therapeutic sessions was that all participants got the diskette with the prescribed therapy course and that they received the treatment at their work places at their PCs.

There were total 2800 measurements, and there were obtained and analysed 105440 of initial and calculated parameters, characterizing the functional condition of different organism systems. The research results were processed by methods of variation statistics. There were calculated the average values and average errors of every parameter. Precision of differences (distinctions) between average values of measures were estimated according to the T-criterion for the pairwise related variants.

## **2.3. Influence of therapeutic impact of computer treatment-and-diagnostic system “Virtual Scanner” on electroencephalography and polymyography characteristics of Central Nervous System functional condition**

Among the new medical technologies, which have appeared during last years, the special place is devoted to the treatment-and-diagnostic computer system “Virtual Scanner” developed by Grakov I.G. (1998, 2000, 2001). “Virtual Scanner” system, developed on the basis of original Virtual Scanning Technology, enables to carry out operative complex diagnostics, treatment and prophylaxis of different functional abnormalities and of any organ and system diseases by normalisation of operating and regulatory cerebral functions (Grakov I.G. etc., 2000). The special clinical research, which have been carried out with the help of multiple patients (370 people-diagnostics; 1672 people-treatment), have proven high accuracy of diagnostics (average 82.4% of coincidences with clinical diagnoses) and high efficiency of treatment (average 93.2% of recovery cases and considerable improvement) with the help of “Virtual Scanner” system.

## Results of research

First of all, it is necessary to note the general state of health improvement of all people who passed tests. That improvement became apparent in decrease of HBF, normalization of arterial pressure and a psychological condition. Many noted an improved vivacity and forces, reduction of psycho-emotional intensity and irritability, increase of calmness, steadiness, sleep improvement, the headaches termination (if they were present), improvement of sight, intellectual and physical activity.

*Two examinees got rid of chronic musculoskeletal system traumas. Two examinees (who had suffered from the myocardial infarction earlier) had the considerable state of health improvement and disappearance of any signs of heart discomfort.*

However the main attention in this experiment was given to the results of unbiased researches. The analysis of research results (Table 3, fig. 1) has revealed the pronounced positive dynamics of a functional condition of Central Nervous System according to the electroencephalographic (EEG) parameters.

Table 3

### Dynamics of Central Nervous System functional condition - according to the EEG data after 5, 10 and 20 “Virtual Scanner” sessions

Parameters	№	ID		After 5 sessions		Distinctions		
		M	m ±	M	±m	%	t	D
Adaptivity	15	1.36	0.07	1.60	0.08	18.55	11.77	0.001
Alpha rhythm	15	37.00	1.97	47.13	3.09	26.81	8.03	0.001
Beta rhythm	15	35.27	1.08	29.13	2.39	-18.22	-3.22	0.05
Theta Rhythm	15	17.40	0.77	15.00	0.84	-13.83	-4.01	0.001
Delta rhythm	15	10.60	1.44	8.73	1.22	-12.29	-1.35	-

Parameters	№	ID		After 10 sessions		Distinctions		
		M	m ±	M	±m	%	t	D
Adaptivity	14	1.35	0.08	1.61	0.08	20.52	5.47	0.001
Alpha rhythm	14	36.71	2.10	48.29	3.59	31.64	4.35	0.001
Beta rhythm	14	35.36	1.16	25.93	1.86	-25.67	-4.57	0.001
Theta Rhythm	14	17.64	0.79	17.42	1.29	-9.37	-1.27	-
Delta rhythm	14	10.57	1.54	9.64	1.61	-9.70	-1.37	-

Parameters	№	ID		After 20 sessions		Distinctions		
		M	m ±	M	±m	%	t	D
Adaptivity	18	1.32	0.06	1.58	0.06	19.30	8.41	0.001
Alpha rhythm	18	37.00	1.66	46.78	2.37	27.07	6.01	0.001
Beta rhythm	18	34.78	1.01	28.17	1.27	-17.33	-3.55	0.01
Theta Rhythm	18	18.50	0.77	16.22	0.72	-11.25	-3.03	0.01
Delta rhythm	18	10.50	1.21	8.89	1.28	-16.05	-2.25	0.05

The note. Names of parameters are stated in the text.

After 5 sessions already the statistically authentic increase of organism adaptability or flexibility was registered at the examinees (for 18.6% D < 0.001) and increase an alpha rhythm (for 26.8% D < 0.001), but decrease of beta (for 18.2% D < 0.05), theta (for 13.8% D < 0.001) and delta (for 12.3% D > 0.05) rhythms in summary EEG.

After 10 sessions even the greater increase of adaptability (for 20.5%  $D < 0.001$ ) and of alpha rhythm (for 31.6%  $D < 0.001$ ) was noticed, but, at the same time, the greater (for 25.7%  $D < 0.001$ ) decrease of beta rhythm in summary EEG. Looking at the dynamics of theta and delta rhythms the distinction is not authentic.

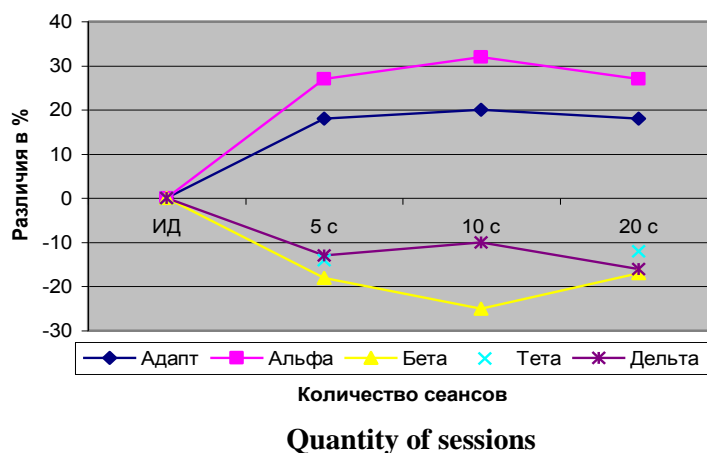


Fig. 1. Dynamics of adaptability and EEG rhythms after 5, 10 and 20 “Virtual Scanner” sessions

(Distinctions Consistency Levels are: \* -  $D < 0.05$ ; \* -  $D < 0.01$ ; \*\*\* -  $D < 0.001$ )

After 20 sessions, in comparison with 10 ones, the tendency to some decrease of adaptability and alpha rhythm and their returning to a level, achieved after 5 “Virtual Scanner” sessions, is noticed. **It means that peak efficiency of therapeutic influences of “Virtual Scanner” system on functional Central Nervous System condition was already achieved after the first 5 – 10 sessions, i.e. in 2.5 – 5 days with two sessions per day.**

Similar dynamics of functional condition of Central Nervous System is achieved, also, according to the data of PolyMyoGraphic (IPMG) research (Table 4, fig. 2). After 5 sessions already, in comparison with the Initial Level, an authentic improvement of the parameters describing the condition of inhibiting processes was registered: the rate of Motor Relaxation Reaction has increased (RMRR) for 5.1% ( $D < 0.05$ ), Development Rate and force of Inhibiting processes (DRI) for 15% ( $D < 0.001$ ), functional Activity of Inhibiting Systems (AIS) for 13.4% ( $D < 0.05$ ).



Dynamics of functional Central Nervous System condition - according to the polymyography data after 5, 10 and 20 sessions of therapy with the help of “Virtual Scanner” system.

Parameters	ID		After 5 sessions		Distinctions		
	M	m ±	M	±m	%	t	D
RMSR	3.30	0.151	3.25	0.100	-1.52	-0.44	-
RMRR	5.83	0.173	6.12	0.222	5.06	2.12	0.05
DRE	2.54	0.091	2.61	0.071	2.76	1.33	-
DRI	2.55	0.072	2.93	0.079	14.98	5.11	0.001
BNP <sub>i</sub>	0.98	0.044	1.13	0.036	15.52	4.76	0.001
AIS	9.61	0.724	10.9	0.588	13.42	2.31	0.05
GFC <sub>Central Nervous System</sub>	4.26	0.084	4.54	0.095	6.65	2.98	0.01

Parameters	ID		After 10 sessions		Distinctions		
	M	m ±	M	±m	%	t	D
RMSR	3.25	0.068	3.30	0.065	1.39	0.75	-
RMRR	5.80	0.108	6.11	0.089	5.34	2.50	0.05
DRE	2.55	0.041	2.62	0.043	2.89	2.07	0.05
DRI	2.60	0.047	3.04	0.031	17.08	6.96	0.001
BNP <sub>i</sub>	0.99	0.03	1.16	0.020	17.17	6.43	0.001
AIS	9.65	0.401	10.99	0.317	13.89	3.40	0.01
GFC <sub>Central Nervous System</sub>	4.25	0.053	4.54	0.039	6.82	4.37	0.001

Parameters	ID		After 20 sessions		Distinctions		
	M	m ±	M	±m	%	t	D
RMSR	3.24	0.057	3.29	0.044	1.50	0.67	-
RMRR	5.75	0.104	6.09	0.123	5.98	2.56	0.05
DRE	2.53	0.033	2.63	0.032	3.77	2.22	0.05
DRI	2.60	0.043	3.09	0.044	18.81	9.17	0.001
BNP <sub>i</sub>	1.00	0.024	1.19	0.024	19.44	6.57	0.001
AIS	9.67	0.332	11.14	0.373	15.20	3.98	0.01
GFC <sub>Central Nervous System</sub>	4.24	0.05	4.55	0.063	7.21	4.39	0.001

The note. Names of parameters are stated in the text.

Consequently a considerable change of Balance of Nervous Processes (BNP<sub>i</sub>) took place to the inhibiting side for 15.5% (D < 0.001). General Functional Condition of Central Nervous System (GFC<sub>Central Nervous System</sub>) for 6.7% (D < 0.01) was authentically improved, too.

After 10 sessions even more improvement of all polymyographic characteristics was seen: increase of RMRR for 5.3% (D < 0.05), DRI for 17.1% (D < 0.001), AIS for 13.9% (D < 0.001), change of BNP<sub>i</sub> to inhibiting for 17.2% (D < 0.001), increase of GFC<sub>Central Nervous System</sub> for 6.8% (D < 0.001). Rate of Motor Stress Reaction (RMSR) has also increased a little (inauthentically).

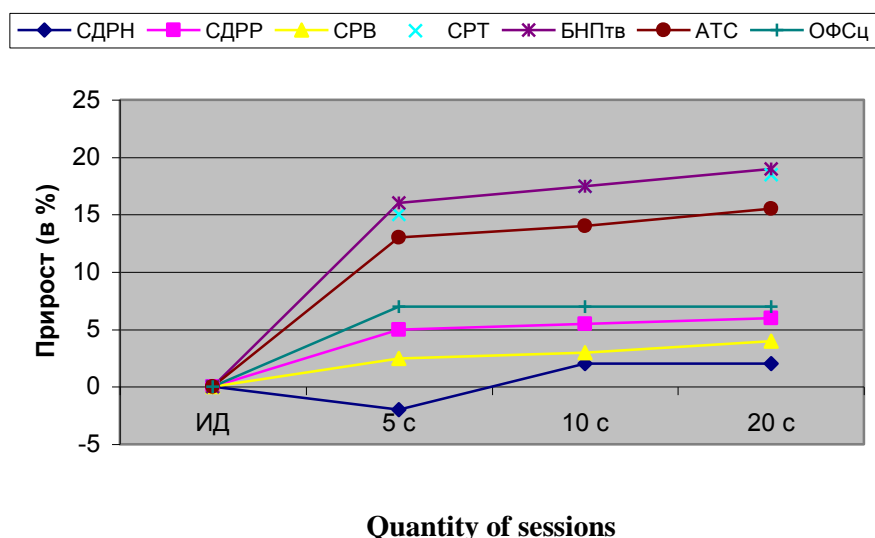


Fig. 2. Dynamics of functional Central Nervous System condition according to the polymyography data after 5, 10 and 20 sessions of “Virtual Scanner” system therapy.

(Distinctions Consistency Levels are: \* - D 0.05; \* - D 0.01; \*\*\* - D 0.001)

However the greatest increase in all polymyographic characteristics of functional Central Nervous System condition is received after 20 sessions. The parameters, describing the excitative systems condition, have increased: the Rate of Motor Stress Reaction (RMSR) for 1.5% (inauthentically), Development Rate and force of Excitative processes (DRE) for 3.8% (D < 0.05). At the same time the parameters, describing functional activity of processes of Central Nervous System inhibiting, have increased even more – RMRR by 6% (D < 0.05), DRI by 18.8% (D < 0.001), AIS by 15.2% (D < 0.01). As a result, a considerable change of Balance of Nervous Processes took place to the inhibiting side (for 19.4% D < 0.001), and general functional Central Nervous System condition was, also, improved (for 7.2% D < 0.001). However, as well as in the previous observations, the biggest rates of all parameters growth were registered after the first 5 sessions.

**Summarising of these researches results allows concluding that therapeutic session with the help of “Virtual Scanner” system really results in fast and substantial improvement of functional Central Nervous System condition. And it happens mainly due to the increase of inhibiting systems functional activity, normalisation of BNP and, accordingly, increasing of inhibiting control, that is one of the most important conditions for the effective realisation of control and regulatory Central Nervous System functions.**

## 2.4. Influence of the Therapeutic Impact of Computer Medical-Diagnostic “Virtual Scanner” System on the Functional Condition of Neuro-Muscular System

The logical effect of functional Central Nervous System condition improvement was the increase of functional condition level and of nervous - muscular system that is under Central Nervous System control (Table 5, fig. 3).

Table 5

**Dynamics of Neuro–Muscular System (NMS) functional condition** - after 5, 10 and 20 sessions of therapy with the help of “Virtual Scanner” system.

Parameters	ID		After 5 sessions		Distinctions		
	M	m ±	M	+m	%	T	D
VSR	5.63	0.246	6.04	0.335	7.32	1.71	-
MVF	5.59	0.27	5.79	0.292	3.54	0.97	-
VRR	4.58	0.179	5.72	0.268	24.92	4.44	0.001
GFCm	10.19	0.279	11.63	0.404	14.19	4.52	0.001
CIAT	1.2	0.082	1.05	0.072	-12.85	-3.85	0.01
GFCcm	6.71	0.201	7.96	0.327	18.64	4.74	0.001
IP	1.25	0.068	1.06	0.065	-15.00	-5.62	0.001

Parameters	ID		After 10 sessions		Distinctions		
	M	m ±	M	+m	%	T	D
VSR	4.97	0.19	5.8	0.192	16.64	4.26	0.001
MVF	5.23	0.151	5.8	0.183	10.84	5.98	0.001
VRR	4.74	0.133	6.17	0.113	30.08	8.63	0.001
GFCm	9.89	0.207	11.82	0.194	19.43	8.27	0.001
CIAT	1.17	0.049	0.98	0.035	-16.10	-6.17	0.001
GFCcm	6.73	0.146	8.86	0.389	31.65	5.23	0.001
IP	1.12	0.043	0.93	0.033	-16.84	-6.80	0.001

Parameters	ID		After 20 sessions		Distinctions		
	M	m ±	M	+m	%	T	D
VSR	4.36	0.225	5.83	0.269	33.74	7.94	0.001
MVF	4.92	0.167	6.27	0.192	27.59	7.97	0.001
VRR	4.8	0.115	6.26	0.095	30.41	13.01	0.001
GFCm	9.48	0.213	12.31	0.255	29.87	14.9	0.001
CIAT	1.14	0.049	0.94	0.03	-17.54	-7.31	0.001
GFCcm	6.75	0.127	8.93	0.245	32.25	9.16	0.001
IP	1.12	0.037	0.92	0.028	-18.11	-7.48	0.001

The note. Names of parameters are shown in the text

After 5 sessions already, in comparison with the initial level, the increase of Voluntary Stress Rate (VSR) for 7.3% (inauthentically), the Maximum Voluntary Force (MVF) for 3.5% (inauthentically), Voluntary Relaxation Rate (VRR) for 24.9% (D < 0.001) and the General Functional Condition of muscles (DFC<sub>m</sub>) for 14.2% (D < 0.001) was registered. The Classification Index of strategy of long-term Adaptation strategy Type (CIAT) for 12.9% (D < 0.001) was essentially improved and the probability of overstrain and Injury Possibility (IP) for 15% (D < 0.001) has decreased. The integrated parameter, characterized the general functional

condition of Central Nervous System and NMS ( $GFC_{cm}$ ) for 18.6% ( $D < 0.001$ ) has authentically increased, too.

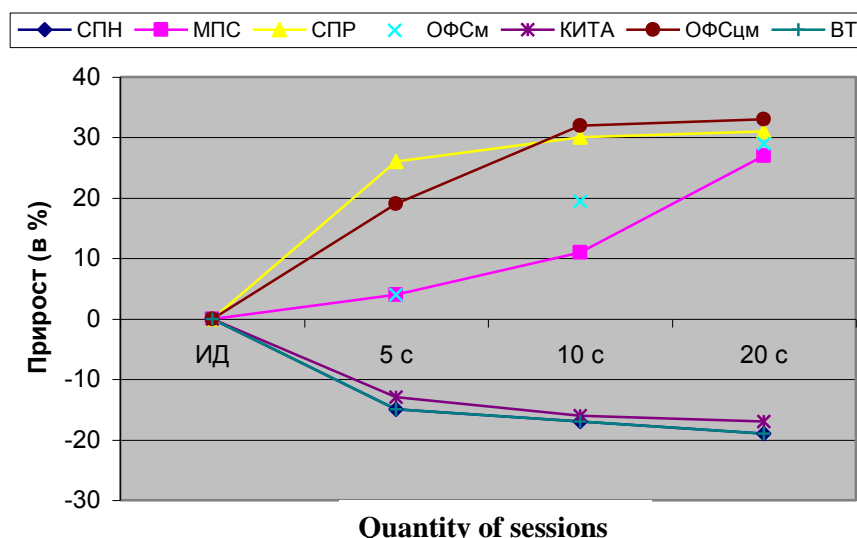


Fig. 3 Dynamics of functional NMS condition after 5, 10 and 20 sessions of system “Virtual Scanner” therapy (Distinctions Consistency Levels are: \* -  $D 0.05$ ; \* -  $D 0.01$ ; \*\*\* -  $D 0.001$ )

Even more expressed positive dynamics in all parameters, describing functional NMS condition, was noticed after 10 sessions of therapy. In comparison with the initial level, it is authentic ( $D < 0.001$ ) that parameters VSR for 16.6%, MVF for 10.8%, VRR for 30.1%,  $GFC_{cm}$  for 19.4%,  $GFC_{cm}$  for 31.7%, CIAT for 16.1% and TO for 16.8% were improved.

Further positive dynamics was kept for all parameters, but for some of them (such as VRR,  $GFC_{cm}$ , CIAT, IP) the growth at the 20<sup>th</sup> session, in comparison to the 10<sup>th</sup> one, appeared small (no more than 1-2%). The general growth in all these parameters was, accordingly, – 30.4%, 31.7%, 17.5% and 18.1%. Stress rate, the maximum force and the general functional condition of muscles have increased in comparison with the initial level for 33.7% ( $D < 0.001$ ), 27% ( $D < 0.001$ ) and 30% ( $D < 0.001$ ) accordingly.

## 2.5. Influence of therapeutic influences of computer medical-diagnostic system “Virtual Scanner” on physical activity and functional condition of cardiovascular system

The pronounced positive changes of functional Central Nervous System and NeuroMuscular System condition were accompanied by not less expressed positive dynamics of physical activity and functional condition of cardiovascular system (Table 6, fig. 4).

Table 6

### Dynamics of the parameters, describing physical activity and functional condition of cardiovascular system - after 10 and 20 sessions with the help of “Virtual Scanner” system

Parameters	ID		After 10 sessions		Distinctions		
	M	m ±	M	+m	%	t	D
FCCq	74.44	1.06	69.71	1.46	-5.99	-4.67	0.001
FCCm	150.14	9.12	154.14	6.46	3.60	1.24	
FCCr	124.52	7.30	122.10	5.22	-1.17	-0.70	
Np	32.34	3.03	34.36	2.80	7.20	2.78	0.01
HSE	9.02	0.84	9.79	0.72	10.46	2.81	0.01
HAEF	8.77	0.89	9.34	0.90	7.04	5.30	0.001
PRR	8.00	0.85	8.59	0.81	8.75	5.42	0.001
GE	8.38	0.87	8.96	0.85	7.83	9.78	0.001

Parameters	ID		After 20 sessions		Distinctions		
	M	m ±	M	+m	%	t	D
FCCq	74.44	0.81	67.78	1.20	-8.89	-5.47	0.001
FCCm	142.78	6.83	142.89	4.85	1.23	0.03	
FCCr	121.19	4.81	114.74	4.24	-5.03	-2.87	0.01
Np	29.65	2.37	33.27	2.27	13.21	4.76	0.001
HSE	9.02	0.64	9.96	0.46	12.84	3.57	0.01
HAEF	8.23	0.63	9.50	0.69	15.59	6.02	0.001
PRR	7.46	0.60	8.82	0.61	19.97	5.36	0.001
GE	7.84	0.62	9.16	0.64	17.54	6.75	0.001

The note. Names of parameters are shown in the text.

After 10 therapeutic sessions frequency of Frequency of Cordial Clonus in quiescence decreases considerably (FCCq) for 6% (D < 0.001) and in period of rehabilitation (FCCr) – for 1.2% (inauthentically), that testifies to the increase of heart activity efficiency and pulse restoration rate. At that the work capacity (N<sub>p</sub>) at veloergometre has considerably increased (for 7.2%, D < 0.01} and High-Speed Endurance (HSE) for 10.5% (D < 0.01). The special factors, calculated according to the ratio of work capacity and its pulse rate/cost, have considerably increased: Heart Activity Efficiency Factor (HAEF) – for 7.1% (D < 0.001), Pulse Restoration Rate (PRR) – for 8.8% (D < 0.001) and General Efficiency (GE) of organism systems – for 7.8% (D < 0.001), describing both an efficiency of systems activity, providing the direct realisation of movements, and energy-supply systems of muscular activity.

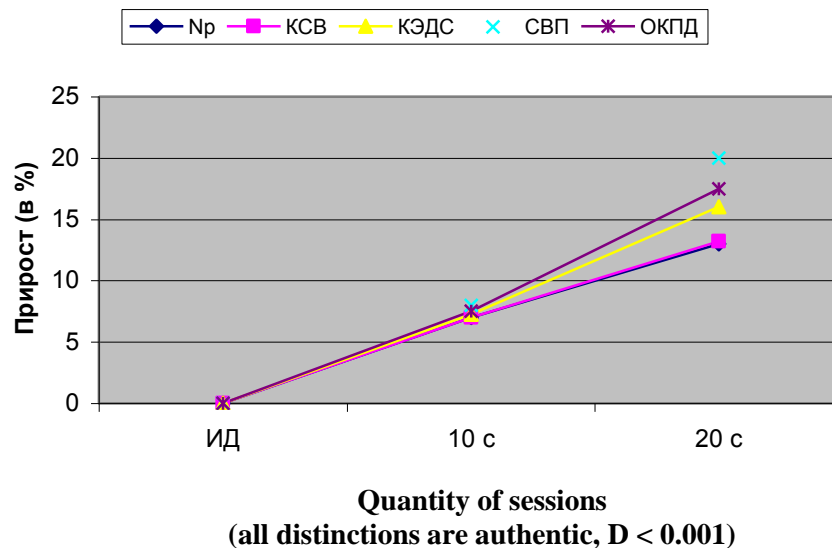


Fig. 4. Dynamics of the parameters, describing physical activity and a functional condition of cardiovascular system after 10 and 20 sessions with the help of “Virtual Scanner” system (all distinctions are authentic at  $D < 0.001$ )

Even more expressed positive dynamics of all parameters was registered after 20 sessions:  $FCC_q$  and  $FCC_r$  values have authentically decreased for 8.9% ( $D < 0.001$ ) and 5% ( $D < 0.01$ ) accordingly. Work Capacity and High-Speed Endurance have increased for 13.2% ( $D < 0.001$ ) and 12.8% ( $D < 0.01$ ). Heart Activity Efficiency, Pulse Restoration Rate and General Systems Efficiency of organism have increased for 15.6% ( $D < 0.001$ ), 20% ( $D < 0.001$ ) and 17.5% ( $D < 0.001$ ) accordingly.

It is noteworthy that maximum FCC level during veloergometry performance ( $FCC_m$ ) has remained at the initial level, though the work capacity has considerably increased (for 13.2%). That again testifies to the considerable increasing of organism systems activity, limiting physical activity and, also, about the lowered inquiries to the energy-supply systems of muscular activity, especially to the cardiovascular one.

# CONCLUSION.

## Discussion of research results

Computer system “Virtual Scanner” is developed on the basis of representations about laws of the biological answer to wave influence (Grakov B.S., Grakov I.G., 1985), the modern scientific concept about the leading part of the higher regulatory systems, the brain in particular (Bekhtereva N.P., 1974, 1980, 1997), and inhibiting-relaxation processes (Vysochin J.V., 1988) in the most important display of vital activity of the whole organism, such as adaptation, ability to work, resistance to extreme environmental influences and etiopathogenesis of various pathological conditions, injuries and diseases.

According to the research results, the therapeutic sessions of rhythmic colour correction with the help of “Virtual Scanner” system has resulted in considerable positive changes in all parameters characterising the functional condition of Central Nervous System, NeuroMuscular System and Cardiovascular System, and also in parameters of physical activity and endurance. However if growth in functional activity of inhibiting systems and General Functional Condition of Central Nervous System, muscles relaxation characteristics, efficiency of CardioVascular System (CVS) activity and physical activity were not unexpected for us, as these effects were predicted at the working hypothesis formulation of research, the considerable growth in muscular retractive characteristics turned out a little bit unexpected. The matter is that, as it was already specified, the volunteers, who participated in experiments, were almost healthy (they were scientific employees with normal motor activity). That is why the following question arose: owing to which physiological mechanisms did the muscular retractive characteristics increase after rhythmic colour correction?

In order to answer this question it is necessary to remember that many movements, carried out with maximum speed, require making considerable efforts in a short time. Efficiency of such movements substantially depends on Retractive Rate (stress), force and speed of muscular relaxation. During the numerous researches of Individual Clonus (IC), executed on separate muscular fibres of birds, reptiles, mammal, etc. (Josephson, 1975; Smith et al., 1973; Ashler, Rigdway, 1968; Barany, 1967; Blinks Ct al., 1978; Eusebi Ct al., 1980; Guthe, 1982 etc.) it is defined that Individual Clonus Rate, measured by the time passed from the electric stimulus till the moment of muscles half-relaxation, depends on plenty of factors: quantity of connected in series sarcometers, i.e. the length of muscular fibre, ATPase actomyosin activity, ATPase sarco-plasmic reticulum activity, and also the time, during which in sarcoplasma (in myofibril area) the supraliminal concentration of ions  $Ca^{++}$  is supported, which, in turn, is defined by sarco-plasmic reticulum volume and by calcium pump capacity (Shigekawa Ct al., 1978; Dawson Ct al., 1980; Dynnik, 1985; Krolenko, 1985). And the speed of muscular fibre stress is not limited neither by diffusion of ions  $Ca^{++}$ , nor by the speed of emission  $Ca^{++}$  from the **end tanks**, as the last process goes very quickly.

The main factor, limiting the rate of Individual retractive-relaxation cycle, is the calcium sequestration rate, affecting the Muscular Retractive Rate (MRR) and associated to the development rate of sarco-plasmic reticulum. Morphological research confirm the considerable differences in the structure of sarco-plasmic reticulum between fast and slow muscles. Thus, shortening the time of Individual Clonus, i.e. increasing the Stress and Relaxation Rate can be achieved by increase of volume, taken by sarco-plasmic reticulum due to the decrease of volume, taken by myofibril retractive organ. The consequence of quick-action increase can be the fall of muscular fibres specific force, which is defined by cross section of myofibril, composing these fibres (Gurfinkel, Levik, 1985). In some researches (Bruse Ct al., 1986) the positive correlation between isometric effort and the cross section area of muscles was found out.

If to follow this data, describing mainly the peripheral mechanisms, providing the increase of muscular retraction and relaxation rate, then the growth of retraction rate should be accompanied by the considerable morphological reconstructions, resulting in increase of sarco-plasmic reticulum capacity and, accordingly, to the reduction of muscles force. But muscles force in our experiments has increased.

Undoubtedly that in these processes not so much peripheral (because it is hardly possible to get the considerable morphological reconstructions in muscles structure during only 10 days of experiments), as the central mechanisms of voluntary movements regulation. It is known that at any voluntary muscles retraction and relaxation, besides the above listed factors, the rate of these processes and clonus force is defined by functional condition of the higher regulatory systems and the segmentary organ of nervous system, by supraspinal and esodic influences on alpha-motorneurons of spinal cord and, also, what is the most important, by the quantity and work synchronism of the moving organs, taking part in clonus process.

It is obvious that such considerable improvement of retractive (growth of Stress Rate for 33.7%, of maximum force - for 27.6%) and relaxation (growth for 30.4%) muscles characteristics is explained by considerable improvement of general functional Central Nervous System condition and, accordingly, its regulatory and control functions.

Testing task during check-ups, as it was specified above, required from examinees to fulfil testing movement with the maximum force and speed. In order to fulfil the task correctly the precise, well-organized and correct command from Central Nervous System to the executive organs (muscles) was necessary. In the beginning of experiment the control and regulatory Central Nervous System functions were not perfect at examinees, therefore not all of available moving organs could participate in the retractive action, or the inclusion sequence into the retractive action didn't provide the synchronism of their interaction. The consequence of it was the low parameters of Retractive Rate and maximum force of muscles.

At the end of the experiment the situation has changed. Due to the considerable improvement of regulatory and control Central Nervous System functions, the retractive action synchronously involved the maximum quantity of available in a muscle moving organs, what was the reason of high rate and the big force of muscular retractions.

**Starting from the above-stated, the high efficiency of “Virtual Scanner” system and its absolute availability for use not only in public health services (for treatment and prophylaxis of various pathological processes} is abundantly clear, but, also, for any kinds of sport and professional work, requiring normalisation of control functions of higher regulatory systems, improvement of inhibiting Central Nervous System control, increase of retractive and relaxation muscles characteristics, capacity of physiological protection mechanisms, efficiency of cardiovascular system activity, intellectual and physical activity, stress-resistance and survival rate in complex and extreme conditions of activity and of the environment.** Taking into account the minimal time expenses for complex diagnostics (not more than 10-15 minutes) and treatment or so-called informational correction (the session lasts 15-20 minutes), and also the main aim of informational correction - normalisation of control and regulatory brain functions, it is necessary to expect that system “Virtual Scanner” in the near future will find the adequate application in all areas of human activity, connected with big physical and psychoemotional load, the increased requirements to systems of movement regulation and coordination, stability to stress-generating and other negative factors (rescuers, firemen, choreography, ballet, sport, landing armies, riot squads, aircraft, astronautics etc.).



## FINDINGS

1. The special clinical research, which have been carried out on a large number of patients (370 people – diagnostics; 1672 people – treatment), have proven the high accuracy of diagnosis (on average 82.4% of concurrences to clinical diagnosis) and the high efficiency of treatment (on average 93.2% of recovery cases and considerable improvements) with the help of the “Virtual Scanner” system.
2. According to the data of electroencephalographical and polymyographical research it was established that “Virtual Scanner” system therapeutic sessions result in fast and considerable increase of adaptability (for 20.5%  $D < 0.001$ ) and percentage of alpha rhythm (for 31.6%  $D < 0.001$ ) in summary EEG, and also to the improvement of general functional Central Nervous System condition (for 7.2 %  $D < 0.001$ ) due to increase of DRI (for 18.8%  $D < 0.001$ ), functional Activity of Inhibiting Systems (AIS) (for 15.2%  $D < 0.01$ ), considerable change in Balance of Nerve Processes (BNP) toward inhibiting processes (for 19.4%  $D < 0.001$ ) and, thereafter, increasing inhibiting control from Central Nervous System side which is one of the major conditions for the control of the regulatory cerebral functions.
3. Efficiency increase of control and regulatory cerebrum activity under the influence of therapeutic sessions of “Virtual Scanner” system results in considerable increase of stress rate (for 33.7%  $D < 0.001$ ), the maximum force (for 27.6%  $D < 0.001$ ), relaxation rate (for 30.4%  $D < 0.001$ ) and the general functional NeuroMuscular System condition (for 30%  $D < 0.001$ ).
4. **The pronounced positive changes of Central Nervous System and NeuroMuscular System functional condition are accompanied by improved dynamics in physical activity and CVS functional condition.** After 20 “Virtual Scanner” system sessions, in comparison with the Initial Data, the Frequency of Cordial Clonus in quiescence ( $FCC_q$ ) and in period of rehabilitation ( $FCC_r$ ) authentically decreases for 8.9% ( $D < 0.001$ ) and 5% ( $D < 0.01$ ) accordingly.  $N_p$  (work capacity) and speed endurance increased by 13.2% ( $D < 0.001$ ) and 12.8% ( $D < 0.01$ ). Heart Activity Efficiency Factor (HAEF), Pulse Recovery Rate (PRR) and General Efficiency (GE) of organism systems raise for 15.6% ( $D < 0.001$ ), 20% ( $D < 0.001$ ) and 17.5% ( $D < 0.001$ ) accordingly.
5. After 5, 10 and 20 “Virtual Scanner” sessions the substantial decrease of the characteristic, which shows the Possibility of Injury (IP) and Musculoskeletal system diseases, and also the heart overstress accordingly for 15% ( $D < 0.001$ ), 16.8% ( $D < 0.001$ ) and 18.1% ( $D < 0.001$ ). **That allows concluding that “Virtual Scanner” system therapeutic sessions can become an effective overstress, injury and musculoskeletal system diseases preventive measure, and also for prevention of cordial overstress at hard physical and psycho-emotional load.**
6. Considerable improvement of retractive and relaxation muscle characteristics, increasing of physical activity, heart functioning efficiency, coordination in different organs and systems activity, which limit physical efficiency, and also reduction of injury possibility, musculoskeletal system diseases and cordial overstress is explained by improvement of overall functional Central Nervous System condition and, accordingly, of its control and regulator functions under the influence of “Virtual Scanner” system sessions.
7. “Virtual Scanner” is a high-performance system and absolutely suitable for wide application not only in public health service (for treatment and prophylaxis of different pathological processes), but **in any kinds of sport or professional human activity that requires effective correction of psychofunctional abnormalities, normalization of regulator systems control**

**functions, improvement of inhibition Central Nervous System control, increasing of retractive and relaxation muscle characteristics, economy and effectivity of CardioVascular System activity, mental and physical activity, stress stability and human survival rate in complex and extreme conditions of activity or environment.**

8. Taking into account the minimum time spent for complex diagnostics (less than 10-15 minutes) and treatment (or so called informational correction) (session lasts 15-20 minutes), and also the main object of informational correction – normalisation of regulator and control of cerebrum functions, it is expected the “Virtual Scanner” system will be applicable in all areas of human activity concerned with hard physical and psycho-emotional load, increased requirements to regulating and movement coordination systems, physical activity, endurance, stability to different stress-generative or confusing factors (sport, choreography, ballet, rescuers, firemen, landing troops, emergency platoons, aviation, cosmonautics and others).

## List of Abbreviations

<b>AIS</b>	- <b>Activity of Inhibiting Systems</b>
<b>BNP</b>	- <b>Balance of Nerve Processes</b>
<b>BNP<sub>i</sub></b>	- <b>Balance of Nerve Processes for inhibiting processes</b>
<b>CIAT</b>	- <b>Classification Index of strategy of long-term Adaptation strategy Type</b>
<b>CNS</b>	- <b>Central Nervous System</b>
<b>CVS</b>	- <b>CardioVascular System</b>
<b>D</b>	- <b>Distinctions consistency level</b>
<b>DRE</b>	- <b>Development Rate or force of Excitative process</b>
<b>DRI</b>	- <b>Development Rate and the force of Inhibiting processes</b>
<b>EEG</b>	- <b>ElectroEncephaloGraphy</b>
<b>FCC<sub>q</sub></b>	- <b>Frequency of Cordial Clonus in quiescence</b>
<b>FCC<sub>r</sub></b>	- <b>Frequency of Cordial Clonus in period of rehabilitation</b>
<b>FCC<sub>m</sub></b>	- <b>Frequency of Cordial Clonus maximum</b>
<b>FS</b>	- <b>Functional System</b>
<b>GE</b>	- <b>General Efficiency</b>
<b>GFC<sub>cns</sub></b>	- <b>General Functional Condition of CNS</b>
<b>GFC<sub>m</sub></b>	- <b>General Functional Condition of muscles</b>
<b>GFC<sub>cm</sub></b>	- <b>General Functional Condition of CNS and NMS</b>
<b>HAEF</b>	- <b>Heart Activity Efficiency Factor</b>
<b>HSE</b>	- <b>High-Speed Endurance</b>
<b>IC</b>	- <b>Individual Clonus</b>
<b>IP</b>	- <b>Injury Possibility</b>
<b>IRFSP</b>	- <b>General Inhibiting-Relaxation Functional System of urgent organism adaptation and Protection</b>
<b>MRR</b>	- <b>Muscular Retractive Rate</b>
<b>MVF</b>	- <b>Maximum Voluntary Force</b>
<b>N<sub>p</sub></b>	- <b>Work Capacity</b>
<b>NMS</b>	- <b>Nervous – Muscular System</b>
<b>PhA</b>	- <b>Physical Activity</b>
<b>PMG</b>	- <b>PolyMyoGraphy</b>
<b>PRR</b>	- <b>Pulse Recovery Rate</b>
<b>RMRR</b>	- <b>Rate of Motor Reaction Relaxation</b>
<b>RMSR</b>	- <b>Rate of Motor Stress Reaction</b>
<b>RF</b>	- <b>Russian Federation</b>
<b>RR</b>	- <b>Retractive Rate</b>
<b>VSR</b>	- <b>Voluntary Stress Rate</b>
<b>VRR</b>	- <b>Voluntary Relaxation Rate</b>