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The Use of Biological Feedback in Complex Treatment of Patients with Rheumatoid Arthritis and Systemic Sclerosis

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Abstract

There are significant emotional problems in patients with systemic sclerosis (SS) and rheumatoid arthritis (RA), including most expressed symptoms of anxiety and depression that complicate the process of social and psychological adaptation of patients, reduce the level of subjective control as an attribute of personal responsibility for controlling their disease. The effectiveness of the biofeedback (BFB) training in the treatment of patients with rheumatoid arthritis and systemic sclerosis is analyzed. Analysis of the effectiveness of treatment was conducted by studying the dynamics of a number of psychological indices (the level of subjective control, reactive and personal anxiety, depression) and their comparison in patients of the main and control groups before and after the treatment. Correction of the psycho-emotional state of patients with SS and RA was carried out using biofeedback (BFB), based on the principle of self-regulation of body functions using external feedback systems. There was a significant reduction in anxiety and depressive reactions in patients, during the process of BFB therapy, accompanied by a significant decrease of scores by Spielberger–Khanin and Beck psychological tests, noted a significant effect of increasing the level of subjective control that can improve the effectiveness of therapy and long-term disease prognosis. Thus, the additional application of BFB training in complex treatment of SS and RA patients promoted the improvement of the efficiency of the treatment and rehabilitation carried out and the improvement of the patients' quality of life.

Keywords: BFB training, systemic sclerosis, rheumatoid arthritis, rheumatic diseases, reactive anxiety, personality anxiety, depression, level of subjective control

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1. Introduction

Rheumatic diseases (RD) retain the status of an important problem for practical health care and scientific activities. Their high prevalence, the predominant development in persons of working age, the chronic progressive course leading to the disability of patients, the significant financial costs associated with the exclusion of patients from the production sphere, the treatment and rehabilitation of patients, the costs of social security for the disable persons determine the urgency of studying this group of diseases [13, 14].

Such RD as systemic sclerosis (SS) and rheumatoid arthritis (RA) are characterized by uncertainty in terms of etiology and prognosis, a rapid decrease in the functionality of patients, the need for constant medication, which leads to a loss of ability to carry out important activities for patients, loss of professional independence and a significant decrease in the quality of life and reduction of its duration [2, 12].

The patient's personality changes both as a result of the direct impact of the symptoms of the disease, and as a result of the patient's psychological experience of his condition, which results in a decrease of self-esteem and self-confidence, dissatisfaction with his lifestyle, development of anxiety, anger, hostility and depression.

To correct the identified psychological disorders in RA and SSD patients, it is possible to use the methods of group, cognitive and behavioral therapy, and the biofeedback training (BFB) in particular. At the heart of the modern concept of BFB clinical application lie the ideas of voluntary and meaningful management of functions with the active participation of the patient for the correction of psychological and functional disorders by appropriate rehabilitation program.

Perhaps BFB is practically the only scientifically grounded method of alternative medicine at present.

The BFB is based on the principle of self-regulation of body functions using external feedback systems [1, 3, 6–11]. The polygraph registration of psychophysiological indices is used in the process of BFB in a transformed form, convenient for human perception. BFB consists of several phases: measuring the physiological parameter, translating the measurement results into an understandable form and feedback – transferring the received information to the person, which is carried out by polygraph unit and the appropriate software. Using BFB allows one to subordinate to voluntary control those processes that were previously considered as involuntary.

The aim of the study is to correct the psycho-emotional state of the SS and RA patients by BFB training.

2. Methodology

We observed 90 patients with SS and 90 RA patients. The average age of patients with SSD was 38.19 ± 12.1 years, the average duration of the disease in the study group was 11.2 ± 3.4 years. The average age of RA patients was 34.65 ± 9.7 years, the average duration of disease in RA patients was 8.76 ± 0.44 years. SS and RA patients were randomly selected for two groups: the main (n = 60) and control (n = 30). The groups of patients were comparable in terms of gender, age and duration of the disease. Patients with SS and RA of primary and control groups received similar medical and physiotherapeutic treatment. Patients of the main groups (SS and RA) received an additional 12–14 daily sessions of BFB training using Reakor rehabilitation unit by Medicom MTD (Taganrog), certified and entered in the State Register of Medical Products (Registration Certificate of the Ministry of Health of the Russian Federation N 97/17-106; Patents RF NN 2076625, 2102004, 2079284). The training was based on the parameters of the electrical activity of the brain (relaxation by the electroencephalogram), aimed at increasing the alpha activity of the brain. The procedure was performed after a single session of the 'Topical Alpha Activity' session in order to determine the area of the greatest alpha-rhythm expression.

Statistical processing of the results was carried out using the 'STATISTICA 6.0 for Windows' package and the 'Biostatistics for Windows 4.03' program.

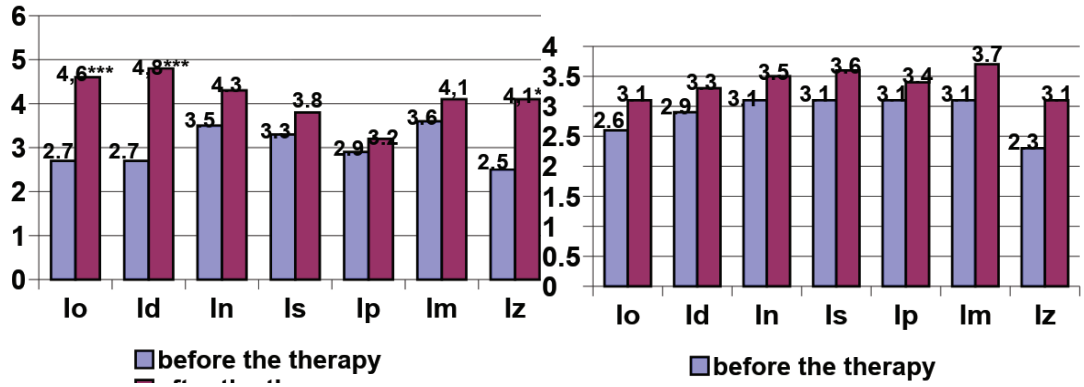
The levels of personality (RT) and reactive anxiety (PT) (Spielberger–Khanin test), depression (Beck's test), and subjective control level (SCL) test were evaluated in SS and RA patients [15]. The level of subjective control (SCL) was studied as an integral characteristic predetermining the personality characteristics of the patient that has a significant influence on the choice of certain individual strategies of behavior [15]. If a person mostly takes responsibility for the events taking place in his life on his account, explaining these events by his behavior, character, abilities, it shows the presence of his internal control. If he is inclined to attribute responsibility to all surrounding factors, finding causes in other people, in the environment, in fate or in a case, this indicates that he has external control.

3. Results

The quality of personal-environmental interaction is determined by an integrative characteristic of a subjective control level. This indicator represents a direct 'target' for the impact of BFB training. There was a tendency to external subjective control in

the spheres of achievements, the production sphere, in relation to illness and health in the basic and control groups of SS and RA patients during the course of BFB, which predetermines the increased psychological sensitivity of patients in the conditions of the disease (Figure 1).

The course of BFB training promoted the increase of the internality of SS patients according to the scales of general sphere, the sphere of achievements and attitude toward the disease. In the group of patients who received traditional therapy, the results of the assessment of these indices were similar, but unreliable.



main group control group

Figure 1: Indicators of SCL in patients with SS of the main and control groups before and after the treatment. Note: * – $p < 0.01$; ** – $p < 0.001$. Io – general internality scale; Id – scale of internality in the field of achievements; In – scale of internality in the field of failures; Is – scale of internality in family relations; Ip – scale of internality in production relations; Im – scale of internality in the field of interpersonal relations; Iz – scale of internality with respect to health and disease.

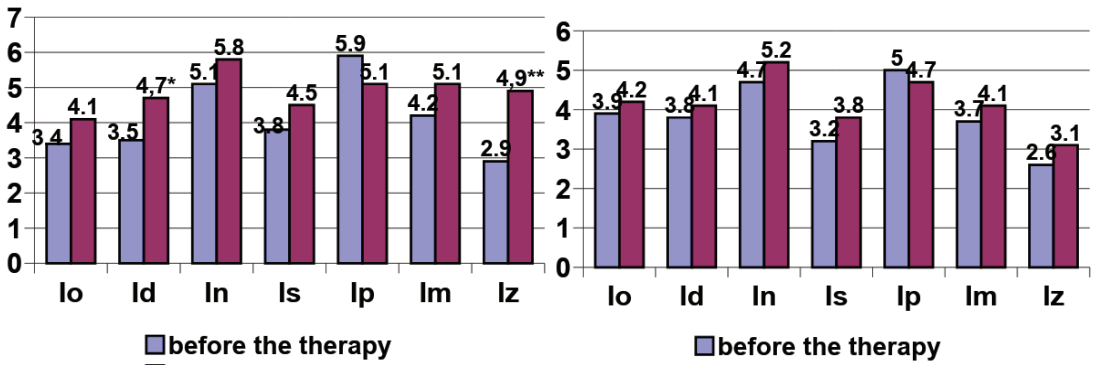
The study of the level of SCL in RA patients in both groups also showed a decrease in subjective control with the formation of external attitudes in the general and family spheres, in the areas of achievement, interpersonal interaction, and especially with regard to health.

Analysis of the effectiveness of BFB training in RA patients and the dynamics of SCL indices in the main and control groups are presented in Figure 2.

From the presented data we can see that the increase in the internality by SCL was observed in both groups in RA patients after BFB training, but only the scores of two scales: achievements and attitudes toward the disease were affected only in the main group of RA patients.

The results of studying the psychological status of patients with SS and RA during the BFB training in the main and control groups are presented in Table 1.

Thus, BFB training opens the possibility to realize the mechanism of self-regulation for the patient. It is especially important that voluntary control with the help of BFB



main group control group

Figure 2: Indicators of SCL in patients with RA of the main and control groups before and after the treatment. Note: * – $p < 0.01$; ** – $p < 0.001$. Io – general internality scale; Id – scale of internality in the field of achievements; In – scale of internality in the field of failures; Is – scale of internality in family relations; Ip – scale of internality in production relations; Im – scale of internality in the field of interpersonal relations; Iz – scale of internality with respect to health and disease.

Table 1: Changes in personal and reactive anxiety, depression during BFB training in patients with SS and RA of the main and control groups.

Indices	Patients with SS				Patients with RA			
	Main group (n = 60) (M ± σ)		Control group (n = 30) (M ± σ)		Main group (n = 60) (M ± σ)		Control group (n = 30) (M ± σ)	
	Before the therapy	After the therapy	Before the therapy	After the therapy	Before the therapy	After the therapy	Before the therapy	After the therapy
Personal anxiety	52.73 ±11.56	48.81 ±10.23	49.35 ±9.98	47.76 ±10.67	54.62 ±11.89	44.44* ±12.66	53.15 ±11.04	48.05 ±9.18
Reactive anxiety	54.98 ±12.09	32.44* ±11.76	53.85 ±11.04	49.05 ±12.39	50.41 ±9.89	39.81* 11.47±	48.85 ±10.25	45.55 ±8.97
Depression	17.89 ±5.09	11.12* ±6.76	18.39 ±6.08	16.78 ±5.23	18.83 6.89±	12.2* 7.47±	17.5 ±6.63	16.2 ±5.08
Note: *$p < 0.05$.								

provides the patient with control over such physiological processes that are involuntary in common conditions. Usually unconscious functions and processes are translated into perceived – first by controlling of external signals, and then by conscious regulation of the internal physiological state or assimilation of adaptive type of behavior.

The knowledge of the individual characteristics of the personality of SS and RA patients associated with the level and direction of responsibility is absolutely necessary and significant. Moreover, the impact of BFB training is associated with the reorientation of the external control locus to the internal, which is allocated as a component of personal maturity. With the help of BFB training, patients acquire a sense of control over their illness, adhere strictly to the treatment regimen, and acquire responsibility for taking care over their health. Perhaps this aspect leads to more effective results of the therapeutic process.

Also, the levels of anxiety and depression were studied in patients with SS and RA. High personal anxiety manifests itself in the predisposition of patients to anxious reactions, that is, in the tendency to perceive a wide range of situations as threatening and react to these situations with a state of anxiety, the intensity of which does not correspond to the objective danger, though. Regarding behavior and adaptation, this manifests itself in the features of self-doubt, indecision, inclination to doubt and fluctuations in the situation of choice, increased self-control and self-criticism. Self-esteem of patients is understated with a tendency to create feelings of guilt and their own insolvency. In addition, the patients develop increased lability, impressionability and reduced tolerance to stress. A high level of reactive anxiety is characterized by a feeling of internal tension, nervousness, psychological discomfort, anxiety, dissatisfaction with the actual life situation, an alarming assessment of the prospects. Against the background of a predominantly reduced and unstable mood, tense anticipation of troubles, a sense of an uncertain threat with the formation of depressive tendencies are revealed. In the behavior there are signs of fussiness, inconsistency or psychological stiffness (neurotic overcontrol). Gradually, the physiological adaptive reserves of the body are depleted due to an increase in the vegetative tone.

4. Discussion

As can be seen from the presented data, high anxiety rates (more than 46 points) were found in all groups of patients at the beginning of treatment, which corresponds to the clinically expressed level of anxiety. The rates of depression in all study groups were in the range of 16–19 points, which corresponds to moderate or subclinical level of depression. During the treatment, the indices of anxiety and depression significantly changed in the main groups of patients with SS and RA. The scores for these scales had no significant differences in the control groups.

It is assumed that BFB contributes to the correction of the psycho-emotional state, the reduction of reflex muscular-tonic syndromes, cerebral and peripheral blood flow, the mobilization of volitional potential and the increase of self-esteem of patients. The session of BFB training is characterized by active and conscious participation of the subject in the process of treatment, his desire for self-regulation and self-control. Some authors indicate that the mechanisms of the therapeutic effect of BFB should be sought not only in changes affecting physiological systems [6, 9–11]. One of the likely mechanisms of impact is the cognitive effect of the BFB experience, the training of self-control skills, which, according to patients, they have never had before; by reorienting

the external level of subjective control to the internal one (this is confirmed by the results of this study). With the help of BFB, patients acquired a sense of control over their illness, adhered strictly to the treatment regimen, taking responsibility for taking care of their health. Perhaps, it is these aspects of BFB that lead to an improvement in the results of the therapeutic process. It can be said that in this case, it is not only the degree of physiological change that acts as a critical value, but also volitional the degree of the patient's belief in his ability to control the symptoms of the disease. BFB training gives the patient the opportunity to receive positive reinforcement due to feedback, informing about development of self-regulation skills, brings a feeling of satisfaction to the patient, connected with completeness of volitional effort, awareness of the possibility of its improvement. The sense of hopelessness and helplessness is replaced by a sense of perspective, new opportunities, which contribute to the reduction of pain syndrome and the reduction of anxiety and depressive disorders [8].

5. Conclusions

The use of BFB therapy in patients with diabetes and RA contributes to an increase in the effectiveness of integrated treatment, promotes active and conscious participation of the subject in the therapy process on the basis of self-regulation and self-control, in connection with which the willful potential is mobilized and self-esteem of patients is increased. The method of BOS therapy is an accessible and safe method of treatment, which allows us to recommend it for widespread use in rheumatological practice.

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