

**НЕЙРОБИОЛОГИЧЕСКИЕ И ПСИХОФИЗИОЛОГИЧЕСКИЕ МЕХАНИЗМЫ  
МЕНТАЛЬНОГО ТРЕНИНГА**

**NEUROBIOLOGICAL AND PSYCHOPHYSIOLOGICAL  
MECHANISMS OF THE MENTAL TRAINING**

Результаты комплексных исследований в рамках  
российско-шведского проекта

"Ментальный тренинг для спорта и жизни"

Some Results from a Joint Russia-Swedish Research Project

"Mental Training for Sport and Life"

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**INTRODUCTION**

In the investigation carried out according to the international scientific-research programme "Mental training for sport and life" in 1995–1999 and summarized in the given work the Swedish model of integrated mental training – IMT was used. The IMT is a systematic, long-term and developing training of mental skill and aims for the purpose of promoting health, as well as the achievement of the peak of professional performance and prosperity in life.

IMT includes more than 50 Swedish audio- and videoprogrammes, 37 of which entered the Russian version of mental training; it was certificated by the Russia Federation of Sports Medicine and Sports Psychology.

The efficiency of healthy influence of the original Swedish and authentic Russian version of IMT was studied on more than 2500 persons of both countries at the age of 11–65 years old. They were schoolchildren of common and specialized gymnasiums, university students attending fitness- and shaping clubs, pupils of Olympic reserve schools, skilled and ex-athletes and persons who take a course of rehabilitation in health centres.

On the whole the results of the investigations carried out testify to the fact that the healthy effect of IMT consists in the rise of organism psychophysical reserves which are manifested in increasing the tolerance to physical and mental stress, as well as the spiritual potential of personality and personal prosperity.

The following psychophysiological and neuro-biochemical mechanisms make up the basis of IMT healthy effect:

1. Broadening of the diapason of self-regulation of the level of brain activation and the formation of the high performance brain.
2. Decrease of sympathetic-adrenal system activity by a simultaneous increase of the level of endogenic-opiatic neuro-peptides and age-dependent hormone-dihydroepiandrosterone.
3. Immunomodulating effect expressed in the normalization of cellular and humoral immunity.
4. Optimization of the interaction of ergo- and tropho-tropic subsystems of the cortico-visceral self-regulation.
5. Intensification of the activity of bioenergetic centres of organism and the development of a positive aesthetics mentality.

Investigations carried out a high healthy efficiency of IMT during 8–21 weeks:

firstly, in the prophylaxis of pre-nozological disturbances of the state of health and, in particular, so-called "alternated psycho-somatic states";

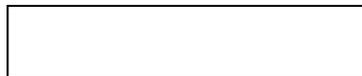
secondly, in the intensification of physical exercises healthy effect at the expense of complimentary stress-limiting influence of IMT on the psychophysical state of subjects;

thirdly, for the operative removing of energydeficient states and the mobilization of psychoenergetic reserves;

fourthly, for the purpose of increasing the efficiency of the rehabilitation of the patients suffering from cardio-vascular diseases and a chronic painful syndrome.

It should be noted that when IMT is used systematically and for a long period of time, its healthy effect combines for the most part with the formation of a positive psychoenergetic state and the diapason of the social adaptation considerably broadens.

The cross-cultural combined investigations carried out prove a high healthy effect of IMT which essentially increases the quality of life and can be used for health promotion, preventive therapy of the disturbances of the psychosomatic health and taking antilogarithms of traditional medical influences by the therapy of acute and chronic diseases. The studied bio-psycho-social aspects of IMT give every reason to speak about adaptogenic and creative (according to its nature) influence of systematic integrated mental training.



Prof. D.M.S. Pavel Bundzen

**COMPLEX BIOELECTROGRAPHIC ANALYSIS  
OF MECHANISMS  
OF ALTERNATIVE STATE OF CONSCIOUSNESS\***



*Bundzen P. , Korotkov K., Uneståhl L.-E.*

The process of self-induction of alternative state of consciousness (ASC) is the key link of the Swedish model of mental training [27], which have been widely practised for the last decade in a number of European and Asiatic countries. Irrespective of the language version of Swedish model of mental training (MT) the muscular and mental relaxation appear to be base training programmes. As the experience of using MT shows the duration

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of teaching ASC self-induction average makes up  $7 \pm 2$  weeks, while the speed and the depth of plunging of the subject in ASC vary depending on the degree of suggestibility [5].

**The task of the given investigation** that was carried out within the frame of the international scientific and technical project "Mental training for sport and life" consisted in studying some bioelectrographic correlates and psychophysiological mechanisms of ASC that are formed in the course of mental relaxation.

The investigations were carried out in Sweden and in Russia in the years of 1996–1999 by means of the authentic versions of MT Swedish model on the basis of Scandinavian International University (Örebro) and Saint-Petersburg Research Institute of Physical Culture. Practically healthy 45 students and post-graduate students at ages 17–23 appeared in the role of subjects. The control of the state of health was fulfilled by means of the automated diagnostic system "HELPSY"; the suggestibility was determined by means of Stenford scale, as well as the scale elaborated by Kharkov Research Institute of Psychiatry [19]. The diagnostics of ASC formation was carried out by means of the registration of quasi DC potential directly in the course of mental relaxation, as well as by means of the linguistic test [25]. The aggregate number of subjects in control group was 33 persons. Besides, on the basis of the Örebro Central Hospital Neurophysiology Department and the laboratory of neurophysiology at the Scandinavian International University there carried out some control investigations on healthy subjects who performed MT not less than during two years and who according to the resolution of MT experts were notable for fast and stable plunging into ASC.

***The following methods of bioelectrography were used in the work:***

1. Mapping of brain EEG bioelectrical activity (BEAM-EEG), spectral analysis of EEG, mapping of the dynamics of changes of cerebral hemispheres activated level in the course of ASC development, as well as some methods of coherent and harmonious analysis of brain biopotentials [3, 23].

2. Bilateral registration of quasi DC potential (patent of Russia № 20113775, 1994) or "omega-potential" [9] and the accumulation of average-latent provoked responses (MLER). For the registration of MLER there used the technique of responses analogous averaging in the field of vertex on 1000 sound clicks by the duration of 0.1 ms with a frequency range of amplifying path from 30 Hz till 1.0 kHz.

3. Registration of concentrative-kinetic potential (Xy-potential) of meridional biologically active points (BAP) by means of the automated system "Zodiac" (patent of Russia № 2106799, 1998) and the level of BAP electric conduction by means of the system "Nakatani" (Joint-stock company "Electronic medical systems", Saint-Petersburg). The measurements of Xy-potential were carried out before and after mental relaxation. In the control investigations there carried out the discrete registration of Xy-potential directly in the course of ASC development.

4. Registration of the intensity and patterns of energyemission processes (the Kirlian effect) by means of photomethod and the computerized system "Diegel". In the investigations there used the following parameters of the work of high-voltage generator: duration of the impulse – 0.5 s, frequency of impulses – 100 Hz, voltage on electrode – 15 kV. The light sensitivity of photosystem over the range of 215–650 nm made up not less than 97 mkA/lm. The registration of the intensity of energyemission processes was realized by means of the recorder "Sigma" (firm "PERKIN ELMER") and the video recording of the figures that reflected the intensity of energyemission processes. In a number of control investigations there used "Corona-TV" elaborated by professor K.Korotkov [12].

For the purpose of averaging the findings and their subsequent statistical processing the bioelectrography was carried out under the conditions of listening to a standardized audioprogramme of mental relaxation by the subjects; it included the following basic fragments: musical relaxation, mental relaxation, rest in "mental room" (ASC-1), imagination in "mental room" (ASC-2) against the background of relaxing music "Avslappningsmusik" and the output from ASC. Besides, there carried out the registration of all bioelectrographic parameters before and after the presentation of audioprogramme. The audioprogramme was reproduced with the help of a high-quality stereoapparatus of the firm "Philips". Candidate of psychological science M.Bendiukov took part in the elaboration and studio recording of this audioprogramme.

***The results of the investigations and their discussion***

1. The patterns of EEG neuro-mapping and the spectral analysis of EEG testify to the fact that the ASC, which is formed in the course of mental relaxation, is characterized by the following neuro-dynamic correlates.

Firstly, by the change of theta- and alpha-activity spatial distribution along the zones of the cortex. In particular, there occurs intensification of theta-activity in antecentral sections of brain ( $p < 0.05$ ) and a statistically reliable ( $p < 0.01$ ) smoothing of the level of alpha-activity in the frontal-occipital direction. The latter is stipulated by a relative reducing of the level of alpha-activity at cortex parietal-occipital zones. At the same time in these zones there find out a splitting of prevailing frequency of alpha-rhythm into two peaks - low-frequency (6.8–8.0 Hz) and high-frequency ( $11 \pm 2$  Hz); their prevailing frequencies are in the ration of  $1.61 \pm 10\%$ .

Secondly, the subsequent analysis showed that the EEG frequency spectrum in retrocentral sections of the cortex at the state of ASC-1 represents a set of subdominant and harmoniously bound frequencies in the range of delta-, theta-, alpha-1-, alpha-2- and beta-rhythms. It should be noted that such poliharmonious structure of EEG spectrum was revealed by EEG analysis, as well registered under natural condition of ASC formation by playing the piano.

Thus, the *polimodal frequency harmonization of cortical bioelectrical activity whose basis may be considered as so-called "golden ratio" should be recognized to be one of the forms of specific neurodynamic correlates of ASC which are formed in the conditions of ASC.*

The study of the dynamics of systemic-structural reconstructions of cortex activated level based on the use of well-known in applied psycho-physiology method - the calculation of the coefficients of activation spectral (CAS) [3, 21] was the second stage of the analysis of ASC neurodynamic correlatives. The mapping of the dynamics of cortex activated level changes according to ASC testifies to the fact that in ASC-1 and ASC-2 a statistically reliable re-forming of brain bilateral and frontal-occipital asymmetry [3] is observed. In ASC-1 there occurs a smoothing of frontal-occipital asymmetry (mainly because of the reduction of alpha-activity in retrocentral sections – see above) which is supplemented in ASC-2 with the disappearing of activation level bilateral asymmetry with a subsequent transition to increasing the activated level of right hemisphere.

*So, according to the findings the formation of the isogradiental relative to vertex (Cz) activated structure distributed in space is the second specific neuro-dynamic marker of ASC.* The latter means that in ASC there occurs a transformation of brain dominant systemic-structural organization which is peculiar to an ordinary state of consciousness (D-mode) to the state of non-dominant activation (A-mode) which is characterized by the symmetry of cerebral hemispheres activated structure.

The mathematical analysis of activation gradients between Cz and the other analysed zones of brain testifies to the fact that their value makes up average  $0.227 \pm 0.031$ , that's it corresponds to the "golden ratio" ( $1.618 \pm 10\%$ ). In this case it should be noted that only in temporal cortex ( $T_3-T_4$ ) had a place process of dezinhibition and increasing of the coefficient of spectral activation [28].

The analysis of regulating the space organization of the field of brain biopotentials carried out in control investigations by means of correlative analysis and EEG concrete analysis enables us to define more exactly the specific character of changing the functional organization of biorhythms in ASC. In particular, there found out that under the conditions of mental relaxation and ASC formation the phenomenon of the age regulating pattern reduction of biopotentials field is observed. This process is clearest manifested in antecentral (frontal and central) sections of cortex; according to the data of neurometric [22] the period of their maturing is correlated with 17-22 years old. The purposeful suggestion of age reduction under the conditions of heterohypnosis confirms the fact that the greatest changes of EEG spectral characteristics are observed in those zones of cortex where the maturing occurs in the period of suggesting age.

Thus, the results of neurophysiological investigations give every reason to conclude that during the transition of the consciousness from "Ä-mode" to "À-mode" there occurs the change of the programmes of brain self-regulation. According to the findings in this case there occurs *the dezinhibition of ontogenetically determined invariants of the programmes of brain self-regulation.*

While summarizing all accumulated data on cortical bioelectrography we have every reason to suggest that the change of the programmes of brain self-regulation in ASC is first of all associated with the reconstruction of the interaction of brain thalamo-frontal and frontal-limbic systems. This conclusion finds its direct corroboration in the results of the study of the dynamics of amplitude-temporal parameters of average-latent provoked replies (MLER) in ASC. In particular, there revealed some alterations of the component Na and Pa ( $p < 0.05$ ) latency and amplitude, those components that are generated at the level of brain thalamic structure. It should be also noted that the analogous changes of MLER at the level of brain thalamo-frontal system were found out by us before under the influence of phenciclidine (katamine) that provokes some alterations of the state of consciousness [4].

2. Taking into consideration the bond of alterations of the state of consciousness with bioenergoinformative processes that has been widely discussed in modern literature [6, 7, 13, 14, 17] side by side with the methods of traditional systemic-structural analysis the work used a battery of some methods of the same systemic analysis but relating to so-called "power paradigm" [11]. These methods include: the registration of the functional state of meridional biologically active points (BAP) and some methods of energyemission analysis (the Kirlian effect).

As a whole, the results of statistical analysis testify to the fact that in the course of mental relaxation and ASC development the following reconstructions of BAP functional state occur in healthy subjects:

firstly, the level of BAP electric conduction of representative meridians reliably ( $p < 0.05$ ) changes and the stabilization of the value of average current is observed within the limits of standard ( $85.2 \pm 11.3$  mA); according to the data obtained by means of the system "Zodiak" there occurs an appropriate increase of BAP potential ( $p < 0.01$ ) and a reducing of their reactivity to a testing influence ( $p < 0.05$ );

secondly, it turned out that a smoothing of the values of electric conduction and Xy-potential in symmetric right- and left-side meridional BAP was observed; it is manifested in the change of the index that is calculated in the map of Ryodoracu ("Ryodoracu Map").

It should be stressed that the given processes in the system of BAP occur synchronously with typical changes of omega potential that are typical for the period of ASC formation. These changes are manifested in decreasing the level of omega potential average till  $17 \pm 5$  mV and disappearing the bilateral asymmetry of omega-potential which is peculiar to an ordinary state of consciousness [29].

An increase of the balance between the values of Xy-potential BAP which concern the meridian subsystems and received the classic Chinese names "inj" and "jan" of subsystem in acupuncture diagnostics appears to be the third parameter which undergoes reliable changes in the conditions of ASC. In this connection and taking into account the well-known in reflexology the authenticity of meridian subsystems "inj" and "jan" to ergo- and trophotropic subsystems of somato-vegetative regulation [16] we have every reason to assume that under the conditions of ASC there observe *essential alterations of organism bioenergetic homeostasis associated with the optimization of the processes of somato-vegetative regulation.*

It is important to note that the indicated changes have a stable and long-term character; they remain not less than 5-6 hours after the seance of mental relaxation. At the same time, as it was shown before there observe the fall of the level of stress-hormones (cortisol, free fat acids) in blood while the level of opiate neuro-peptides ( $\beta$ -endorphin) and the threshold of pain sensation increase [2].

If we try to describe the revealed and stated above systemic-structural reconstructions at the level of centre nervous system and somato-vegetative regulation from the positions of "power paradigm", we could interpret them as the processes of "accumulation" and "merging" of energy, and as a whole – "the creation of power body" [8, 10].

Indeed, at present there appear more and more direct objective data proving the influence of some alterations of the state of consciousness on bioenergetic processes [1, 6, 13, 14 and others]. In particular, our investigations have shown that regardless the used method of the registration of energyemission processes under the conditions of mental relaxation their intensification is observed. However, we revealed stable statistically reliable changes of aura only at the level of the fourth fingers at the stage of active imagination, that's the mental work in ASC-2. In this case it deals with the concentration of a subject of the images of "inner vision" or the ideo-motor reproduction of psychomotor habits in ASC-1.

The exposure of energyemission processes phisical selective intensification naturally demanded the intensification of the analysis, and first of all for the purpose of defining more precisely the topography of the changes of energyinformative processes within the limits of aura patterns. The solution of this problem became possible only owing to unique abilities of the automated complex of gas-discharge visualization (GDV) worked out by professor K.Korotkov [12, 14].

Using the analytical possibilities of GDV method there revealed that the phenomenon of Psycho-Energetic Phasing Activation (PEPA) is concentrated in the sectors of the aura of the fourth fingers which according to the topographic maps of P.Mandel [18] and K.Korotkov [12] correspond to the projections of organism neuro-endocrine centres. In this case there found out that in these conditions the aura acquires either the nature of "crown" within the limits of sectors 1, 2, 6, 7 or some fragments of concentrated emission distantly isolated from the aura are formed. We did not succeed in finding such changes of the aura in an ordinary state of consciousness (D-mode).

So, the phenomenon of PEPA has a phisical nature and it is clearly associated with the period of mental work in ASC. In this case taking into consideration the character of aura changes we have every reason to suppose that in these conditions the physical nature of registered emission also changes; it acquires some qualities of "quasicoherece" [15].

No doubt that the revealed effect of mental (informative) activation of energyemission processes in ASC demands a very thorough studying. However, it is quite obvious that in the course of ASC development two qualitatively different phenomena are probably observed: firstly, these are some alterations of systemic and intersystemic bioenergetic homeostasis at the level of the higher sections of brain and links of somato-vegetative regulation which have a tonic character and secondly, the processes of a proper mental phisical activation of energyemission processes.

The fact that the phenomenon of PEPA is revealed in topographic zones correlated with the centres of neuro-endocrine regulation allows us to examine the hypothesis concerning their ties with the activation of bioenergetical centres ("chakras") and the activation of the processes of energyinformative exchange between a physical body and thinmaterial world in ASC [7, 8, 20 and others]. To a certain extent these hypothetical considerations are confirmed by subjects' self-accounts; the subjects experience the feeling of "broadening of psychical space" and "flight of thoughts-images" in ASC, and their psychoemotional state is compared with a trans ("collagenic") state [26].

In conclusion of the statement of experimental material we would like to emphasize the fact that on the border of XX–XXI centuries it becomes more and more obvious that the knowledge of the psychophysical

mechanisms of consciousness and alternative state of consciousness in particular is impossible out of the synthesis of knowledge and methodologies of "substrate" and "energetic" approaches which till now have in many respects separated the scientific schools of the West and the East.

## Conclusion

Naturally enough that the investigations carried out should be examined as the first attempt to use the complimentary possibilities of modern methods of bioelectrography for the experimental study of human alternative state psychophysical mechanisms.

On the whole, the revealed correlates and phenomena enable us to conclude that at the alternative state of consciousness which is formed under the conditions of mental relaxation there occurs *a changing of the programs of both psychosomatic and psychoenergetic self-regulation*. In this case two phenomena should probably attract a special attention: firstly, the age reduction and the harmonization of brain biopotential field revealed under the conditions of mental relaxation and secondly, the phenomenon of phasical psychoenergetic activation which is directly associated with mental activity at the alternative state of consciousness. The bond of these phenomena with various "carrier of consciousness" may be theoretically grounded. However, from our point of view the interpretation of the mechanisms of their interactions or to be more precise interassistance in ensuring the energyinformative processes at alternative state of consciousness demand a profound experimental study.

At the same time the investigations carried out give every reason to think that it is the methodology of complex bioelectrography uniting the analytical possibilities of modern neurophysiology, psychophysiology and psychophysics that is able to extent the access to the cognition of the mechanisms of consciousness.

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## PSYCHO-DYNAMIC AND BIO-ENERGETIC EFFECTS OF INTEGRATED MENTAL TRAINING



*Bundzen P. , Korotkov K., Uneståhl L.-E.*

Bio-energetic paradigm in West-European psychosomatic medicine was figured in the mid-1930s based on works by Freud and Jung. Further, this concept was expressed directly in W.Reich's and A.Lowen's researches. A.Lowen considered the idea of individual internal harmony and beauty, mind and body reuniting the main purpose of "bio-energetic therapy" [8, p.20].

This very approach serves as a basis for both psychotherapeutic and creative mental training modifications development. In the latest decade these modifications have achieved worldwide use and note, specially in Europe, USA, Canada and Russia [12, 14, 16–18]. A series of surveys conducted within "Mental Training for Sport and Life" Russian-Swedish R&D project, limiting that the stress-eliminating effect of Swedish model of systematic mental training is in inextricable connection with both the raise of functional potential of a person and bio-energetic homeostasis reconstruction.

According to the results obtained the further purposive research into the integrated mental training psycho-energetic influence was launched. A complex psychophysical approach was applied with the involvement of latest bio-electrographic developments and technologies.

### Research methods

**1. Mental Training Audio-Programmes Complex.** These programmes fall into two main groups. The first group performs basic course syllabuses for muscular and mental relaxation. The second group of programmes has a creative and sanative set: "Anti-stress", "Mental Power", "Problem-solving", "Beauty and Harmony".

The entire course lasts seven weeks at five sessions for a week. Russian training version bottom programs were quite authentic to the programmes developed by Scandinavian International University [18]. The basic course lasts three weeks; each creative or healing program mentioned above takes one week. "Active Imagining" test conducted under so-called "mental room" conditions (when has a place of selfinduction "Alternative State of Consciousness" (here is after named "ASC"))).

**2. Bilateral Digital Registration of Quasi-Constant Potential** (Russian patent № 20113775, 1994), or of Omega-Potential (OP). OP registration at the current study was aimed at controlling the process of "penetration" into ASC. To conduct OP registration, bipolar leads were used: the middling-frontal electrode position – and right and left hands. OP bilateral asymmetry disappearing (with values reducing up to  $20 \pm 5$  mV) was considered to be the differential and diagnostic symptom of a complete penetration of a participator into ASC.

**3. "Profile of Mood States" (POMS)** – a diagnostic test on psycho-emotional state and psycho-energetic potential [11]. Russian adapted and verified version of POMS developed by P. Bundzen & N. Schlyter, 1995 was applied in research. The calculation of parameter characterizing the relative scale of psycho-energetic readiness was the only POMS modification factor. The psycho-energetic readiness parameter (hereinafter PERP) is determined by a formula:

$$PEPP = \frac{V}{\sum (A_n + D + A + F + C)},$$

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where:  $A_n$  – Anxiety, D – Depression, A – Aggression, F – Fatigue, C – confusion, V – Vigour – standard scales of POMS.

The test was run prior to the beginning of mental training program, as a result of the basic course (as mentioned above), and promptly after the whole program accomplishment.

**4. "Stress Profile" Test** developed by "Stress Management Centre" (Karlstad, Sweden). This test consists of 224 questions, purposed to estimate the obtained data by 8 parameters: 1 – work-place situation; 2 – home situation; 3 – vital well-being; 4 – difficulties and troubles; 5 – life events and chop & changes; 6 – life style; 7 – mental state; 8 – health.

"Stress profile" test was conducted before the beginning of the mental course and within three days after its accomplishment.

**5. Acupoints (hereinafter AP) Conductivity Level and Meridian AP Concentrated-Kinetic Potential ( $\xi$ -potential) Registration.** The AP conductivity level is registered via special "Nakatani" system developed by

"Electronic Medical Systems" corporation, Saint-Petersburg. The meridian AP  $\xi$ -potential was measured by the automated "Zodiak" system (Russian patent № 2106799, 1998).  $\xi$ -potential and AP conductivity registrations were conducted before and after the carrying out of the mental training course. A series of check researches were superinduced for  $\xi$ -potential discrete registration while mental relaxation and ASC developing. The following parameters were used for the results estimation:

General functional index B is:

$$B = \frac{n_{normal}}{n}$$

where n – the number of measured acupoints,  $n_{normal}$  is a number of them inside the normal physiology range ( $80 \pm 10$  mkA).

Balance of left and right is  $B_{LR}$ :

$$B_{LR} = \frac{\sum X(i_R) - \sum X(i_L)}{\sum X(i_R) + \sum X(i_L)} \times 100\%$$

where  $i_R$  and  $i_L$  are currents measured on the right and left side of the body correspondingly.

Good value for balance coefficients is 0% within  $\pm 5\%$ .

Balance of Yin and Yang is  $B_{YI}$ :

$$B_{YI} = \frac{\sum X(i_Y) - \sum X(i_I)}{\sum X(i_Y) + \sum X(i_I)} \times 100\%$$

where  $i_Y$  and  $i_I$  are currents measured on the Yang and Yin acupoints correspondingly.

Good value for balance coefficients is 0% within  $\pm 5\%$ .

**6. *Ergo-emission Intensity Patterns Registration (Kirlian effect)*** by Photomethod and Computerised "Digel" System. High-voltage generator parameters were as following: impulse width – 0.5 sec, impulse rate – 100 Hz, electrode voltage – 15 kV. System photosensitivity in 215–650 nm range no less than 97 mkA/ml. Ergo-emission intensity registration was carried out by inertia-free "Sigma" registrar and by videotape recording.

**7. *Program-hardwired "GDV-Camera" Complex***, using GDV Technique developed by K.Korotkov ("Kirlionics Technologies International" company, 1995). The principle of this technique is the registration of Biological Emission and Optical Radiation of biological subject stimulated by Electromagnetic Field amplified by Gaseous Discharge with Visualisation by Computer processing. In short, the technique named as BEO GDV Technique and images after processing are named as BEO-grams [7]. Two-years experience in using GDV Technique demonstrated its exclusive practical importance in different fields of study: express-diagnosis of a person's health and psycho-emotional state, the influence of different drugs, medicine and meditation [13]. More than 200 specialists all over the world benefit by using this technique now.

All research techniques were approved on wide-range of tests [3, 7]. This research aimed at all these techniques integrated usage for finding out correlative connections between the studied parameters and psycho-physical principles of systematic mental training.

19 formally healthy students at ages 18–21, both genders (random access) took part in the research. 15 students of 19 succeeded in ASC self-inducting during the seven-week mental training course. These 15 persons' findings were taken for statistic processing with correlative and factorial analyses. Typical OP changes in the course of mental relaxation (as mentioned above) considered to be an objective criterion of mental training success, as well as self-reports, whose verbal structures were by linguistic test [15] estimated.

## **Research results and discussion**

### ***Individual Psycho-Emotional Status and Psycho-Energetic Potential Changes under Systematic Mental Training Influence***

Researches into psycho-emotional status (hereinafter PES) and psycho-energetic potential were conducted three times during the mental training course: before the beginning of the program, after the basic course accomplishment (three weeks), and upon the whole course completion (seven weeks).

According to the POMS scales data provided, mental training basic course, mainly, has an influence upon PES modifications with T, D & F factors reliable reducing ( $p < 0.05$ ). This effect is verified by the results of numerous researches into both original Sweden and Russian mental training versions influence on PES. These researches were based on a wide range of testees involved: school- and high school students, higher education students, middle-aged people, shaping- and fitness clubs members, athletes [3].

It is important to point out that similar POMS factors variations are accompanied by reliable stress-hormones (cortisole, dehydroepiandro-steron) level modifications and immunity improvement [2, 4].

At the same time it was noted that statistically reliable "Vigour" factor modifications emerge only under the entire programme complex (including both basic and creative mental training courses) application. At that POMS profile is getting close to well-known "ice-berg" model at "Vigour" parameter as a dominant and the PERP parameter is ever changing ( $p < 0.001$ ) in statistically reliable manner.

Testees' self-reports confirm the discovered POMS modifications completely by emphasising such qualities as "Cheerful", "Alert", and "Vigorous" development.

According to POMS modifications, we can also conclude that the mental training course results in the individual statistically reliable stress-tolerance development. Moreover, not only stress-tolerance scales, but also psychosocial adaptation values are under (positive) changing.

Basing upon the data obtained and analysed it is possible to sum up that the systematic mental training course has integrated psycho-dynamic effect including testees' stress-tolerance increase, psychosocial adaptation rise and a strongly pronounced psycho-energetic effect.

### ***Complex Bioelectrographic Analysis of Mental Training Psycho-Energetic Effect***

In the search for psycho-energetic status modifications bioelectrographic correlate, state-of-the-art technologies were applied. By methodology, these technologies take their intermediate stand between "substratum" and "energetic" approaches of present-day psychosomatic medicine [5]. These technologies application is well-founded in terms of fundamental and applied psychophysiology and psychophysics [1, 6, 7].

The data, gathered by standard and well-known in reflexology Nakatani method, are represented at Table 3-1. The results estimate proves that two main system (meridian) processes accompany mentioned above individual PES and PERP modifications. First, some polisystem effect concerning the conductivity normalisation and stabilisation of all the 12 main AP meridians emerges in the course of training. Table 1 illustrates this very effect showed both in AP current characteristics and general functional index. The second process contains an intersystem effect expressed in balance increase between AP current values which relate to meridian subsystems adopted in acupuncture diagnostic as "Yin" and "Yang". Taking into account the well-known in reflexology fact that "Yin" and "Yang" meridian subsystems directly correspond to ergo- and trophotropic subsystems [9], it is possible to assume that the mental training basic course leads to somato-vegetative regulation optimisation. It is confirmed, in particularly, by the study of extra- and intracardial regulation modifications under the influence of mental training with up-to-date cardiology technique [1].

Table 3-1

Alteration of the functional state of meridian biologically active points (BAP) under the influence of mental training during seven weeks (data from "Riodoraku" profile)

Indices	Prior to mental training	After mental training
Average value of BAP current, mkA	79,2±8,1	95,4±6,6**
General functional index – B	0,3±0,19	0,8±0,07*
Balance of left- and right-side BAP	+7,7%	-1,4%
Balance of BAP concerning meridian subsystem "Yin" and "Yang"	+6,8%	-2,9%
The reliability of indices changes is from $p < 0,01$ ** till $p < 0,05$ *		

The obtained with automated "Zodiak" system data aimed at meridian AP concentrated-kinetic  $\xi$ -potential determination verified entirely classical reflexodiagnostic measurements. These researches revealed that the integrated mental training course resulted in high-reliable ( $p < 0.001$ ) bilateral balance index of all the main 12 paired meridians. Thus, the discovered AP functional state modifications can be defined as a personal bio-energetic homeostasis harmonisation under mental training influence.

The energy-emission processes rate measured by "Digel" system is ever increasing in 215—650 nm range up to statistically reliable upper limits at 7<sup>th</sup> course week. The energy-emission intensity reinforcement corresponds to PERP dynamics defined by POMS parameters (see above).

The data obtained upon seven weeks course completion were analyzed by correlative and factorial analyses (Table 3-2). It testifies that nearly all the parameters correlating with psycho-energetic status (POMS – Vigour and PERP scales; Current AP;  $\xi$ -potential; Energy-Emission) are in statistically reliable interconnection and belong to factor 1. Therefore, factor 1 could be adopted as a psycho-energetic potential factor.

Factor 2 might be taken as a psycho-energetic asymmetry parameter, thus factor 3 registers individual psychosomatic self-regulation peculiarities.

Factor 1 also includes the parameter determining the energy-emission level by a functional load that specifically means here an active imagining process (ASC formation period) under the "mental room" conditions [18].

A series of specialised complex researches based on different energy-emission analysis techniques (photomethod; "Digel" system; computerised "GDV" complex) discovered the energy-emission phasing activation under functional load (active imagining) conditions. From our viewpoint, it is appropriate to define this process according to its functional load specificity (attention focusing; memory activation; imagining), as Psycho-Energetic Phasing Activation (hereinafter PEPA) phenomenon.

Some PEPA functional peculiarities by now:

1. Only the entire integrated mental training course including both basic and creative programs stimulates individual PEPA rise.
2. PEPA arises under specific mental functioning (active imagining) conditions, when an experiment participator "penetrates" into ASC while mental relaxation.
3. PEPA discovers mainly within the fourth finger (in 80% cases), and at topographic zones corresponding, in accordance with Mandel – Korotkov [6, 10], to neuro-endocrine regulation centers specifically.
4. Two types of PEPA patterns are to be emphasized: either reinforcement of the energy-emission intensity within mentioned above topographic zones or detached concentrated fragments of emission.
5. There is a couple of PEPA generation necessary conditions: firstly, bilateral quasi-constant potential balance (see above) adopted as a differential-diagnostic sign of ASC formation [3]; secondly, highest possible individual values of current emission characteristics.

Thus, in contrast to AP functional state modifications, PEPA is phasing nature phenomenon connected directly with ASC mental functioning period. Taking into account energy-emission patterns modifications, it is reasonable to presume that the physical nature of registered emanations is also under some certain changes getting "quasi-coherence" characteristics [7].

## Factor analysis

Items	Factors		
	1	2	3
POMS-ANXIETY	-0,53	-	+0,59
POMS-DEPRESSION	-0,69	-	+0,53
POMS-ANGER	-0,58	-	+0,61
<b>POMS-VIGOR</b>	+0,80	-0,55	-
POMS-FATIGUE	-0,61	-	-
POMS-CONFUSION	-	-0,57	-
<b>POMS-PSER</b>	+0,87	-	-0,55
<b>CURRENT BAR</b>	+0,71	-	-
DISBALANCE L/R BAP	-	+0,68	-
DISBALANCE YIN/YANG BAP	-	-	+0,71
<b>KSI-POTENTIAL</b>	+0,67	-0,53	-
LEVEL q.DC POTENTIAL	+0,63	-	-
ASYMMETRY q.DC POTENTIAL	-0,66	+0,57	-
ENERGY EMIS. INT. L1	-	+0,61	-
ENERGY EMIS. INT. L2	-	-	-
ENERGY EMIS. INT. L3	-	+0,55	-
<b>ENERGY EMIS. INT. L4</b>	+0,68	-	-
<b>ENERGY EMIS. INT. L5</b>	+0,54	-	-
ENERGY EMIS. INT. R1	-	+0,59	-
ENERGY EMIS. INT. R2	-	-	-
ENERGY EMIS. INT. L3	-	+0,67	-
<b>ENERGY EMIS. INT. L4</b>	+0,77	-	-
ENERGY EMIS. INT. L5	-	+0,53	-
ENERGY EMIS. INT. IN MENTAL ROOM R4	-	-	-
<b>ENERGY EMIS. INT. IN MENTAL ROOM L4</b>	+0,84	-	-
Percentage of variance	0,41	0,14	0,10
n = 15, p < 0,05-0,01			

On the basis of the data obtained, it should be concluded that along with exposed psycho-dynamic modifications, the functional state reconstruction of individual bio-energetic system segments, as well as the essential energy-emission physical nature modification take place as a result of mental training influence.

### Conclusion

To summarize research results and progress, sound to infer that psychodynamic modifications under mental training influence are of complex energy-informative nature whose interpretation might be of vital importance for the cognition of both mental training psycho-physical mechanisms and proper "bio-energetic therapy" fundamentals of psychosomatic medicine.

The energy-emission phasing reinforcement effect by mental functioning in ASC first discovered in the researches requires the further detailed elaboration. The experimental data, however, confirm that this phenomenon testifies psycho-energetic self-regulation programs transitions while consciousness state transformations. It may be practically applied as a mental training efficiency criterion.

The experimental findings point the urgency of ASC principles virtual study and application; they also stress the very importance of fundamentals and methodology synthesis of "substratum" and "energetic" approaches, present stumbling-stone of the West and the East scientific paradigms.

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## INFLUENCE OF MENTAL TRAINING ON THE ORGANISM'S BASIC STRESS TARGETS



*Bundzen P. , Gavrilova E., Isakov V.\**

One particular aim of integrated mental training which has been actively developed over the last few years [9, 23, (Uneståhl L.-E. et al., 1993; Bundzen P., 1995)] is the matter of increasing stress tolerance as a basic mechanism of psychosomatic health.

It has been established that stress can promote the development of pathology in any organ or system, especially in the case of genetically predisposed diseases. However, the majority of authors maintain that irrespective of the kind of stress, the central nervous system as well as the cardio-vascular and immune systems are basic stress targets in the human organism [2, 4, 7, 8, 10, 12, 15].

An analysis of the information available via literature requires us, at the same time, to assert that to date, the psycho-physiological and neuro-biochemical mechanisms involved in correcting pathological reactions induced by systemic stress are not sufficiently known [1, 12]. The latter can, however, be regarded as a health promoting effect of mental relaxation (MR) which makes up the psychological base for Integrated Mental Training.

The above provides the grounds for studying the mechanisms of the stress limiting effect of MR, a major component of mental training.

The investigation included:

1. Analysis of the singular as well as the systematic influence of MR on the organism's basic stress targets.
2. Study of the neuro-biochemical and immunological mechanisms of MR's stress limiting and health promoting effects.
3. Comparison of MR's ability to provide a stress limiting influence under conditions of a) acute (experimental) stress and b) chronic (vital) stress.

### Materials and Methods

The 90 students taking part in this study, were 18–22 years of age and attended The Military Institute of Physical Culture and other institutions of higher education in St. Petersburg.

Programs used by the subjects were the Russian version of the Swedish mental training model as well as the experimental program, "Induction of an Alternative State of Consciousness" [3] which has been certificated by the Sports Federation of Russia.

Two series of experiments were carried out in order to pursue the aims of this study. In the first series, the effects of one single application of the MR program were studied, where the subjects from the basic group (BG) listened to the program from a reclining position, using earphones. The effect of this was studied by using the POMS test [13], which provides an evaluation of psycho-emotional status, the Luscher test and the Spielberger-Khanin Scale of Reactive Anxiety as well as by registering the changes observed in the differences of quasi DC potential.

The dynamic state of the cardio-vascular system (CVS) in the acute series was studied by measuring pulse rate, arterial pressure, and ECG dynamics in 12 standard nodes.

In addition, the first series of experiments included the Cold-Ischemic Test (CIT) [11] which provided an acute stress situation. This included submerging the hand into icy cold water while at the same time applying a tourniquet to the humeral artery until the pulse disappeared. That moment established the time point for the appearance of pain sensations (TAPS).

The biochemical study included determining cortisol levels in the subjects' blood serum (B) via the radio-immunological method as well as determining the level of fat-free acids (FFA) in the subjects' blood serum via the photo-calometrical method.

The control group (CG, n = 10) listened to the calming background music of the MR program. Otherwise, the conditions carried out in the investigations were in every way analogous to those already described.

In the second series, the BG participants (military students, n = 28) engaged in daily mental training for a total of 6 weeks – 4 for the basic course and 2 for either the 'cheerfulness' or 'activity' program. The last two weeks of the course coincided with end-of-the-term exams. The CG (n = 20) took part in the school curriculum as usual. During the study, the influence of mental training on psycho-emotional status was determined via the Luscher Test and the POMS Test. Immunological status in the sub-groups of those often suffering from illness was tested by determining the level of immunoglobulins A, G and M in the blood serum via Manchinin's method (1965) and also by determining the state of cellular immunity via the Mendes method (1973). As the result of

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\* См. также: J. of Pathophysiology. – 1998. – Vol.5. – P.148.

discussions on the immunological status data, some methodological recommendations from the Pasteur Institute of Immunology and Microbiology in St. Petersburg were taken into consideration.

Concomitantly, some measurements of beta-endorphin (BEN) levels in the subjects' blood serum were taken by means of the radio-immunological method, and ECG alterations were registered in 12 standard nodes.

The resulting data was processed using non-parametrical statistical methods i.e. criterion of signs, the exact Fischer method and the Student t-criterion.

## **Results and Discussion**

### ***1. Estimation of MR Influence on the State of the Nervous System***

While listening to the audio-program, 30 of 32 students showed the similar omega-potential activity. At the left-sided standard node, there was a smooth reduction of omega-potential from diapason 27–32 mB to diapason 15–20 mB ( $p < 0.005$ ), accompanied by a return to initial values after the program's conclusion ( $p < 0.005$ ).

The similar activity was also observed at the right-sided standard node ( $p < 0.01$ ). However, if the initial potential was higher at the left-sided standard node, it was also higher on the left while listening ( $p < 0.05$ ). No changes of omega-potential activity were observed in the CG.

Given one single induction of MR in the BG, a considerable reduction was observed at the levels of anxiety ( $p < 0.01$ ), depression ( $p < 0.01$ ) and fatigue ( $p < 0.01$ ). Strength for psychic processes increased ( $p < 0.01$ ) and the total index showing psycho-emotional status was improved ( $p < 0.01$ ). These data concurred with the reduction of anxiety levels revealed by using the Spielberger-Khanin Scale ( $p < 0.05$ ). There was also some improvement of psychological indices observed in the CG, but in most cases these lacked reliability. By comparison, the effect in the BG ( $p < 0.05$ ) is more significant than in the CG. During the systematic use of mental training lessons, the POMS test shows the results that are on the whole, analogous, although somewhat less noticeable, while a tendency toward increasing anxiety and fatigue was observed in the CG.

The AT-norm, tested by the Luscher Test, showed no reliable changes after one MR induction. However, during the 6 week course a considerable decrease of this index ( $p < 0.05$ ) was noted, whilst in the CG, there were no changes.

Carrying out the CIT under the influence of MR, the participants showed a reliable increase of TAPS. 28 cases out of 30 showed increases – in 16 cases an increase of more than 50% over the initial state and in 4 cases no pain sensation occurred up until the end of the program. In the CG a reduction was observed in 6 cases and in 4 cases there was an increase of TAPS (not more than 10% above the initial state). The reliability of differences between the groups is  $p < 0.001$ .

These findings indicate a functional reconstruction in the activity of the central nervous system in the persons engaged in MR. The reduction of pain sensations and the improvement of mood can be associated with increases in the activity of the cerebral opioid system. This is corroborated by the data produced by Turner and Tomas [21] who observed the disappearance of the sense of joy in persons practising the relaxation after receiving Narloxon.

### ***2. Dynamics of Biochemical Indices Under the Influence of MR***

At the commencement of MR in the experimental group, there was a 15–20% reduction (compared with initial levels) at the levels of cortisol and dehydroepiandrosterone ( $p < 0.005$ ) and FFA ( $p < 0.01$ ) while the changes observed in the control group were not reliable.

After six weeks of MR, an increase of BEN levels could be ascertained where the greatest increase (twice the initial value) was observed in the subgroup involved with the 'cheerfulness' program ( $p < 0.01$ ). Changes in BEN levels were not observed in the CG.

Cortisol and adrenalin (ascertained via FFA content) are basic hormones playing the leading role in the development of stress reactions [17]. At the same time BEN, as a part of the stress limiting system, restricts the excess development in this area [Blalock G., Smith E., 1985; Sevy H., 1989; 24; Burkina I. et al, 1995 –20 ) and prohibits damage from catecholamines and corticosteroids. In the opinion of some authors [6, 16] the release of endogenic opioid peptides from the cells of the hypophysis provide the fundamental means by which the nervous system exerts its influence on the organism's stress targets. The findings concerning the reduction of the level of cortisol in the FFA as well as the findings concerning the increase of BEN levels demonstrate the stress limiting effect of MR. These findings enable us to define more exactly the biochemical mechanisms behind MR's ability to affect the immune and cardio-vascular systems.

### ***3. Evaluating the Influence of MR on the CVS State***

In the acute test of the BG and CG, a reliably reduced pulse rate was observed ( $p < 0.05$ ). However, in the BG, systolic arterial pressure also decreased in a parallel way ( $p < 0.05$ ). In a few cases in the BG the

disappearance of the rhythm migration leader was noted along with some improvement of the repolarization process of ventricles and of conductivity in the right pedicle.

During 4 weeks of basic mental training a military student who suffered from myocardial dystrophy showed a considerable improvement of health in the absence of other medical measures and the ECG reading was also improved showing mainly a positive activity with smoothed-out and negative T waves.

The indicated alterations in pulse rate, arterial pressure and ECG readings may be considered to be an index of the reduction of sympathetic influences on the cardio-vascular system and of the level of catecholamines in the peripheral blood supply which is confirmed by the resultant data of the biochemical study. The hormonal alterations described promote a decreasing flow of calcium to the cardiomyocytes (resulting in a reduction of the pacemaker activity of the sinus node) and to some other centers of the autonomic nervous system, as well as an improved conductivity in the myocardium and normalized metabolism [7, 14].

#### **4. Influence of MR on the State of the Organism's Immune System**

In both the BG and CG, 5 subjects stood out as those who often fell ill. From the beginning both groups showed strained cellular immunity (T-cells) combined with reduced IGgM in the blood serum. With mental training the BG participants showed a reliable IGgM increase ( $p < 0.05$ ) and a tendency toward increasing IGgA and IGgG levels, as well as a tendency toward normalization of cellular immunity. The CG indicated changes with an opposite trend, namely a tendency toward humoral depression and an increasingly strained cellular immunity system.

In this case the data provided by clinical observations were of great interest. 3 CG subjects out of 5 suffered from the following diseases during the course of the experiment: acute laryngotracheitis, acute right-sided bronchial pneumonia and pyoderma. However, among the subjects practicing MR only one suffered from an acute respiratory-viral infection during the first week of the study.

The assumed immunomodulating effect of MR is probably conditioned by the activation of the immunocompetent cells' opioid receptors, which prevent, on the one hand, the premature influencing of corticosteroids and catecholamines during conditions of physiological stress and regulates, on the other hand, the stimulation of the entire immune system.

These findings enable us to draw the following conclusions:

1. A single and systematic application of MR to the human organism is co-directed: MR leads to expressed alterations in the status of the neuro-endocrinal system, which leads to alterations in the functioning of the cardiovascular and immune systems.

2. With respect to the fore-mentioned data regarding neuro-biochemical alterations, one may suppose that a tonal decrease in the sympathetic nervous system provides the base for the stress limiting and health promoting effects of mental training. This is affected via the simultaneous activation of the endogenous opioid peptides.

3. Under the influence of the mental training had showed a reliable increase of the activity of "antinoceptive" (pain blocking) system of organism.

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## PSYCHOIMMUNOMODULATION IN THE COURSE OF MENTAL TRAINING

*Kostireva T.A., Kozhevnikov V.A.\**

Numerous studies have shown that a prolonged and intense physical effort in sports can alter the organism's immunological reactivity and stimulate the development of the immuno-deficient state (IDS). This leads to a reduction in the effectiveness of training process and increases the susceptibility to illness and disease in athletes [4, 10, 12].

Connected to the fact that today there are insufficient studies of the methods and mechanisms for IDS correction in athletes is a very important aspect of determining the possibilities for using some methods of psychoimmunomodulation to normalize the immunological state. These methods would be used directly during the training process.

The basis for such a study was provided by reassuring data obtained during the past few years regarding the increase of cellular immunity in healthy subjects who used the method of integrated psycho-training [3, 15].

The above provided the direction for this research project where the effect of modified mental training of the immunity system of skilled athletes is the focus. The modification consists of a heterosuggestive suggestion with a background of psychomuscular relaxation (HSPMR). The athletes were in training for important competitions.

### Materials and Methods of the Study

The study involved 25 athletes who were accomplished wrestlers involved in the training preparations for important competitions. They ranged in age from 17–19 years. Two groups were formed – one, an experimental group (12 persons), and the other, a group for the comparison (13 persons). At the same time, a control group of practically healthy men (17 persons) covering the same age range was examined. They were not athletes and did not undergo any physical efforts during the study.

The experimental group underwent HSPMR, as well as dwelling upon positive emotions whilst experiencing the alternative state of consciousness (ASC). They were to visualize the performing of a specific sports activity with due regard to the specific character of the method of mental relaxation [13]. HSPMR consisted of ten sequences per day, each of them lasting for one hour. During the relaxation sequences the omega-potential was measured on a selective basis in order to gauge the athletes' state of consciousness objectively. A microprocessor and a variant of the "Omega-sport-testers" were used with an omega-potential quantization of 5s in the recording [8].

In the second group (the control group) where the similar training conditions existed, HSPMR sessions were not conducted. Each of the subjects including the inactive persons who made up the control group underwent two examinations of the immune system – once at the onset of HSPMR and once at the end, with an interval of 15 days.

The immune system check-up involved examining the contents of leucocytes, lymphocytes, T-lymphocytes and their status in reference to their basic sub-populations using the methods of V.Kozhevnikov and L.Sakhno [6]. The levels sustained by circulating immune complexes (CIC) were established by means of the method devised by Y.Grinevitch and L.Kamenets [5]. The immunoregulator index (IRI) was calculated as the ratio of T-helpers to T-suppressors. The index of thymus function (ITF) was measured according to the methods of V.Kozhevnikov and co-authors [7]. The measurement of the concentration of immunoglobulin (A, M, G) was carried out by using the method of radial immunodiffusion [9].

### Results of the Study

The analysis of the omega-potential dynamic during HSPMR revealed the following general regularities: *firstly*, in state of mental relaxation and the formation of ASC, a reduction of the level of omega-potential to the values  $15.0 \pm 4.5$  was noted;

*secondly*, during the phase of mental relaxation a sharply defined stabilization of omega values was noted along with the cessation of super-slow fluctuations which are peculiar to the background and consequence of the usual states of consciousness.

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\* См. русскую версию: Костырева Т.А., Кожевников В.А. Иммуномодуляционный эффект ментального тренинга: В кн. "Современные проблемы физической культуры и спорта". – СПб., 1998. – С.87-91.

The results of statistical analysis showed that both the level and stability of omega-potential in ASC differed reliably from the values indicated in the usual state of consciousness ( $p < 0.01$ ). Some typical alterations in omega-potential given the conditions provided by the middle HSPMR sequences are shown.

The analysis of the immunogram parameters showed that during the preparational training for important competitions, each of the examined athletes suffered from a cellular humoral immuno-deficiency. This was apparent due to the reduction in numbers of the general, complex T-lymphocytes and T-helpers; increase in the number of immature forms of T-cell; drop in the immunoregulator index and the index reduction of thymus activity (Table 4-1).

The decrease in concentration of immunoglobulins of class "G" and "A" and the reduced values of the circulating immune complexes (relative to the control group) define the development of IDS in athletes, categorized by humoral type (Table 4-2).

The immunological testing carried out after HSPMR sequences was completed by the athletes of the experimental group; it revealed the normalization of peripheral blood leucocytes and lymphocytes. The indices of cellular immunity changed as follows: The number of general-, complex- and helper-lymphocytes increased considerably; at the same time the number of immature forms of T-cells decreased. The number of T-suppressor did not show significant differences from the background values, but in this case the correlation between T-helpers and T-suppressors became normal through an increase in IRI (Table 4-1). The indices of humoral immunity in the experimental group were characterized by an increase in the concentration of all classes of immunoglobulins and at the same time by an increase of the concentration of circulating immune complexes (Table 4-2).

In the control group of athletes where HSPMR did not take place during training, a more significant oppression of cellular humoral immunity was noted. The reduction of IRI and functional oppression of the thymus were especially unfavourable regarding the IDS development and manifestation. The indices for humoral immunity were characterized by the reduction in levels of G-class immunoglobulins and the tendency to reduce A-class immunoglobulins, however in this case the level of M-class immunoglobulins increased reliably relative to the initial value ( $p < 0.01$ ). The level of circulating immune complexes decreased considerably relative to the control and initial value in the group of athletes.

In the control group of inactive men any reliable differences in the indices of immunity during the same period were not indicated.

Table 4-1

Modification of the cellular immunity under in influence of HSPMR

Indexes	Control group, n = 17	Groups of athletes		
		Whole group before HSPMR, n = 25	Experimental group after HSPMR, n = 12	Group for comparison, n = 13
	A	B	C	D
Leucocytes, ABS·10 <sup>9</sup> /l	6.14±0.09	5.86±0.12	7.51±0.16 <sup>a</sup>	5.72±0.14
Lymphocytes, ABS·10 <sup>9</sup> /l	2.03±0.04	1.79±0.09 <sup>x</sup>	2.28±0.11 <sup>a</sup>	1.73±0.11
Common T-lymphocytes, c/mkl	1412.0±116.1	1108.4±106.5 <sup>xx</sup>	1542.1±113.2 <sup>a</sup>	1011.6±123.3
T-helpers, c/mkl (T4 cells)	883.4±65.1	607.9±71.3 <sup>xx</sup>	964.3±48.4 <sup>aaa</sup>	600.3±59.6
T-suppressors, c/mkl (T8 cells)	510.3±39.7	449.1±30.9	479.8±21.5	498.2±27.4

Nondifferentiated cells, c/mkl	17.20±1.42	68.00±8.35 <sup>xxx</sup>	21.10±2.03 <sup>aaa</sup>	75.10±9.13
Integrated T-lymphocytes, c/mkl	1475.6±120.4	1324.2±183.1 <sup>x</sup>	1589.7±110.4 <sup>a</sup>	1396.7±152.4
Immunoregulatory index	1.76±0.18	1.34±0.11 <sup>x</sup>	2.01±0.09 <sup>aa</sup>	1.19±0.07 <sup>o</sup>
Timus function index	2.04±0.14	1.37±0.08 <sup>xx</sup>	2.27±0.11 <sup>aa</sup>	1.12±0.17 <sup>o</sup>

Distinction: <sup>x, xx, xxx</sup> – between A and B; <sup>a, aa, aaa</sup> – between B and C;  
<sup>o</sup> – between B and D.  
<sup>x, a, o</sup> – p < 0.05; <sup>xx, aa</sup> – p < 0.01; <sup>xxx, aaa</sup> – p < 0.001.

Table 4-2

## Modification of the humoral immunity under influence of HSPMR

Indexes	Control group, n = 17	Groups of athletes		
		Whole group before HSPMR, n = 25	Experimental group after HSPMR, n = 12	Group for comparison, n = 13
		A	B	C
Concentration of immunoglobulins, mg/ml				
G	12.80±0.18	10.97±1.23 <sup>x</sup>	16.40±2.53 <sup>aaa</sup>	9.71±0.33 <sup>o</sup>
A	1.26±0.14	0.89±0.04 <sup>xx</sup>	1.94±0.06 <sup>aaa</sup>	0.82±0.06
M	1.45±0.11	1.32±0.07	1.49±0.02 <sup>a</sup>	1.56±0.11 <sup>oo</sup>
Level of the immune complexes	55.30±10.70	42.30±6.51 <sup>xx</sup>	62.80±7.50 <sup>aa</sup>	30.70±4.81 <sup>o</sup>

Distinction: <sup>x, xx, xxx</sup> – between A and B; <sup>a, aa, aaa</sup> – between B and C;  
<sup>o</sup> – between B and D.  
<sup>x, a, o</sup> – p < 0.05; <sup>xx, aa</sup> – p < 0.01; <sup>xxx, aaa</sup> – p < 0.001.

**Discussion of the Results**

The findings show that the systematic use of HSPMR enables us to level-out immuno-deficiencies developing in the athletes during the periods of intense training prior to important competitions. In particular, a decrease of non-differentiated forms of lymphocytes, the normalization of IRI (see above) and the restoration of thymus function can be noted.

It is important to point out that if HSPMR is systematically applied, the growth of helper T-lymphocytes (which carry out the most activity in the synthesis of neuroleucines) appears to be most significant [1]. The latter is confirmed by the influence of integrated psychical training on the immune status of healthy subjects [4, 15]. In this case it is very important that in the work given some integrated forms of mental training are used; they include the combination of muscular and psychical relaxation with positive thinking and visualizations. In particular, visualizations were used of the victory of blood cell elements over the viruses. This method of concrete positive imagining was based on the subjects' prior knowledge of the organism's immune protection system.

It is important that the normalizing of athletes' immune status (given HSPMR) which was revealed during this study should occur against a background of expressed alterations of omega-potential during the mental training sequence. In this case it is typical to find no reliable change in the level of background values of omega-potential in the subjects throughout the course of HSPMR. At the same time the following is observed during the HSPMR sequence: firstly, a reduction of omega-potential to  $15.0 \pm 4.5$  during mental training and secondly, an expressed stabilization of its values. Such alterations of omega-potential were discovered previously given the conditions of mental relaxation and the formation (according to experimental research) of the alternative state of consciousness in the subjects [2].

If we compare all of the foregoing data and take into consideration the information accumulated in literature up to the present time [11] we will have every reason to consider that the effect of mental training on the state of the immune system is associated to a considerable extent with the reconstruction of information-controlling mechanisms of the brain. It may be characterized as the formation of the system of control given the conditions provided by mental relaxation [13].

According to the findings, the reconstruction of the activation level of the cortex and parts of its functional asymmetry appear to be neuro-physiological markers showing the beginning phase of the alternative system of control.

At the same time the highly effective influence of the integrated forms of psycho-training on the neuroimmune interaction process is defined from our point of view by a purposeful activation of the mechanisms of brain self-confirmation produced by these conditions – the system of opioid peptides [3]. The leading significant factor in this process is the use of positive imagination (visualization).

To all appearances, the indicated mechanism ensures the expressed psychoimmunomodulating effect occurring given the conditions provided by systematically applied mental training.

## Conclusion

1. While engaging in preparative training for important competitions, the case of immune insufficiency develops in athletes.

2. Systematic mental training stabilizes the parameters of the immune system and levels-out the developing immune deficiency; in this case the T-lymphocyte helpers respond most actively.

3. The effects of the psycho-immunomodulation by mental training, the reconstruction of the information-controlling mechanisms of the brain are of great significance.

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# CORRECTION OF THE FUNCTIONAL STATUS AND RELIABILITY OF YOUNG SPORTSMEN DURING COMPETITION THROUGH THE MENTAL TRAINING

*Balandin V.I.*

The efficiency of sportsmen in competitions depends on the readiness for competitions and their reliability in competitions. One of the major parts of the overall readiness of sportsman is his functional readiness. However even well prepared sportsmen are not always successful in important competition. And the reason for this failure lies in their low competition reliability. Psychic training is known to be one of the important factors of managing psychic state of sportsmen in important competitions for increase their level of competition reliability ("comp.rel.").

Among the various tasks of psych, training the important one is to teach the sportsman how to control his state and behaviour, mobilise at maximum extent the psychic reserves, to adapt himself to the extreme conditions of the competition. During the last decades mental training plays an important role among the various methods of psych, training. Analyses of the foreign literature showed, that the foreign authors use mostly 2 terms: psychic preparation and mental training. The first term belongs to the well-known meaning of this type of training; the second mental training (psychic training, brain training, etc.) covers more narrow sphere, connected to the specific procedures of self influence of sportsmen.

Mental training is viewed as one of the tools of reaching good results in sport and developing a positive attitude towards the competitions, though the essence of the mental training programmes.

There is full range of mental training program: from long-term up to minute-long ones and very specific. Mental training program can be adapted to meet the certain requirements. However it is necessary to note that every mental training program is aiming to focus mental activity on the **easyning** for the sportsman reaching the ideal results.

The most used in Russia is the russian version of the Swedish model of Mental Training, developed in St.Petersburg by the specialists of Research Institute of Physical Culture (Bundzen P.V. et al., 1994).

In order to study the cumulative effect of mental training on the functional state and competition reliability of sportsmen, two series of research experiments have been conducted on the young qualified sportsmen.

## **Object and methods of research**

In the first set of experiments 18 young qualified sportsmen of 15-17 years old were under observation, out of which 6 sportsmen have formed a control group, and 12 track and field athletes and football-players twice a week after the basic training have listened to audio-programs on the basic mental training aimed to develop specific psychic qualities (features). They were lying in a specially equipped room.

The length of the program was from 10 up to 15 minutes. The sportsmen were examined before and after the mental training audiocourse with a complex testing, including the evaluation of psychic processes (memory, attention, thinking, speed of information processing), vegetative supply, personality features (temperament, emotional stability, frustration tolerance, selectivity, etc).

In the second set of experiments, 23 sambo-wrestlers of 17-20 years old were observed during the period from February until May (3 months). They have listened five times per week to audiocourses in 1, 2 and 3 tapes, while lying after the basic training on the wrestling carpet. The length of the program – 10-15 minutes. Sportsmen got through the complex testing before and after the mental training course. The tests included evaluation of vegetative supply of the body, psychomotorics and psychomotor coordination through 2 method of reflexometrics (simple and complex psychomotor reaction, reaction on the moving object and transferral reaction, work in light maximal tempo, tee ping test), of the psychic sphere (memory volume, attention features, thinking, speed of information processing). Personality features, that form the basis of competition reliability of the sportsmen, were evaluated on the following way: extra-introversion, neurotism – according to **Aysenek** Method, frustration – according to the graphical test of Rosenzweig, anxiety – according to Spilberg, temperament – to Below, besides selectivity and leadership tendency were defined. Each factor was evaluated, based on the specially developed 9-point scale (Balandin V.I., 1991), that allowed to define the Integrated evaluation of this or that sphere of functioning. The data was processed statically, using nonparamether methods (Gubler E.V., Genkin A.A., 1966) and range correlation method.

## **Results and comments**

Results of the first set of experiments are presented in Tables 1-4. The changes in vegetative features (attributes) of the sportsmen are presented in Table 1.

As one can see from the Table 1, the first group has shown positive tendencies in the vegetative supply of the sportsmen, also the integral vegetates index got statically substantially better, In the control group, no changes in the vegetative indexes has been noticed.

The dynamics of the psychic processes of the investigated sportsmen is presented in Table 2.

As we can notice from Table 2, the indexes of psychic processes were improved in both groups of examined sportsmen, excluding the volume of operative memory, which has not changed.

Improvement of psychical processes of the sportsmen, using mental training, were more substantial ( $p < 0.01$ ) and could be noticed through all the applied methods. In control groups mentioned changes were at the level of reliability of results, and were noticed mostly on the integral indexes.

Table 1

Changes in vegetative features

Vegetative features	Experimental group		Control group	
	I	II	I	II
Heart beat rate, beats per min	67.0±3.2	67.0±3.5	64.0±5.1	66.0±9.5
Breath holding in breathing out, sec	27.0±1.8	29.0±3.3	24.0±2.5	30.0±5.1
Kerdo index, %	-14.0±4.9	-18.0±6.1	-21.0±10.8	-17.0±11.4
Endurance index of the heart system, units	19.0±1.6	14.0±1.1	13.0±1.7	14.0±2.1
Arterial blood pressure				
maximal	112.0±2.3	118.0±2.8	127.0±6.2	121.0±4.4
minimal	75.0±1.8	72.0±1.8	78.0±3.5	73.0±5.3
pulsive	37.0±2.7	46.0±1.8	49.0±3.5	48.0±3.5
Integral vegetatics index, score	4.5±0.3	5.4±0.3	5.1±0.5	5.3±0.9
Notes: I – Results of the first check up, II – Results of the second check up.				

Table 2

## Changes in the indexes of the psychic processes

Psychic processed and methods of research	Experimental group		Control group	
	I	II	I	II
Attention: distribution numbers, units (ranging)	21.4±0.8	20.1±1.0*	16.5±1.4	17.7±0.9*
Londolt's rings, score	3.5±0.4	5.5±0.4*	3.5±0.6	4.5±0.4*
Addition with and switch (mistakes), score	3.0±0.6	5.9±0.5**	2.1±0.5	4.5±17.1*
Red and black, score	3.3±0.7	5.9±0.5**	17.8±0.8	3.0±1.2*
Integral attention index, score (X <sub>4</sub> )	4.2±0.4	6.0±0.3**	1.9±0.5	4.2±0.7*
Operative memory: addition (orally), score	6.3±0.6	6.5±0.6*	4.2±0.4	4.4±0.9*
test of tasks, score	3.3±0.6	4.3±0.5*	2.5±0.5	3.5±0.5*
integral memory index, score (X <sub>2</sub> )	4.8±0.4	5.4±0.5*	3.3±0.3	3.9±0.4*
Information processing speed: Londolt's rings "A", units	1.29±0.1	1.60±0.1**	1.17±0.1	1.53±0.1*
Addition with 2 switch (productivity), units	77.0±7.8	125.0±6.7**	56.0±13.4	73.0±17.5*
Reserves, N, score	5.8±0.2	6.5±0.5**	5.6±13.4	6.0±0.4*
Integral index (X <sub>3</sub> ), score	4.1±0.3	5.8±0.3**	3.4±0.4	5.0±0.5*
Process of thinking: test of thinking (accumulated result), score	3.5±0.5	4.5±0.5**	3.0±0.4	3.8±0.4*
Addition with a switch, score	3.0±0.6	5.9±0.3**	2.1±0.5	4.5±1.0*
Reserves-II	4.6±0.4	5.5±0.5**	4.2±0.5	4.9±0.8*
Integral index of thinking (X <sub>3</sub> ), score	3.7±0.3	5.4±0.3**	3.1±0.3	4.4±0.6*
Integral index of psychic processes (X <sub>4</sub> ), score	4.2±0.3	5.5±0.2**	3.2±0.3	4.4±0.3*

Notes: I – results of the first check up, II – results of the second check up,  
\* – p < 0.05; \*\* – p < 0.01.

The dynamic of changes in the indexes of stress-tolerancy is presented in Table 3.

Table 3

## Changes in stress-tolerance indexes of sportsmen

Indexes	Experimental group		Control group	
	I	II	I	II
Reactive anxiety, units	40.2±1.8	38.3±2.0	37.5±1.8	39.2±3.2
Personality worrydness, units	44.0±1.4	41.7±1.6	37.7±2.6	40.5±3.9
Neurotism (stability), units	13.0±1.0	11.3±1.0	9.2±2.3	9.3±2.5
Percentage of melancolik features in the temperament, %	14.0±2.5	12.0±3.9	12.0±3.9	10.7±4.8

Emotional stability (on the test of tasks), units	-2.6±1.6	-0.2±1.2	-2.0±1.2	-1.0±1.5
Vegetative Kerdo index, %	-8.4±5.5	-18.2±5.8	-17.8±9.5	-16.8±11.0
Integral index of stress-tolerancy (X <sub>6</sub> ), score	4.6±0.3	5.2±0.3	5.4±0.6	5.4±0.5
Notes are the same as in Table 1.				

As one can see from Table 3, stress tolerance of the experimental group has substantially risen statistically ( $p = 0.05$ ), though in the control group the improvement in the emotional stability has not been noticed.

Indexes of frustration tolerancy, selectivity and leadership tendency of the sportsmen are presented in Table 4.

Table 4

Frustration tolerance of the sportsmen,  
level of selectivity and leadership tendency

Indexes	Experimental group		Control group	
	I	II	I	II
Direction of frustration reaction:				
on the object (E), %	56.0±4.2	52.0±3.4	47.7±3.5	46.8±7.4
on yourself (i), %	22.0±3.1	22.8±3.0	18.5±3.5	23.2±2.8
non-directed (m), %	22.0±3.2	25.7±3.1	34.8±5.7	30.0±5.5
Type of reaction:				
clear frustration (OD), %	25.5±2.6	13.8±2.0	35.3±3.5	30.7±4.6
aggressive (ED), %	46.0±4.2	50.3±3.2	37.0±2.8	40.7±6.4
on the solvation of the frustrative situation (NP), %	28.0±2.3	35.9±3.4	27.0±4.2	28.7±4.8
Integral index of frustration tolerancy (FT = 2NP + ED – OD), units	77.0±5.4	106.0±5.8	60.0±11.3	67.0±7.6
Leadership tendency, units	2.3±1.4	2.4±0.7	0.75±1.3	2.8±0.8
Selectivity, units	3.3±0.9	3.2±0.6	3.3±0.6	3.4±0.4
Notes are the same as in Table 1.				

As one could see from Table 4, frustration tolerancy, which means the ability of sportsman to resist the development of neurotic situation (state) when facing obstacles to reaching the target, has increased only in experimental group. It was reached due to the decrease of the clear frustration reaction ( $p < 0.01$ ) and increase of the %-age of reaction on the solvation of the frustration ( $p < 0.05$ ).

The results of the examination of the sambo-wrestlers are presented in Table 5.

Table 5

Changes in functional state index of the sambo-wrestlers  
under the influence of m/t

Indexes of functional state of body of the sportsmen	Stages of examination		
	before m/t	after m/t	p
Vegetative sphere score	5.1±0.22	5.4±0.30	0.05
Psychomonorics and psycho- motor reaction, score	6.2±2.25	6.8±0.18	0.01
Psychic sphere, score	4.6±0.20	5.5±0.25	0.01
Integral index of the functional state of the body	5.3±0.16	5.9±0.23	0.01

Note: m/t – mental training.

As one could see from Table 5, sportsmen have reliably improved their functional conditions under the influence of Mental Training. And the index increase of the psychomotorics, psychic process and fractional condition in general were statically substantial ( $p < 0.01$ ). Due to the fact, that the presence of the sportsmen in Mental Training lessons was different, and correlative interconnection between the number of lessons visited and the increase in the indexes of the studied processes and condition of the sportsmen.

#### Comments of the results

Results of the research show that Mental Training stimulates increase of functional abilities of the organism of the sportsmen, reaching high sport results. However in order to reach top results, quite a high intensity of lessons is needed (4-5 times per week) as well as good percentage of attendance of those lessons (80-90% of the lessons), repeating of those programs 3-4 times, motivation of sportsmen on obtaining of the good results.

# USE OF MENTAL TRAINING IN THE REHABILITATION OF PERSONS AFTER ACUTE MYOCARDIAL INFARCTION

*Isakov V.*

The normalization of psychoemotional states, especially in the patients suffering from cardiovascular diseases is one of the most important components of therapy and the pledge of its successful outcome [3].

At present the correlation of psychoemotional states alterations with ischemic heart diseases and arterial hypertension is considered to be proved [7]. The correlation between the depression and obstruction of coronary vessels is angiographically corroborated [8]. According to the data of employees-men Rotterdam investigation before the development of myocardial infarction (MI) the patients showed the sense of sorrow, apathy, fatigue and some other symptoms of depression. By the results of the investigations carried out at Montreal Institute of Heart more than 50% of the patients suffering from MI manifested various forms of depression disorders [3]. In this case according to the data of Killip they had reliable more often ventricular extrasystole which was the main reason of sudden death during the subsequent 18 months. In the given group the risk of cardiac death was 6.5 times higher than in other patients. In spite of the fact that the correlation of MI and psychoemotional state is considered to be established, it is still unknown whether MI is the reason of worsening the psychoemotional state, or on the contrary the latter favours its development.

In connection with the above-stated the necessity of the correction of patients psychoemotional state seems to be indispensable.

For this purpose we used mental training (MT), which is a variety of heterosuggestion. It was elaborated by professor L.-E. Unestahl in Sweden in 1982 and it was primordially destined for sport of higher achievements. In 1992 at Sports Medicine Department of Saint-Petersburg Research Institute of Physical Culture under the leadership of professor P. Bundzen there created the Russian modified version [1]. In the course of complex investigations there revealed a positive effect of MT in the athletes who had some phenomena of physical overstrain myocardium dystrophy and arterial hypertension [2]. In this connection the attempt of using MT in the rehabilitation of the subjects suffering from MI is well grounded.

## **Methods**

There examined three groups of patients (at the same age) from Saint-Petersburg Marinsky hospital who were diagnosed as having MI and who did not have any complications by the moment of the beginning of mental training.

In the first group (1 GR, n = 11) during 10 days after MI in addition of standard therapy there started listening to verbal-musical programmes of MT that included some habits of teaching muscular and psychical relaxation and the visualization of a positive image. The patients listened to the programmes through earphones staying in the ward 3-5 times per week at the interval from 15 to 17 hours for three weeks. In other days at the same time they were recommended to relax without assistance. The programme changed every week.

In the second group (2 GR, n = 10) the musical accompaniment of the programmes-relaxing music was listened. The persons from the third group (3 GR, n = 10) received a medicamental treatment only. In all the patients the medicamental therapy was carried out traditionally; it included heparin, nitrates, lidocain, polarizing mixture. To evaluate the psychoemotional status the test "Profiles of mood states" [5] was used; the patients filled it prior to the beginning of psychotherapy and then every week; the hypnability was evaluated by the scale worked out at Kharkov Research Institute for Neurology and Psychiatry [6]. Before and after the listening of each audio-programme the patients subjectively assessed their state of health by 10-mark scale; they retold in detail about their mood and feelings and discussed the listened programmes with the physician. The dynamics of pain syndrome was also evaluated. The two-month catamnesis was gathered.

## **Results**

The statistical processing was carried out with using the two-tailed t-criterion in modifications for bound and non-bound extracts. In connection with the discharge the number of those who were examined was somewhat diminishing, and by the end of the third week from the beginning of the investigation 2 persons remained in the first group and 4 patients in the second one, as well as in the third group, therefore the mathematical analysis of the given section was not conducted.

All the patients associate the development of MI with a great psychical stress (divorce, death of relatives, etc).

The subjects in the groups did not differ by the average level of hypnability among them, and patients with a low hypnability were absent in the groups. None of the patients had the hypnability less than 4 marks according to the 12-mark scale.

As a rule the listening of the programme by the persons of the first and the second groups was accompanied by some improvement of the state of health by 1 mark average ( $p < 0.05$ ).

Prior to the beginning of MT there are no statistical differences of the indices of psychoemotional state (PS) by the test POMS in the groups. A week later there observes a significant decrease of the average level of anxiety, depression, fatigue; there appears a tendency to reducing the average level of aggression and the average level of vigor increases (Table 5-1).

At the end of the second week the revealed regularities remain. The average levels of anxiety, depression, tiredness, confusion and the total index remain low, while the level of vigor remains heightened comparative the initial one (Table 5-1).

In group 2 only a reliable decrease of the average level of anxiety is observed by the end of the second week. The other psychological indices do not change (Table 5-2). In group 3 during all the time of the observation not only reliable dynamics of some indices of psychoemotional status was marked (Table 5-3).

Two months later three patients of group 1 kept performing MT independently, one of them completely refused to take nitrates (see below an extract from the case history) and two of them considerably decreased the taken dose.

"The patient S. (56 years old) entered the cardioreanimation section of Marinsky hospital with some complaints of intensive sternalgia that lasted for a few hours. For the first time the pleuralgia appeared 2 weeks before entering the hospital when he was leaving the house, but then, inside it passed. Later on the bouts repeated several times. He did not address the doctors and tried to take analgin. An especially strong bout appeared on the day of hospitalization without any obvious reasons. Cold perspiration and weakness accompanied the pains. The team of ECG diagnosed acute, penetrating myocardial infarction in the field of posterior wall.

Three days later of the hospitalization the patient was moved from the cardioreanimation section to common ward. The mental training began in the fourth day. On this day the patient did not objectively complain of any pains. His general state was satisfactory. After listening to the programme he noted some improvement of his general state of health.

Table 5-1

Dynamics of the indices of psychoemotional status  
in the 1<sup>st</sup> group

	Prior to psychotherapy, M±s (n = 11)	At the end of the 1 <sup>st</sup> week, M±s (n = 11)	At the end of the 2 <sup>nd</sup> week, M±s (n = 9)	Level of sign.	
				1 <sup>st</sup> week	2 <sup>nd</sup> week
Anxiety	55±12	48±10	48±11	p < 0.05	p < 0.04
Depression	57±14	48±7	49±11	p < 0.03	p < 0.05
Aggression	55±11	49±9	49±12	p = 0.1	p = 0.1
Vigor	47±7	53±9	53±7	p < 0.04	p < 0.02
Fatigue	57±12	47±8	46±8	p < 0.03	p < 0.02
Confusion	56±12	47±8	47±10	p < 0.02	p < 0.02
Total	57±12	47±8	48±10	p < 0.02	p < 0.03

index					
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At the end of the first week by the test POMS there revealed a considerable decrease of the levels of anxiety, depression and tiredness, though the patient did not subjectively note a decrease of the named indices. The indicated effect also remained at the end of the second week of psychotherapy. He was discharged from the hospital 19 days later of the hospitalization in a satisfactory state.

Two months later while speaking on the telephone he said that he used the relaxing skills for removing the stress. After his discharge from the hospital he did not take nitrates and he did not complain of any pains.

Dynamics of the indices of psychoemotional status  
in the 2<sup>nd</sup> group

	Prior to psychotherapy, M±s (n = 10)	At the end of the 1 <sup>st</sup> week, M±s (n = 10)	At the end of the 2 <sup>nd</sup> week, M±s (n = 8)	Level of sign.	
				1 <sup>st</sup> week	2 <sup>nd</sup> week
Anxiety	56±11	55±9	51±10	p > 0.1	p < 0.05
Depression	54±12	54±10	55±8	p > 0.1	p > 0.1
Aggression	53±12	52±7	55±11	p > 0.1	p > 0.1
Vigor	52±8	52±8	54±10	p = 0.1	p > 0.1
Fatigue	56±12	55±11	53±9	p > 0.1	p > 0.1
Confusion	53±9	55±8	55±9	p > 0.1	p > 0.1
Total index	54±10	54±8	54±10	p > 0.1	p > 0.1

The development of MI early and late complications was observed in group 3 in 7 cases; and in groups 1 and 2 in 3 cases; in group 3 there occurred frequent ventricular extrasystoly in two cases and the recurring MI in two cases while in group 1 the similar complications were not observed at all, only two episodes of uncommon extrasystoly (precardial and ventricular) and one case of the transient blockade of bundle of his left pedicle.

Dynamics of the indices of psychoemotional status  
in the 3<sup>rd</sup> group

	Prior to psychotherapy, M±s (n = 10)	At the end of the 1 <sup>st</sup> week, M±s (n = 10)	At the end of the 2 <sup>nd</sup> week, M±s (n = 8)	Level of sign.	
				1 <sup>st</sup> week	2 <sup>nd</sup> week
Anxiety	55±12	54±10	53±11	p > 0.1	p > 0.1
Depression	53±14	52±7	52±11	p > 0.1	p > 0.1
Aggression	52±11	55±9	55±12	p > 0.1	p > 0.1
Vigor	54±7	52±9	53±7	p = 0.1	p > 0.1
Fatigue	58±12	54±8	55±8	p > 0.1	p > 0.1
Confusion	54±12	56±8	56±10	p > 0.1	p > 0.1
Total index	54±12	54±8	55±10	p > 0.1	p > 0.1

### Conclusion

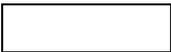
Mental training favours the fast regress of psychological disorders that accompany MI which under the conditions of further studies is accompanied by a more favourable course of postinfarction period.

The use of isolated musical programmes is ineffective; it probably occurs owing to the lack of practical skills for mental self-relaxation in the patients.

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## GEROPROPHYLAXIS BY MEANS OF MENTAL TRAINING

 *Bundzen P. , Uneståhl L.-E.*

The problem of health promotion of ex-athletes and sports veterans whose sports career is over is one of the actual problems of sports science. The urgency of the problem is explained by the fact that prolonged intensive physical exercises and the psychoemotional effort that is typical of training process and competitive activity in elite sport make great demands of organism functional reserves.

Some special investigations carried out within the framework of international scientific-research project "Mental training for sport and life" testify to the fact that the psychoemotional state of ex-athletes can be described as an altered psychosomatic state (APS) [1].

The distinctive peculiarities of ex-athletes APS appear to be first of all some changes of organism psychoenergy homeostasis and secondly those of neuro-endocrine status.

The investigations enable us to reveal some reliable alterations of psychoemotional status profile (POMS) in ex-athletes in comparison with practically healthy control subjects of corresponding age. The highest possible changes were found out by the psychoenergy index ( $p < 0.01$ ) which testifies to the decrease of both the ex-athletes stress-tolerance and their active potential whose high level is extremely important for their optimal psychosocial re-adaptation.

The use of the new technology of "Kirlian diagnostics" in the investigations [2] allowing to assess the level of human organism systemic bioactivation gives every reason to affirm that the ex-athletes show reliable alterations of bioenergy homeostasis, mainly within the limits of neuro-endocrine system. The latter is completely corroborated by the results of biochemical investigations. In particular, the study of dehydroepiandrosterone (DHEA) high-active neurohormone which is one of the predecessors of androgens and estrogens by means of radioimmunological method in ex-athletes' blood plasma testifies to an essential decrease of its level ( $2.59 \pm 0.43$  ng/ml) in comparison with the age standard for practically healthy subjects ( $3.31 \pm 0.22$  ng/ml). According to the fact that at present the DHEA is considered to be a marker of biological age [3, 4] these data point out the necessity of introducing special methods of geroprophylaxis into ex-athletes medical ensuring.

As is known, today the methodology of geroprophylaxis is sufficiently minutely elaborated. The methods allowing to restore the organism functional-energy balance and psychoenergy potential in the course of organism premature aging take an essential place in geroprophylaxis. A lot of complex investigations of neuro-biochemical and psychophysical mechanisms of integrated mental training [1, 5] testify to the fact that the aforesaid processes that cause the longevity of organism can be optimized at the expense of a systematic psychophysical training. In connection with all this and for the purpose of geroprophylaxis we would like to recommend to include the technology of integrated psychophysical training into the system of sports veterans complex improving from a health point of view.

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