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Burnout syndrome; Chronic stress, Disintegration of brain structures; Neurophysiological mechanisms

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Violation of the Balance of Activation of the Hemispheres of the Brain as the basis of the Burnout Syndrome

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Annotation

Burnout syndrome creates problems for organizations and employees themselves and needs to be studied. The purpose of the study: to identify neuropsychological and psychological correlates of the burnout syndrome, which will allow to objectify this condition. An open, non-randomized, prospective study of 339 people of the "human-human" professions was conducted. Emotional burnout syndrome was identified, personal characteristics were analyzed, and a neuropsychological examination was conducted. It is shown that the emotional burnout syndrome is based on neurophysiological mechanisms characteristic of the state of chronic stress. This condition is characterized by an imbalance of activation of the hemispheres of the brain and includes the right-hemisphere dominance in the background of left-brain deficit, misalignment of the activities of the cerebral hemispheres, the violation of interhemispheric transfer of emotionally significant information. The revealed signs of disintegration and misalignment of the brain structures create prerequisites for insufficient awareness of their activities and adequate response to work situations.

Introduction

The work of medical personnel, social workers, lawyers, prison and law enforcement officials, and school teachers is closely linked to intense and emotionally stressful interactions with people. These specialists are most often observed mental and physiological reactions to a wide range of situations in the workplace. This is an error, conflict, violation of labor technology, dependence on psychoactive substances, autoaggressive. Over time, they begin to feel dissatisfied with their work, lose interest in it, and formally perform their duties. Disorders gradually progress, neurotic and psychosomatic phenomena develop. In the future, this is the termination of work due to morbidity, mental maladjustment, which leads to a shortage of qualified personnel. These reactions are a manifestation of such a phenomenon as professional stress, and, as a result, the professional burnout syndrome (*H Freudenberger, 1974*) Also, defined as the "powerless assistant" syndrome (*W Freudenberger, 1974*), (*Schmidbauer, 1977*) and "emotional exhaustion syndrome" [1].

Literary Review

Burnout syndrome is a reaction of the body that occurs as a result of prolonged exposure to medium-intensity professional stress, which manifests itself in symptoms of emotional, mental and physical fatigue, personal detachment and reduced satisfaction with the performance of work. Some scientists agree that emotional exhaustion is a key aspect in understanding the burnout syndrome [2,3,4], and other scales are less significant. In addition, when creating the burnout questionnaire, *S. Maslach* herself pointed out that all three scales of the questionnaire do not correlate with each other. For example, she noted a low correlation between the professionalism reduction scale and the other two scales [5]. This indirectly supports the interpretation of the burnout syndrome as a chronic occupational stress. Drawing parallels with the emotional state of concentration camp prisoners, we can agree with this interpretation [6]. Emotional exhaustion refers to the feeling of emotional emptiness and fatigue caused by work activities. It is defined as a feeling of overexertion, exhaustion of emotional and physical resources, fatigue that does not pass after sleep. After a rest, these phenomena are weakened, but they resume when they return to the previous working situation. The consequences of burnout can manifest themselves in various types of disorders: ranging from psychosomatic, ending with cognitive, motivational and emotional. Thus, this phenomenon is of great importance not only for the productivity of the individual, but also for the productivity of the organization, since there is a link between emotional exhaustion and the well-being of organizational relationships [7,8,9].

Experimental data revealed a high correlation between emotional exhaustion and quantitative indicators of work volume [4,10]. Other studies have indicated that emotional exhaustion, playing a key role in the process of emotional burnout, is associated with such phenomena as life satisfaction, work process, as well as time spent communicating with clients and colleagues [11,12]. The prevalence of emotional burnout syndrome reaches 30% among those employed in the "person-to-person" professions [4,10,13]. The diagnosis of burnout syndrome is carried out on the basis of a questionnaire and is subjective. At the moment, the criteria for the diagnosis and prevention of burnout syndrome are not defined. The lack of accurate diagnosis and unambiguous interpretation of this condition does not allow us to take into account the consequences of its manifestations. The problem of the study is the need to objectify burnout syndrome. This is necessary for the development of methods of prevention and correction.



The methodology of the study

The aim of the study is to identify the neuropsychological and psychological correlates of the burnout syndrome, which will allow to objectify this condition.

The design of the study

Open, non-randomized, prospective. Criteria for inclusion in the research-questionnaires of all survey participants, regardless of gender, professional group and age. The analysis used data from two surveys, the total number of participants of which was N=339 people.

Research methods

Factors were selected and questions were compiled that measured the impact of a particular factor on a person [14]. Diagnostics of the level of emotional burnout was carried out using the method "Diagnostics of the level of emotional burnout V. V. Boyko". To determine the status of personal identity, we used the method "Study of personal identity by L. B. Schneider" [15]. To measure the scope of achieving identity, the method "Measuring personal and social identity V. Urbanovich" was used [16]. The neuropsychological examination was aimed at analyzing the conjugate functioning of the brain hemispheres and included the most informative and frequently encountered tests [17]. The visual-spatial capabilities of the subjects were determined using a task for dividing lines with the right and left hand. The assessment of the participation of the right and left hemispheres of the brain in speech functions was carried out by the method of a double task (manual-verbal interference). As a non-verbal task, tapping was used, performed at a maximum pace for 10 seconds separately with the right and left hand, the verbal task consisted of the oral declension in the specified case of nouns with an interval of 2 seconds. In the course of the experiment, the subjects performed first tapping with one hand, then with the other hand, then tapping in the same sequence against the background of the declension of nouns. This procedure was repeated three times. The initial tapping frequency (N_{ex.}) was determined by averaging the data of three measurements for each hand. The frequency of tapping against the background of competitive verbal activity was also determined (N_{nar.}). The relative tapping deceleration (RR) was calculated separately for each hand using the formula:

$$RR = \frac{100\%(N_{ex.} - N_{nagr.})}{N_{ex.}}$$

The results of the study

The study showed that emotional burnout is more likely to develop in people with an unformed identity, with unstable basic areas – family, immediate environment, financial situation, etc., with problems in these areas. There are significant differences in the personal characteristics of the subjects in the groups that are polar in terms of the severity of the symptoms of emotional burnout. Summarizing the results of the study, it can be argued that the majority of our subjects who identify burnout syndrome in different phases (stress, resistance, exhaustion), falling into conditions of emotional fatigue, are not able to effectively resist the influence of factors, due to personal characteristics described using correlation analysis. The resistance phase showed a significant weak feedback with the areas of achieving personal identity: "My inner world" (r=-0.36, p=0.02), "My health" (r=-0.33, p=0.03), "My family" (r=-0.39, p=0.01), "My relationships with others" (r=-0.39, p=0.01). The more quickly a person develops the resistance phase, the less he has a discord with himself in these areas of achievement. Moderate feedback was found in the resistance phase with the sphere of personal identity "I and the society in which I live" (r=-0.49, p=0.01). The symptom "inadequate selective emotional response" showed weak feedback with the spheres of achieving identity "My inner world" (r=-0.38, p=0.01) and "My relationships with others" (r=-0.31, p=0.05); moderate feedback with the spheres of achieving identity "My health" (r=-0.46, p=0.01), "My family" (r=-0.40, p=0.01), "Me and the society in which I live" (r=-0.48, p=0.01). The symptom is manifested more than the less harmonious the given spheres of identity in the individual. The symptom of the resistance phase "Emotional and moral disorientation" is inversely moderately correlated with the areas of identity achievement "My service" (r=-0.46, p=0.01), "My relationships with others" (r=-0.40, p=0.01), "Me and the society in which I live" (r=-0.45, p=0.01). The sphere of achievement "My inner world" has a weak feedback relationship with this symptom (r=-0.34, p=0.03). That is, the lower the value of the identity of the individual in these areas, the greater the probability of an increase in burnout during the resistance phase.

The symptom "Expansion of the sphere of saving emotions" showed significant weak feedbacks with the identity coefficient (r=-0.34, p=0.03) and with the sphere of achieving

the identity "My family" (r=-0.31, p=0.04). This means that the economy of emotions expands to the areas of a person's life with unfavorable indicators of personal identity in these areas. Also, the emotion savings are greater if the identity quotient is low. "Reduction of professional responsibilities" is weakly inversely correlated with the areas of identity achievement "My inner world" (r=-0.33, p=0.03), "My future" (r=-0.37, p=0.02), "I and the society in which I live" (r=-0.36, p=0.02), with the adequacy of self-esteem (r=-0.32, p=0.04). The third phase of emotional burnout-the phase of exhaustion, showed a weak feedback with the spheres of identity "My family" (r=-0.37, p=0.02), "My relationships with others" (r=-0.30, p=0.05), "Me and the society in which I live" (r=-0.38, p=0.01). The symptom "emotional deficit" is moderately inversely related to the sphere of identity "My family" (r=-0.40, p=0.01). The symptom of "emotional detachment" and the adequacy of self-esteem showed a moderate inverse correlation (r=-0.42, p=0.01). "Personal detachment" has a weak feedback with spheres of achievement of personality "inside My mind" (r=-0.33, p=0.03), My family (r=-0.31, p=0.05), "My relationships with others" (r=-0.37, p=0.02), "I and the communities in which we live" (r= mobility in soil -0.35, p=0.02), with the adequacy of self-esteem (r=-0.32, p=0.04). "Psychosomatic and psychovegetative disorders" showed a weak feedback relationship with the personal identity coefficient (r=-0.35, p=0.03), with the areas of identity achievement "My financial situation" (r=-0.37, p=0.01), "My family" (r=-0.32, p=0.04), "My relationships with others" (r=-0.31, p=0.04), "Me and the society in which I live" (r=-0.33, p=0.03). When performing a task for dividing a segment, healthy adult subjects have a slight shift to the left of the real center, which is the same for both hands. The pronounced lateral differences that we observe in group 1 in this task (Table 1) are a sign of a violation of interhemispheric connections.

If the increase in verbal-manual interference when performing a motor task with the left hand indicates the involvement of the right hemisphere in speech activity and a decrease in lateral differences in functional asymmetry, then differences in the accuracy of dividing segments with the left and right hands may indicate a violation of the paired functioning of the hemispheres in the perception and motor assessment of spatial relations, which confirms a violation of the coordinated functioning of the brain hemispheres. Clinically, this is manifested in the inability to consciously control the content of consciousness, for example, the attitude to one's work.

Table 1: Average values (in mm) of deviations from the center when dividing segments with the right and left hand in groups (N=36).

Participants	N	Right hand	Left hand
Group 1 (main)	16	1, 21±0, 37	0, 36±0, 32*
Group 2 (control)	20	0, 49±0, 27	0, 47±0, 38

Source: * - The reliability of lateral differences P<0.05 according to the t-criterion for conjugate values.

The analysis of the immediate and delayed reproduction of neutral and emotional words presented in the pair showed that all the subjects had better emotional words than neutral ones. The group 1 subjects were worse at reproducing neutral words from the left ear than the control subjects, and they were better at reproducing emotional words from the right ear when they were directly reproduced. With delayed reproduction, neutral words were reproduced in group 1 mainly from the right ear, while in the control group – from the left. This indicates that the transfer of emotional words from the right hemisphere to the left, for the implementation of their awareness, is broken. The deterioration of the transfer of emotionogenic information in group 1 from the right hemisphere to the left indicates that the information about emotionality does not reach the center of speech in the left hemisphere. This leads to diffuse activity of the right hemisphere of the brain and difficulties in verbalizing the emotionogenic meaning of the word. The right hemisphere remains in a state of emotional arousal, which has a negative connotation, without a critical understanding of the actual emotional color of the stimulus. When the mood is negative, any information will be perceived in the perspective of the negative color, regardless of its tone. The presence of a violation of the interhemispheric transfer of emotionally significant information in individuals with signs of CMEA (group 1) was also indicated by the inversion of emotional reflection. It is expressed in the fact that when presenting emotionogenic words, the persons from Group 1 responded with words-associations that have an emotional coloring opposite to the word-stimulus (Table 2).

A comparative analysis of the study of functional asymmetry of the brain showed that in the group of individuals with signs of burnout syndrome, in contrast to the control group (without signs of burnout syndrome), there are violations of the coordinated functioning of the right and left hemispheres of the brain, deterioration of the transfer of emotionogenic information from the right hemisphere to the left. The right hemisphere remains in a state of emotional arousal, which has a negative connotation, without a critical



understanding of the actual emotional color of the stimulus. When the mood is negative, any information will be perceived in the perspective of the negative color, regardless of its tone. Clinically, this is manifested in the inability to consciously control the content of consciousness, for example, the attitude to one's work, the inability to critically assess the situation, and the narrowing of the range of situational decision-making.

Table 2: The test results of the inversion emotional reflection.

Number of inversions	Group 1 (N=16)		Group 2 (N=20)	
	Abs.	%	Abs.	%
6 and more inversions	13	75	1	5
2-5 inversions	2	20	5	25
No more than 1 inversion	1	5	14	70

Discussion

The study shows that emotional burnout develops in people with an unformed identity, with unstable basic areas – family, immediate environment, financial situation, etc., with problems in these areas. Currently, in the rapid change of social environment, personality is more and more forced to operate in difficult and demanding situations, in terms of lack of staff resources, insufficient financial incentives. In a short time, a professional becomes a hostage of overload, a “powerless helper”, although he was called to remove the burden, heal, help. It is his duty to find the strength to recover, get stronger and move forward, and he, to his shame, is incapable of such actions, although he was initially ready for them. In an extreme effort to achieve self-esteem, to show their importance, “burnout emotionally” overestimate the requirements for themselves in the search to confirm the meaning of their life and self-actualize in work. Such systematic overloads inevitably lead to new losses, exhaustion, depersonalization, and other disorders. In addition, a person with an unformed identity is simply not able to adequately assess their loads, see the line when it is necessary to retreat for self-preservation, which provokes psychovegetative and psychosomatic disorders and again harms the common cause.

The identified neurophysiological features in individuals who show signs of CMEA may indicate their neuroticism, a violation of labor adaptation, and possibly overwork. Revealed activation of the right hemisphere, reflected in the improvement of playback of emotiogenic words presented to the left ear, and the violation transfer emotiogenic information from the right hemisphere to the left, leads to the inversion of the original relationship of the cerebral hemispheres, formation of stagnant pockets of excitation in the right hemisphere, focusing on a range of experiences: his fatigue, inability to be successful, the negative emotional coloring of his condition. The spatiotemporal organization of a person's mental activity in the burnout syndrome state corresponds to the right-hemisphere type. The right-hemisphere strategy is energetically more beneficial to the body, since it is devoid of elements of probabilistic prediction, does not establish cause-and-effect relationships, provides greater freedom in manipulating information and, therefore, requires less additional physiological costs. This is a subjective and contextual perception of the world, a fixation on negative, in this case, moments of activity. It is possible that the high activity of the right hemisphere contributes to the desire for altered states of consciousness due to the violation of the interhemispheric transfer of emotiogenic information (that is, causing physiological changes corresponding to emotional experience), and this fact can provoke alcoholism in persons with burnout syndrome. It is noted that in burnout syndrome, people do not adequately respond to an emotiogenic stimulus, and often attach emotional significance to indifferent influences. This is also evidenced by the inversion of emotional reflection revealed in individuals with burnout syndrome. And, finally, due to the violation of the transfer of verbal emotiogenic information from the right to the left hemisphere, awareness and critical attitude to it are disturbed, which is clinically manifested by suspicion, depression, anhedonism, increased anxiety. It becomes clear why psychotherapeutic measures for the prevention of burnout syndrome are not very effective: these measures only strengthen the emotional dominant by fixing attention on it. The psychotherapeutic approach to burnout syndrome should be aimed at eliminating the pathological dominant and is associated with the activation of the left hemisphere, training awareness of one's desires and intentions, training in probabilistic forecasting, stimulating empathy, extraversion, and friendliness.

Conclusion

The emotional burnout syndrome is based on neurophysiological mechanisms characteristic of the state of chronic stress, associated with right-hemisphere dominance against the background of left-hemisphere deficit, violation of the coordinated activity of the brain hemispheres and violation of the interhemispheric transfer of emotionally significant information, which is generally interpreted as the disintegration of the coordinated work of brain structures.

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