



Burnout Syndrome in the Context of Entropy Neuron-Glial Networks of the Brain



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Abstract

The article discusses the diagnosis of SPV and defines its place among the other mental illnesses with a new unique method of dispersion of amplitude-frequency characteristics of the alpha rhythm. The technique allows moving from categorical methods of diagnosis in psychiatry to a demersal, to a certain extent, providing the search of a new paradigm.

Keywords: Professional burnout syndrome; Dispersion of alpha-rhythm; Diagnosis of mental illness

Abbreviations: BPD: Borderline personality disorder; BS: Burnout syndrome; DAFCAR: Dispersion of Amplitude-Frequency Characteristics of the alpha rhythm EEG; NGNB: Neuron-Glial Network of the brain; HVT: Hyperventilation test; CD α 1: Coefficient of Dispersion of alpha-Rhythm EEG-1 (the quotient of the modal values of power of alpha rhythm to his total power in the range of 7-13 Hz); CD α 2: Coefficient of Dispersion of the alpha-Rhythm EEG-2 (the quotient of the power of the alpha rhythm in the range of "a modal value ± 0.5 Hz" to his total power in the range of 7-13 Hz); O Mo f: Value of the Modal Frequencies in Occipital Electrodes; F Mo f: Value of the Modal Frequencies in Frontal Electrodes; O Mo f - F Mo f: Value of the Difference of Modal Frequencies Between the Occipital and Frontal Electrodes; IIDA: Integral Index of Dispersion of the Alpha rhythm EEG (Value of the Kurtosis of the Normal Distribution CD α 1 in the Occipital Electrodes); ADA: Asymmetry Distribution of the Alpha rhythm EEG (Value of the symmetry Distribution CD α 1 in the Occipital Electrodes); IIH: Value of the Index Hypofrontality (Kurtosis of the Normal Distribution CD α 1 in the Frontal Electrodes); AH: Value of the Asymmetry of CD α 1 in the Frontal Electrodes; CV% - the Coefficient of Variation; CI: Confidence Interval; c.u.: Conditional Unit

Introduction

The problem of "burnout" in social terms goes far beyond the production problems. The World Health Organization considers the disease a "global epidemic", estimating the annual loss from her 200,000,000,000\$. Because we are all participants in the proceedings, and sick pay, hospitalization, and costs from reduced productivity are heavy burdens on the state budget. Social consequences of "burnout" of the President in historical terms can cost the lives of millions of its inhabitants and the inhabitants of neighboring countries, and change the historical fate of continents. And this is no exaggeration [1,2].

In history, led many States were often personality, which fully fit the criteria of "burnout", or simply a mental disorder. However, we have no data on the survey of presidents and kings, so in the continuation of cycle of articles, devoted to a new method of studying the entropy of the NHS GM, we race-look, what are the signs of DAFCAR is characterized by the syndrome of professional burnout among people of ordinary professions,

interpolating the data obtained at all working professionally in various fields of people. Burnout syndrome (BS) was first described in 1974, the American psychologist Freudenberg [3] to describe the demoralization, frustration and extreme fatigue, which he watched from mental health workers. The developed model proved to be convenient to evaluate this condition among health care workers occupations with the highest tendency to "burnout" because their working day is a constant close contact with people, besides the pain-governmental, requiring constant care and attention, restraint. The main symptoms of BS are:

- weariness, fatigue, exhaustion after an active professional activity;
- psychosomatic problems (fluctuations in blood pressure, headaches, digestive and cardiovascular systems, neurological disorders, insomnia);
- emergence of a negative attitude to colleagues and clients (instead of the existing positive relationship)

- d. negative attitude to the activity performed;
- e. aggressive tendencies (anger and irritability towards coworkers and clients);
- f. functional, negative attitude;
- g. anxiety, pessimistic mood, depression, sense of meaninglessness of the events, the guilt [1-14].

I think it does not make sense to describe in detail the clinical characteristics of the burnout syndrome. It is widely represented in the scientific and popular literature. Very ha Acterna formation in patients with a specific behavioral pattern:

- a) the high tempo of life to achieve ill-defined (often elusive) goal;
- b) constant pursuit of comparing and competition, to the promotion;
- c) a persistent search of recognition;
- d) active participation in different activities;
- e) lack of time;
- f) high commitment to action;
- g) impatience and constant rush;
- h) the sense of insecurity;
- i) the high tempo of life and accelerate many physical and mental functions;
- j) inability to relax.

Symptoms of this type of behavior: pointless hostility, irritability, rapid, loud, staccato speech, emphasizing certain words, expressions, energetic gestures and such people quickly go and quickly eat [7].

It should be noted that the overwhelming number of works devoted to professional burnout based on descriptive psychiatric and psychological techniques. Of course, there are also quite extensive neurophysiological researches on this issue. However, the disadvantage is of minor clinical value, because changes detected by these authors non-specific and rarely used as markers of psychopathology [6]. BS currently has the status of a diagnosis in the list of ICD-10 Z73 and Z56 Problems related to the difficulties of their lives and the problems associated with work and unemployment.

- i. Z73 Problems related to life-management difficulty
- ii. Z73.0 Burn-out
- iii. Z73.2 Lack of relaxation and leisure
- iv. Z73.4 Inadequate social skills, not elsewhere classified
- v. Z73.5 Social role conflict, not elsewhere classified

vi. Z56 Problems related to employment and unemployment

- vii. Z56.3 Stressful work schedule
- viii. Z56.4 Discord with boss and workmates
- ix. Z56.5 Uncongenial work
- x. Z56.6 Other physical and mental strain related to work
- xi. Z56.7 Other and unspecified problems related to employment

Mental burnout is understood as a professional crisis associated with the work as a whole and not only with interpersonal relationships in the process. Burnout can be equated with distress (anxiety, depression, hostility, anger) in the extreme and to the third stage about the future of the adaptation syndrome - the stage of exhaustion. Burnout is not just a result of stress a consequence of unmanaged stress [2]. In fact, diseases these are derived from the psychiatric articles in the section emotional and behavioral disorders. However, there is another point of view. As studies have shown, include the identified disorders to normal is not quite professionally, as surveyed, though continued to work, but they already had the signs of maladjustment in interpersonal and family conflicts. To account for this identified disorder cannot be attributed to normal.

They require correction, and in most cases, and the treatment, otherwise the person having the symptoms, become more marginalized, which can lead to care at a lower professional level, including refusal of work; there is a more profound violation of interpersonal relations (the destruction of families, quarrels with the children, breakup of a relationship with a significant inner circle and friends). Deeper manifestations of maladjustment, maintaining professional status, may be alcoholism, abuse of tranquilizers, it is possible to use professional access to medicines. Maladjustment can go up to suicidal tendencies and completed suicides. All this confirms the need to combine the identified symptoms in a separate nosological unit, which should be considered in the context of ICD-10 [7]. Thus, to establish the ownership of SPV to psychopathology is an important methodological problem of psychiatry, it is impossible without evidence of the role of organic and functional pathological changes in the brain in this disease.

a. The purpose of the study: to determine whether patients with BS signs of accelerated entropy NGNB.

Materials and Methods

Was studied 68 men and 64 women aged from 25 to 40 years who underwent inpatient psychiatric examination and comply with the clinical criteria of SPV. Their distribution by occupational category is presented in (Table 1). All of them performed EEG

according to standard methods with the installation of the electrodes according to the international scheme “10-20%” with ipsilateral reference electrodes with conducting HVT for 3 min with a frequency of 16 in-depth breaths in 1 min. Clinical and

anamnesic data were collected on the basis of entries in the case histories. The obtained results were statistically processed using Microsoft Excel and Statistica 10.0 according to the method of determining the parameters DAFCAR [8].

Table 1: Distribution of patients according to professional categories.

Professional contingent	Men, experience			Women, experience		
	1-4 years	5-9 years	10 years or more	1-4 years	5-9 years	10 years or more
Managers of different levels			2		2	
Health workers		2	5	1	5	10
University Professors		2	1		3	3
Teachers of secondary schools		2	2	2	5	4
Educators of preschool institutions				4	6	12
Technical workers	10	17	24		3	2
Finance staff		1		1	1	
TOTAL	10	24	34	8	25	31

Results

Analysis of the case histories revealed the following distribution of patients according to the criteria of BS (Tables 2-6).

a. Discussion of the results

Table 2: The distribution of the patients according to the criteria of BS.

Criteriafor BS	Men	Women
fatigue, fatigue, exhaustion after an active professional activities	66	64
psychosomatic problems (fluctuations in blood pressure, headaches, digestive and cardiovascular systems, neurological disorders, insomnia)	55	60
the emergence of negative attitudes to customers	45	56
a negative attitude to the activity performed	65	59
aggressive tendencies (anger and irritability towards coworkers and customers)	67	45
Auto aggression, negative attitude	45	44
Anxiety, pessimistic mood, depression, sense of meaninglessness of the events, the guilt.	64	62

Table 3: The distribution of the patients a BS in clinical diagnostic syndromes.

Clinical syndromes	Men	Women
Asthenic and asthenic-hypochondriac	51	48
reduction of professional duties and achievements	62	58
neurotic depersonalization	10	10
obsessive-phobic	10	10
professional diluting or cynicism	7	6
depressive different severity	37	35
of them :		
disturbing option	24	22
dysphoric	7	6
apathetic	10	10
mixed	27	26
Alcohol abuse		
Domesticdrinking	50	45
alcoholism stages 1-2	14	3

A General analysis of the contingent of the surveyed shows that the SPV group represented young people, socially successful, with higher and specialized secondary education and work experience up to 10 years. In spite of numerous psychological and psychosomatic problems (Table 2, таб3) according to EEG studies we do not find those changes that are characteristic of BPD [12]. Cartograms not different from normal, however in

conjunction with the data (Tables 4-6) there is a slight increase of the indices DAFCAR compared to the norm, particularly in frontal leads (K/Δa1 F, IIG) with some trends of alpha rhythm slowing (decrease in O Mo F). This fact is very interesting, because it reflects the overall tendency of these patients to the anxiety and depression that was noted in the works of L. B. Ivanov [5], describing the pattern of EEG as "alarming".

Table 4: The summary table of parameters DAFCAR with BS in comparison with the norm and BPD, he left hemisphere.

Gender	Index DAFCAR	BS		BPD		Norma	
		Mean CI=95%	CV%	Mean CI=95%	CV%	Mean CI=95%	CV%
Men	Alpha-1/ Alpha	0.114 0.108-0.14	37	0.194 0.157-0.335	57	0.119 0.118-0.141	35
	Alpha-2/ Alpha	0.755 0.7-0.81	21	0.593 0.518-0.638	30	0.773 0.737-0.808	18
	Alpha-3/ Alpha	0.137 0.08-0.195	120	0.141 0.111-0.17	83	0.134 0.09-0.178	128
	F Morf	0.387 0.245-0.508	21	0.305 0.18-0.33	49	0.384 0.274-0.594	14
	O Morf	0.741 0.717-0.766	9	0.573 0.528-0.618	31	0.745 0.727-0.762	9
	Δ Morf (O-F)	7.1 6.176-8.025	37	4.054 2.933-6.175	111	6.895 6.359-7.431	30
	CDa1	2.67 2.515-2.815	16	1.948 1.721-2.175	47	2.657 2.573-2.741	12
	CDa2	10.15 9.93-10.37	6	9.79 9.56-10.02	9	10.25 10.11-10.4	6
	CDa1_F	10.07 9.84-10.3	6	9.22 8.94-9.5	12	10.26 10.13-10.41	5
	CDa2_F	0.11 0.05-0.17	150	0.57 0.26-0.88	217	0.84 0.62-0.86	228
	Δ F	0.352 0.233-0.472	22	0.155 0.138-0.175	51	0.33 0.216-0.443	23
	EDA	0.648 0.616-0.68	14	0.449 0.411-0.487	34	0.623 0.597-0.649	16
	ADA	7.271 6.424-8.117	33	3.053 2.106-4	124	8.334 5.925-9.144	36
	EH	2.667 2.515-2.816	16	1.613 1.493-1.833	55	2.542 2.427-2.656	18
	IZ	0.131 0.089-0.173	92	0.129 0.097-0.161	100	0.148 0.121-0.176	72
	Age	28.176 26.798-29.555	14	26.719 26.479-26.959	14	21.508 20.033-22.984	27
Women	Alpha-1/ Alpha	0.114 0.101-0.148	50	0.188 0.147-0.229	57	0.121 0.093-0.149	40
	Alpha-2/ Alpha	0.808 0.733-0.83	8	0.581 0.517-0.625	30	0.813 0.779-0.846	7
	Alpha-3/ Alpha	0.079 0.053-0.105	91	0.138 0.109-0.167	83	0.094 0.06-0.131	64
	F Morf	0.312 0.238-0.336	22	0.301 0.176-0.326	49	0.384 0.267-0.512	17
	O Morf	0.77 0.748-0.791	8	0.561 0.517-0.606	31	0.762 0.727-0.798	8
	Δ Morf (O-F)	7.701 6.585-8.817	40	3.973 2.874-6.071	111	6.674 5.558-7.789	29
	CDa1	2.751 2.575-2.922	17	1.909 1.686-2.131	47	2.651 2.462-2.841	12
	CDa2	9.93 9.77-10.09	4	9.59 9.37-9.82	9	10.13 9.87-10.38	4
	CDa1_F	9.93 9.78-10.07	4	9.03 8.76-9.31	12	10.07 9.77-10.37	5
	CDa2_F	0.09 0.04-0.13	140	0.56 0.26-0.86	217	0.85 0.63-0.14	270
	Δ F	0.358 0.238-0.477	21	0.152 0.131-0.171	51	0.33 0.182-0.443	25
	EDA	0.649 0.615-0.684	15	0.44 0.403-0.477	34	0.616 0.553-0.68	18
	ADA	7.074 6.815-8.372	32	2.992 2.064-3.92	124	8.366 4.589-9.754	28
	EH	2.741 2.598-2.884	14	1.581 1.365-1.796	55	2.373 2.204-2.543	12
	IZ	0.136 0.089-0.19	100	0.126 0.093-0.158	100	0.169 0.105-0.233	66
	Age	28.8 27.3-30.1	13	29.7 28.7-30.8	14	24.5 22.8-26.9	35

Table 5: The summary table of parameters DAFCAR with BS in comparison with the norm and BPD, the right hemisphere.

Gender	Index DAFCAR	BS		BPD		Norma	
		Mean	CV%	Mean	CV%	Mean	CV%
		CI=95%		CI=95%		CI=95%	
Men	Alpha-1/ Alpha	0.119 0.1-0.138	45	0.284 0.239-0.328	63	0.112 0.101-0.123	38
	Alpha-2/ Alpha	0.761 0.706-0.816	21	0.605 0.558-0.652	31	0.793 0.754-0.83	18
	Alpha-3/ Alpha	0.105 0.048-0.161	154	0.111 0.086-0.137	92	0.095 0.056-0.133	150
	F MoI	0.282 0.26-0.304	22	0.215 0.192-0.239	44	0.296 0.284-0.307	16
	O MoI	0.733 0.7-0.766	13	0.586 0.544-0.627	29	0.767 0.749-0.785	9
	ΔMoI(O-F)	6.901 5.922-7.88	40	4.76 3.743-5.778	86	7.137 6.563-7.711	31
	CDa1	2.617 2.458-2.776	17	2.102 1.891-2.313	40	2.766 2.635-2.798	13
	CDa2	10.06 9.83-10.29	7	9.67 9.44-9.89	9	10.25 10.1-10.39	6
	CDa1_F	9.95 9.71-10.2	7	9.37 9.1-9.64	11	10.26 10.12-10.4	5
	CDa2_F	0.12 0.04-0.17	131	0.3 0.1-0.5	267	0.05 0.02-0.08	202
	AC_F	0.249 0.231-0.266	21	0.165 0.135-0.175	52	0.23 0.215-0.244	24
	HDA	0.645 0.617-0.673	13	0.449 0.411-0.487	34	0.625 0.598-0.653	17
	ADA	7.319 6.569-8.069	29	2.951 1.977-3.924	132	6.194 5.521-6.868	42
	HR	2.684 2.66-2.808	13	1.584 1.355-1.813	58	2.479 2.348-2.61	20
	IZ	0.215 0.172-0.258	58	0.178 0.143-0.214	79	0.241 0.218-0.264	37
	Age	28.176 26.798-29.335	14	29.719 28.479-30.738	14	21.533 20.033-23.033	27
Women	Alpha-1/ Alpha	0.114 0.092-0.135	52	0.278 0.235-0.322	63	0.113 0.077-0.149	55
	Alpha-2/ Alpha	0.825 0.798-0.852	9	0.593 0.546-0.639	31	0.822 0.778-0.866	9
	Alpha-3/ Alpha	0.046 0.035-0.057	64	0.109 0.084-0.134	92	0.065 0.043-0.087	58
	F MoI	0.308 0.284-0.332	21	0.211 0.188-0.234	44	0.275 0.253-0.296	14
	O MoI	0.779 0.747-0.811	11	0.574 0.533-0.615	29	0.776 0.742-0.811	8
	ΔMoI(O-F)	7.465 6.509-8.401	35	4.665 3.668-5.662	86	6.031 5.128-6.935	26
	CDa1	2.728 2.583-2.873	15	2.06 1.854-2.267	40	2.558 2.393-2.722	11
	CDa2	9.85 9.67-10.02	5	9.47 9.25-9.7	9	10.16 9.89-10.44	5
	CDa1_F	9.8 9.61-9.99	5	9.18 8.92-9.44	11	10.29 9.79-10.39	5
	CDa2_F	0.08 0.04-0.12	151	0.29 0.1-0.49	267	0.07 -0.03-0.18	254
	AC_F	0.257 0.236-0.279	23	0.152 0.133-0.172	52	0.208 0.178-0.237	24
	HDA	0.651 0.615-0.687	15	0.44 0.402-0.478	34	0.61 0.546-0.675	18
	ADA	7.553 6.654-8.452	33	2.892 1.938-3.846	132	4.993 3.758-6.229	43
	HR	2.714 2.564-2.863	15	1.552 1.328-1.777	58	2.281 2.016-2.547	20
	IZ	0.208 0.156-0.259	67	0.175 0.14-0.209	79	0.233 0.165-0.3	50
	Age	33.013 27.6303	13	29.7 28.7-30.3	14	34.9 27.5-41.9	35

Table 6: Comparative indicators of differences in the average values of certain parameters of the BS compared with normal by Student's test (t-value).

Index DAFCAR	Gender	Hemisphere	Mean	Mean	t-value	df	p
			BS	NORMA			
CDa1 F	men	left	0.25233	0.22963	1.99424	93	0.049054
O Mof - F Mof	men	left	0.10985	0.04098	2.60665	93	0.010649
CDa2	men	right	0.73312	0.76716	-2.01705	92	0.046605
IIH	men	right	7.31903	6.19448	2.13670	92	0.035276
AH	men	right	2.68438	2.47891	2.08738	92	0.039619
F Mof	men	right	9.95409	10.26250	-2.37560	92	0.019595
O Mof - F Mof	men	right	0.11699	0.05000	2.55395	92	0.012295
CDa1 F	women	left	0.25795	0.21252	2.64318	44	0.011336
IIH	women	left	7.69359	5.36648	3.30394	44	0.001901
AH	women	left	2.74079	2.37313	3.10866	44	0.003290
CDa1 F	women	right	0.25720	0.20755	2.72663	44	0.009153
IIH	women	right	7.55302	4.99323	3.33681	44	0.001730
AH	women	right	2.71374	2.28147	3.14723	44	0.002956
O Mof	women	right	9.84636	10.16071	-2.01666	44	0.049860

Note. Values highlighted in red font are statistically significant differences in the compared groups.

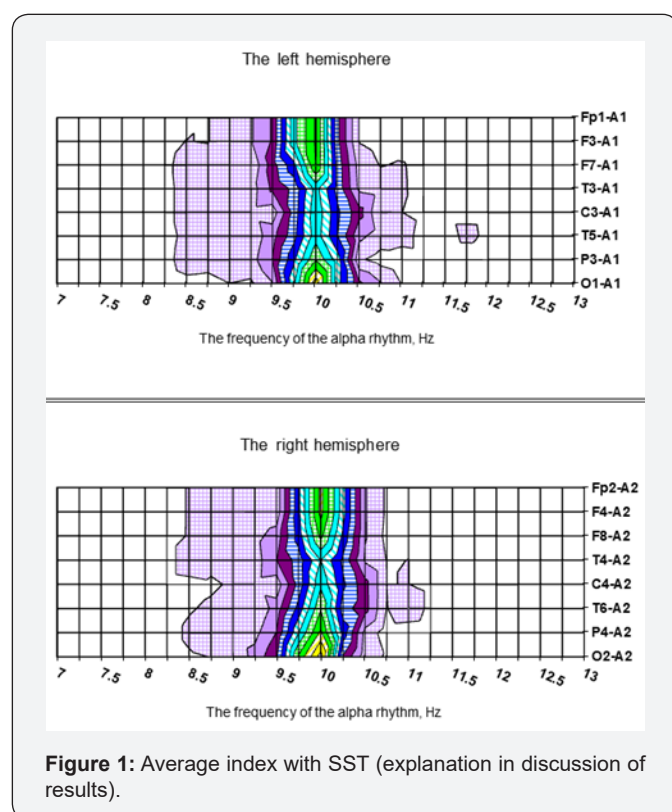


Figure 1: Average index with SST (explanation in discussion of results).

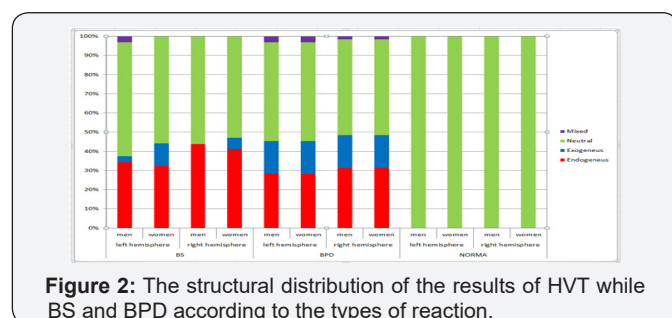


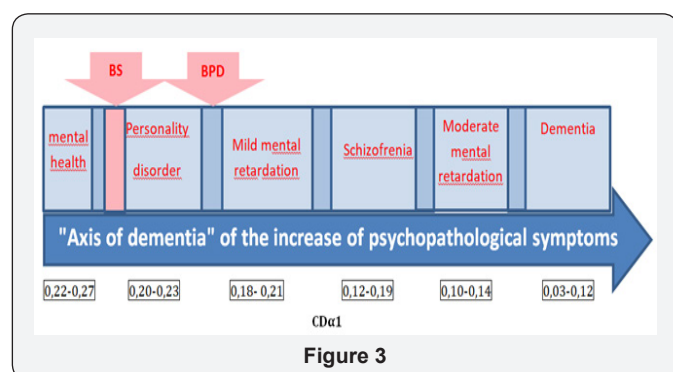
Figure 2: The structural distribution of the results of HVT while BS and BPD according to the types of reaction.

In all likelihood, this process reflects a compensatory reaction to a stressful mechanisms, which are aimed at preservation of stability and synchronization of work of all Department of the brain. Such “functional supersynchronous” brain activity for some time is able to maintain stability and efficiency. However, resources such mode of operation is very limited (Figure 1). Accordingly, all parameters DAFCAR when BS is much higher than those with BPD, thus it is doubtful that BS belonged to the BPD group. An interesting situation arises - BS when we have a normal EEG with elements of “a disturbing pattern”. However, the results of the assessment data show HVT, that we are dealing with subcompensated disorders, and this is confirmed by the analysis of structural distribution of the results of HVT for the types of reaction. It is clearly seen that these results with BS are almost identical to the results in BPD (Figure 2). There is even a structural predominance of the endogenous reaction in BS, but most likely, if the BPD has a prevalence of exogenous pathology of vascular and toxic Genesis in patients of this category, a very high percentage of alcoholism and asocial. This may be caused by the following reasons:

- Changes to the NGNB at subcompensated BS are subclinical in nature
- There is a constitutional defect NGNB, which leads to destabilizing go-the criminal brain.

Previous articles in this series [8,9,12,13] on DAFCAR emphasized repeatedly on the stability of endogenous reactions in ontogenesis. Of course, this is only a hypothesis, but it is possible that here we are faced with the true cause of certain mental illnesses. No one doubts that schizophrenia is transmitted genetically, however, the gene for schizophrenia has never been found. Perhaps, genetically transmitted functional failure of the frontal lobes to respond adequately to stress – instead of the synchronized activities of neurons occurs disrupting their work.

Thus, dopamine synchronization mechanism of the brain leads to the opposite effect.



When a BS picture of imaginary EEG of well-being in which the entropy NGNB are in the intermediate stage, subclinical, so the “axis of dementia” BS is directly next to the norm, but the norm is no longer (Figure 3). Independent confirmation of these results could have very significant implications for the evaluation of patients to identify potential candidates for the SPV group. This has implications for the prediction of stress examined for inclusion in the composition of the contingent employed in the heavy and responsible operations. Preventive examination in the clinical examination will allow you to diagnose hidden psychopathology that will help to reduce the incidence of such socially significant diseases as depression, drug addiction and alcoholism, will reduce the level of suicides.

Currently, the possibility of this is greatly facilitated by using a new instrument, which is based on the identification of the degree of entropy NGNB according to the method of determining indices of DAFCAR- “Detector of the neuropsychiatric disorders” produced by MCS (Zelenograd, Russia). Of course, the question may arise why the dispersion characteristics of the alpha rhythm are not absolute? The answer is very simple: first, despite the fact that in a series of articles dedicated to the new method of the study has been proved repeatedly the ability of the indexes DAFCAR to identify psychopathology, it cannot be assumed that this token entropy NGNB - only; second, those who read an article on fractal mechanism of the brain[8], it should be understood that using the classic EEG we see not three-dimensional and two-dimensional distribution pattern DAFCAR, and therefore much of the information is hidden from us, because the neurophysiological fractal of the brain is three-dimensional [8].

We still have a lot should learn – for example, to link DAFCAR with the phase changes of the oscillations of the potentials(a measure of coherence) in the brain, to understand the mechanisms of regulation of the number of iterations in NGNB-before we can talk about the complex markers of entropy NGNB. But the most important thing is to ensure that potentials in the whole volume of the brain non-invasive way.

Conclusion

- Patients with BS are primary, sub compensated, signs of entropy NGNB, which can be verified using EEG HVT according to S. V. Rosman (2017).
- It is not excluded that BS patients before any clinical symptoms had a predisposition to this disease in the form of hidden functional inferiority of the NGNB, which may be uncompensated as a result of distress.
- Early diagnosis of the initial stages of the BS by using a new method of identifying entropy NGNB - dispersion of amplitude-frequency characteristics of the alpha rhythm, will help to timely identify patients with the goal of preventing, in the process of treatment, the severe social consequences of the BS -suicide, crime, alcoholism, drug abuse and significant economic losses.

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