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BIOPSYCHOSOCIAL APPROACH IN MEDICAL REHABILITATION OF PATIENTS AFTER CORONAVIRUS INFECTION

Levitskaya Tatiana Evgenievna
Candidate of Psychological Sciences, Associate Professor

Kozlova Natalia Viktorovna
Doctor of Psychological Sciences, Head of Department

Atamanova Inna Viktorovna
Candidate of Psychological Sciences, Associate Professor

Bondar Olga Nikolaevna
Postgraduate, Assistant of Department

National Research Tomsk State University

Abstract. This article presents the experience of defining an integrative medical and psychological model for assessing health and developing a model for subsequent rehabilitation measures based on a biopsychosocial approach. The results of the study after the rehabilitation measures: psychological correction, psychoprophylaxis of acute stress and post-traumatic stress reactions, anxiety disorders, maladaptive mental states of patients who have undergone COVID-19, improving their quality of life and adaptive capabilities in a situation of uncertainty.

Keywords: COVID-19, psychological health, anxiety, depression, stress, medical rehabilitation, psychological rehabilitation, psychological correction.

The emergence of a new coronavirus infection COVID-19 posed challenges for healthcare professionals around the world related to the rapid diagnosis and provision of medical care to those affected by the pathogen SARS-CoV-2. Nevertheless, despite the increase in the number of patients who have recovered and the already available accumulated information about the epidemiology and clinical features of the disease caused by the virus, there is a delayed deterioration in public health of the population, which manifests itself not only at the physical level, but also at the level of mental, psychological and its social component. Accordingly, along with the problem of restoring somatic health, tasks related to the restoration of the psychological and mental health of patients who have undergone coronavirus infection are of great importance (Temporary guidelines. Ver-

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It is important to understand that in a pandemic situation, the psychological and mental health of people becomes a target for many influencing factors. On the one hand, this is due to the fact that infectious diseases often lead to mass mortality of people - more than any other pathology. Accordingly, epidemics of infectious diseases formed an automatic response in our subconscious - fear of infection, stigmatization of people suffering from infection "as life-threatening activities of others". (Achkasova E.E., Tvorogovoy N.D., 2018; Caia W., Lian B., Song X., Hou T., Deng G., Li H. A., 2020).

The excessive desire of society to isolate itself or discriminate against patients with infectious diseases often leads to the development of additional psychological problems both in patients, thereby aggravating the course of their illness, and in healthy people (Ponomarenko G.N., 2014; Cénat J. M., Felix N., Blais-Rochette C., Rousseau C., Bukaka J., Derivois D., Noorishad P.-G., 2020). Most people perceive the pandemic situation as extreme and even the psyche of people who have not been ill suffers from certain factors caused by the epidemiological situation. These factors include the suddenness of the event, the more sudden the event, the more traumatic it is for the human psyche; lack of such experience; the duration of the event, traumatic effects can multiply with each subsequent day; lack of control of the situation in conditions of uncertainty, if the loss of control persists for a long time, people may show signs of "learned helplessness" or panic; exposure of death, even short life-threatening situations can change the personality structure of a person and his "cognitive map", lead to a severe existential crisis (Rogacheva T.V., Zalevsky G.V., Levitskaya T.E., 2015). Given the fact that a sufficient amount of time has passed since the onset of a new coronavirus infection before the current treatment regimens were developed, many patients already at an early stage of the disease had a feeling of fear and a feeling of insecurity, anxiety that the disease is incurable, the symptoms of the disease will progress, and can lead to irreversible consequences in the flesh before death (Achkasova E.E., Tvorogovoy N.D., 2018; Smorodintsev A.A., 1978). A number of Russian and foreign studies have shown that the current epidemiological situation has a significant negative impact on people's mental health, leading to clinical and subclinical disorders, such as anxiety, depression, acute stress disorder, post-traumatic stress disorder, and also contributes to the exacerbation of pre-existing mental conditions (Achkasova E.E., Tvorogova N.D., 2018; Kang L, Li Y, Hu S, Xiang Y-T, Yang Y, Li W., 2019; Ogueji A. I., Okoloba M. M.,2020; Brooks et al., 2020; Cénat J. M., Felix N., Blais-Rochette C., Rousseau C., Bukaka J., Derivois D., Noorishad P.G., 2020). On the other hand, a violation of the metabolic processes of the central nervous system, blood coagulation system in the direction of hypercoagulation, impaired cerebral circulation associated with hypoxia of the

brain, general intoxication of the body, physiological stress caused by the severity of the disease, suppression of the immune status, all this in combination also negatively affects the emotional and cognitive the sphere of patients who have undergone coronavirus infection (Bolotova E.V., Shulzhenko L.V., Sholin I.Yu., 2016; Malyavin A.G., 2004; Kang L, Li Y, Hu S, Xiang Y-T, Yang Y, Li W., 2019).

In our opinion, the not entirely favorable situation of getting out of the disease is associated with the fact that it is generally accepted, first of all, to monitor and restore the physiological status of patients, i.e. the physical component, however, this does not take into account the complex of other components such as mental, psychological and social levels of health.

These facts indicate the insufficient effectiveness of the current monitoring system and rehabilitation measures for patients who have undergone coronavirus infection. This determines the need to conceptualize health-centered concepts in medical and psychological practice, which implies the need to use an integrative medical and psychological model for assessing health and develop a model for subsequent rehabilitation measures based on a biopsychosocial approach.

Based on the above, we have developed a rehabilitation program, the **purpose** of which was psychological correction and psychoprophylaxis of acute stress and post-traumatic stress reactions, anxiety disorders, maladaptive mental states of patients who have undergone COVID-19, as well as to improve their quality of life and adaptive capabilities in the situation. uncertainty. When developing and conducting the program, the main principle of psychological rehabilitation was taking into account the individual psychological characteristics of each patient, his psychophysiological, emotional and personal characteristics.

The main complaints presented by patients included in the rehabilitation group: sleep disturbance; irritability; increased anxiety and excitability; vegetative manifestations: tachycardia, sweating, dizziness, shortness of breath, tremors, experience of uncontrollable fear and panic; constant feeling of tiredness; decreased memory and distraction of attention; impoverishment and narrowing of emotional reactions; avoiding thoughts, feelings, talking about the disease; waiting for the return of the disease; the formation of help-centered behavior: medicalization of behavior and dependent behavior from loved ones and doctors; violation of socialization and professional adaptation: decreased interest and participation in habitual activities, fear of going to work and society.

As methods of psychological influence, psychological counseling was carried out using elements of cognitive and positive psychotherapy (group sessions and individual counseling); a progressive method of muscle relaxation was used (neuromuscular relaxation; breathing techniques); method of psychological self-regulation (biofeedback therapy); cognitive training.

Patients underwent rehabilitation at the clinic of the TRIBP SibFRCC FMBA of Russia Branch.

The sample consisted of 42 patients who underwent pneumonia caused by the SARS-CoV-2 virus. The main group of patients (n = 20), in addition to drug therapy, was additionally engaged in biofeedback training, cognitive training, as well as group and individual sessions using elements of positive and cognitive psychotherapy. The control group included 22 patients who received only medication and physiotherapeutic treatment.

When statistically processing the data obtained, the normal distribution of features was checked using the Shapiro-Wilks and Kolmagorov-Smirnov tests. In the presence of a normal distribution of the trait, the data were presented as "mean±standard deviation" (M±SD). If the distribution of features was different from normal, the data were presented as a median (Me) and interquartile range in the format Me $[Q_1;Q_3]$, where Q_1; – lower quartile, Q_3 – upper quartile. The determination of the statistical significance of the differences in the dependent samples before and after rehabilitation measures was carried out using the nonparametric Wilcoxon T-test (Z; p). To compare two independent samples before and after rehabilitation measures, the nonparametric Mann-Whitney U-test (U; p) was used. To find the relationship between the indicators, Spearman's r_s-test (r_s; p) was used. The dynamics of biofeedback training was assessed using the Student's t-test for paired observations (t; p).

Psychological rehabilitation by the method of biofeedback training was carried out using the software and hardware complex "Biofeedback 2000 x-pert" (CPS, SCHUHFRIED, Austria). This is a method of biocontrol using visual biological feedback, the main content of which is the regulation of psychophysiological parameters, performed in the process of playing activity. In this case, the patient's pulse was regulated, which was recorded using pulsometry.

Classes were conducted individually under the supervision of a psychologist, lasting 20-25 minutes, at least 12 sessions during the rehabilitation period. Criteria for terminating the session: deterioration of the patient's well-being and feeling of fatigue, negative dynamics of psychophysiological indicators.

During the game session, the patient could see his pulse wave on the computer screen, recorded using a physiorecorder attached to his index finger. At the same time, during the game, the patient was given recommendations in one way or another to achieve a state of relaxation, reduce the level of emotional stress, while controlling his own heart rate. Possible options for the regulation of the internal psychological state were proposed (autogenous training, visualization elements, progressive muscle relaxation, breathing exercises, etc.). The patient observed information about the result of the task in real time, after which he could correct his psychophysiological state for the successful completion of the task. The choice

of the game program is based on the individual preferences of the patient (visual effects, game stories, etc.).

During the course of the entire training, both controlled psychophysiological parameters such as pulse (HR) and uncontrollable ones - hand temperature (HT) and electrical skin conduction (ESC) were recorded, which also underwent changes in the training process. It should be noted that when a persistent change in the parameter of heart rate (HR) is obtained, a similar trend is usually observed in other parameters.

Cognitive training was also carried out on an individual basis, at least 8-10 sessions lasting 30 minutes. Methods were used to train the memory and attention of patients: "anagrams", "confused lines", "memorizing 10 words", "memorizing visual images", "noisy pictures", "Schulte table", "puzzles".

Also, during the period of the patients' stay in the hospital, 3 group sessions were held, the main goals of which were self-awareness and acceptance of their illness, the study of fears associated with a recurrence of the disease, the formation of an image of the future and a picture of health.

Thus, the psychological rehabilitation block included 3 targets of influence: the patient's personal, emotional and cognitive spheres.

Psychodiagnostics of the studied psychological indicators was carried out twice: when the patient was admitted to the hospital and before discharge.

The criteria for the inclusion of patients in the groups: anxiety and/or depression in mild (8-12 points according to the "HADS" method) and moderate (13-17 points according to the "HADS" method) degree of impairment separately and/ or in combination with moderate and mild impairments cognitive functions (attention span 61-74 points/75-89 points according to the Schulte-Platonov Tables method), attention distribution (107-131 points/132-158 points according to the Schulte-Platonov Tables method), attention switching (41 -49 points/50-59 points according to the "Schulte-Platonov Tables" method); visual memory (3-4 images/5-6 images); motivation for recovery (10-12 points/7-9 points).

Before the beginning of the rehabilitation measures, there were no statistically significant differences in psychological indicators between the groups of patients of the main and control groups.

After a course of medical and psychological rehabilitation, the patients of the main group showed a significant positive dynamics of indicators of both emotional and cognitive spheres. There is a decrease in the level of anxiety and depression from "mild impairments" to "no impairments", an improvement in visual memory from "pronounced impairments" to "moderate impairments", "Mild violations". The indicator of motivation for recovery also changed from "average values" to "no impairments" (Table 1).

In the control group, positive dynamics was observed only in three studied

indicators: anxiety, depression in the range of "mild disorders" and motivation for recovery to the value "no violations" (Table 1).

Table 1.

Comparison of psychological indicators of patients of the main and control groups of patients with ischemic stroke in the carotid basin before and after rehabilitation measures, (Me [$Q_1;Q_3$], points)

	Main group (n=20)	Z	p	Control group (n=22)	Z	p
Visual memory	3[2;4]; 6[3;6]*	2.242	0.015	3[2;3]; 4[4;5]	-2.209	0.016
Short-term memory	5[4;6]; 6[5;6]	-0.024	0.981	6[5;6]; 6[5;7]	-0.626	0.469
Long-term memory	4[3;6]; 4[2;6]	-0.730	0.465	4[3;6];4[3;7]	-0.765	0.456
Scope of attention	97[75;112]; 85[71;110]*	-3.234	0.001	95[86;124]; 90[72;111]	-2.804	0.005
Distribution of attention	132[128;158]; 125[111;138]*	-2.807	0.005	129[108;155]; 121[102;145]	-1.789	0.060
Switchability of attention	61[60;87]; 63[59;84]	-0.785	0.432	64[46;88]; 64[46;87]	-0.704	0.482
Anxiety	11[10;12]; 6[4;6]*	-2.929	0.003	10[8;14]; 8[7;10]*	-2.246	0.025
Depression	10[8;11]; 7[7;9]*	-3.496	0.000	10[7;9]; 9[5;8]*	-2.328	0.020
Motivation for recovery	21[19;24]; 26[24;30]*	-2.236	0.025	22[20;23]; 24[22;28]*	-2.351	0.022

Note: Z, p – Wilcoxon T-test, * – statistically significant differences after rehabilitation measures

It is important to note that a comparison of the results between the two groups, obtained after rehabilitation measures, showed the presence of statistically significant differences in a number of indicators. Thus, in the group of patients who additionally engaged in biofeedback training and cognitive training, the level of motivation for recovery was higher than in the control group (U=645, p=0.016), and the level of anxiety and depression was significantly lower (U=566, p=0.004; U = 564, p=0.004, respectively), which indicates a positive effect of biofeedback training on the emotional and motivational sphere of patients. Also, in the patients of the main group, compared with the control group, there was a more pronounced improvement in visual memory (U=566, p=0.004), the volume and distribution of attention (U=561, p=0.000; U=561, p=0.000, respectively), which directly related to the cognitive training of patients. In our opinion, the obtained data are

explained by the presence of a relationship between the emotional-motivational and cognitive spheres, which is confirmed by the conducted correlation analysis. Negative relationships were found between indicators of anxiety, visual memory and motivation for recovery (r_s=-0.554, p=0.000; r_s = -0.565, p = 0.000, respectively); anxiety by the volume and distribution of attention (r_s=-0.586, p=0.000; r_s = -0.678, p=0.000, respectively).

The digitized data of biofeedback training also reflect the positive dynamics of the studied physiological indicators, which indicates an improvement in the psychoemotional state of patients: there is a decrease in the values of heart rate and electrical conduction of the skin, an increase in hand temperature (Table 2).

Table 2.

Dynamics of the average values of psychophysiological indicators of relaxation biofeedback training in patients of the main group with ischemic stroke in the carotid basin, M±SD (ESC – µS; HT – °C; HR – beats/min), n=20

Indicators	At the beginning of the training	At the end of the training	t	P
ESC	2.39±0.19	1.62±0.11	-3.886	0.000
HT	31.07±2.75	34.81±1.67	-2.864	0.045
HR	79.56±8.30	71±8.41	3.579	0.000

Note: t, p - Student's t-test; ESC – electrical skin conduction,
HT – hand temperature, HR – heart rate

Thus, our research has shown that a complex of psychological measures covering the personal, emotional and cognitive spheres of patients who have undergone COVID-19, included in the general structure of medical rehabilitation, is an important component of the rehabilitation process and allows you to most effectively cope with the consequences of the disease.

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