

IS THE COMORBIDITY OF A MILD TRAUMATIC BRAIN INJURY A FACTOR INFLUENCING THE REDUCTION OF SYMPTOMS OF POST-TRAUMATIC STRESS DISORDER IN VETERANS?

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ДА ЛИ ЈЕ КОМОРБИДИТЕТ БЛАЖЕ ТРАУМАТСКЕ ПОВРЕДЕ МОЗГА ФАКТОР КОЈИ УТИЧЕ НА СМАЊЕЊЕ СИМПТОМА ПОСТТРАУМАТСКОГ СТРЕСНОГ ПОРЕМЕЋАЈА КОД ВЕТЕРАНА?

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ABSTRACT

Objective. To investigate the relationship between the severity of clinical symptoms and functioning in veterans with comorbidity of PTSD and mTBI in comparison with veterans with monopathology (mTBI or PTSD) after an 8-week comprehensive intervention [combining a psychotherapy program with transcranial direct current electrical stimulation (tDCS)].

Methods. 329 veterans (PTSD (n = 109), mTBI (n = 112), PTSD + mTBI (n = 108)) were examined using The Four-Dimensional Symptom Questionnaire - 4DSQ, WHODAS 2.0 and BAT-L. Standardized treatment was provided as well as psychotherapeutic intervention - a combination of psychoeducation with motivational interviewing and acceptance and commitment therapy for PTSD (ACT) and transcranial direct current stimulation (tDCS).

Results. Depressive symptoms in PTSD combine with impaired social activity, impaired functioning due to the disease, self-care defects. In the PTSD/TBI group, psychological distress was associated with the depth of cognitive impairments, in contrast to the PTSD group, where no such pattern was found. Also, in contrast to the PTSD group, there was a noticeable increase in daytime activity with a reduction in depressive symptoms.

Conclusion. The presence of excitement and hyperactivation in TBI patients with pronounced consequences of combat traumatic brain injury, even in the absence of clinically defined PTSD, as well as the relationship between the expressiveness of TBI, not related to combat trauma, and the level of depressive symptoms indicate the need for routine examination of all patients with TBI for the presence of comorbid PTSD and depression.

Key words: stress disorders, post-traumatic; brain injuries, traumatic; comorbidity; veterans; transcranial direct current stimulation.

САЖЕТАК

Циљ. Истражити везу између тежине клиничких симптома и функционисања код ветерана с коморбидитетом PTSP-а и mTBI у поређењу с ветеранима са монопатологијом (mTBI или PTSP) након осмонедељне свеобухватне интервенције [комбиновање психотерапијског програма са транскранијалном стимулацијом једносмерном струјом (tDCS)].

Методе. Испитано је 329 ветерана (PTSP, n = 109, mTBI, n = 112, PTSP + mTBI, n = 108) коришћењем упитника за четвородимензионалне симптоме – 4DSQ, WHODAS 2.0 и BAT-L. Обезбеђени су стандардизован третман и психотерапеутска интервенција – комбинација психоедукације с мотивационим интервјуисањем и терапијом прихватања и посвећености за PTSP (ACT) и транскранијалну стимулацију једносмерном струјом (tDCS).

Резултати. Депресивни симптоми код PTSP-а комбинују се с поремећеном друштвеном активношћу, поремећеним функционисањем услед болести и недостацима у самозбрињавању. У групи са PTSP/TBI психолошки дистрес био је повезан с дубином когнитивних оштећења, за разлику од PTSP-а групе, где такав образац није пронађен. Такође, за разлику од PTSP-а групе, приметно је повећање дневне активности уз смањење симптома депресије.

Закључак. Присуство узбуђења и хиперактивације код пацијената са TBI са израженим последицама борбене трауматске повреде мозга, чак и у одсуству клинички дефинисаног PTSP-а, као и однос експресивности TBI, који није у вези с борбеном траумом, и степена депресивности, указују на потребу рутинског прегледа свих пацијената са TBI на присуство коморбидног PTSP-а и депресије.

Кључне речи: стресни поремећаји, посттравматски; повреде мозга, трауматске; коморбидитет; ветерани; транскранијална стимулација једносмерном струјом

INTRODUCTION

The combination of traumatic brain injury (TBI), as a result of a mine-explosive injury, with post-traumatic stress disorder (PTSD) is a painful condition that is

difficult to cure due to the partial overlap of clinical symptoms and a significant impact on the functioning of veterans, which significantly worsens the quality of life in general (1-3). Moreover, while curing such patients, it is necessary to take into account the probability of clinical

impact of individual clusters of remote consequences of previous TBI (4): cognitive dysfunction; emotional-behavioral, somatosensory and somatic symptoms; addictive cluster, etc. Moreover, depressive symptoms and somatization of mental disorders quite often acquire clinical significance (3).

Thus, a study of a sample of 736 military personnel and veterans found that the average overall severity of somatic symptoms in the PTSD group with comorbid depression was high and significantly different from that in groups with only PTSD or MDD or without these diseases. The results of this study indicated that the manifestation of comorbid PTSD and MDD is more harmful in terms of the severity of somatic symptoms than either disorder alone. The authors noted that after diagnosis of the mental state, servicemen and veterans should be examined for the presence and severity of somatic symptoms (5).

It is generally known that military personnel and veterans have a higher risk of developing mental disorders such as PTSD and major depressive disorder than the civilian population, as well as a higher degree of severity of somatic symptoms than civilians (6-8). Somatic symptoms negatively affect everyday functioning in both civilians and military personnel (9-11).

A longitudinal study of US military personnel found that 8.7%, 9.9%, and 12.5% of participants had at least moderate severity of somatic symptoms at baseline, 3 years, and 6 years, respectively (12). In a study by Engel C.C. Jr. and co-author found an independent relationship between PTSD and the number of somatic symptoms: veterans with PTSD had an average of 6.7 somatic symptoms, and veterans with other mental disorders other than PTSD had an average of 5.3 somatic symptoms (13). Finally, a Canadian study found that PTSD symptom severity was associated with gastrointestinal and musculoskeletal somatic symptoms, as well as headache (14).

Experiencing a concussion during combat also increases the risk of PTSD or depression: 44% of soldiers who lost consciousness on the battlefield met criteria for PTSD three to four months after returning from Iraq, compared with 16% of those with other injuries, and 9% had no injuries. The rate was 27% for those concussed soldiers who did not lose consciousness (15). It is also worth paying attention to the fact that in many cases we are talking about repeated TBI, because mTBI received in the civilian period of life are often not diagnosed and treated, but in the future negatively affect the psychosomatic condition of veterans due to the increase in the burden of general traumatization with the corresponding clinical symptoms (16).

A study of retrospective TBI diagnoses among 153 veterans using The Boston Assessment of Traumatic Brain

Injury–Lifetime (BAT-L) found that 43% of TBIs reported in the BAT-L had no documented evaluation or diagnosis in DoD records USA (17). The authors noted that this study addresses a critical research gap by comparing the diagnostic accuracy of a validated semi-structured clinical interview with existing medical records.

Diagnosis of TBI using the BAT-L was both sensitive and specific compared to the DoD records, supporting the validity of the BAT-L for retrospective assessment of TBI in the military. Therefore, it is clear that the provision of comprehensive medical care and rehabilitation to veterans with LTB, PTSD and a combination of these painful conditions must take into account the cumulative burden of brain trauma.

The purpose of the study was to investigate the relationship between the severity of clinical symptoms and functioning in veterans with comorbidity of PTSD and mTBI in comparison with veterans with monopathology (mTBI or PTSD) after an 8-week comprehensive intervention (combining a psychotherapy program with transcranial direct current electrical stimulation (tDCS)).

PATIENTS AND METHODS

After providing informed consent to participate in the study and completing the study program (initial examination, treatment program, re-examination), the data of 329 veterans from three clinical groups, namely: individuals with PTSD ($n = 109$), with mild TBI ($n = 112$) and with comorbid PTSD+TBI ($n=108$), were analyzed regarding the relationship between the expressiveness of clinical symptoms according to the Four-Dimensional Symptom Questionnaire (4DSQ) and functioning according to the WHODAS 2.0 scale and the cumulative severity of brain injuries according to the Boston Lifetime Traumatic Brain Injury Assessment (BAT-L). The diagnostic criteria for TBI, depending on severity (mild, moderate, severe), have been elaborated by the American Congress of Rehabilitation Medicine (ACRM) and set out in the relevant clinical.

All patients, in addition to standard therapy in accordance with the Unified Protocols for PTSD and mTBI, received psychotherapeutic intervention (a combination of psychoeducation with elements of motivational interviewing and acceptance and commitment therapy for PTSD (Acceptance and Commitment Therapy, ACT)) and transcranial direct current electrical stimulation (tDCS). The duration of the treatment was 8 weeks: 10 tDCS sessions daily and 8 weekly psychotherapy sessions lasting 45-60 minutes 1-2 times a week.

The Mann-Whitney U coefficient was calculated when comparing the BAT-L test indicators of the representatives of the studied groups. A rank correlation was also

determined between the data of the primary and re-examination for each clinical group on all the scales involved in the study.

RESULTS

When calculating the indicators on the scale of the BAT-L method between respondents of different research groups with the estimated U Mann-Whitney coefficient (Table 1), it was shown that on all scales, the group of respondents with PTSD ($p \leq 1E-18$) had the lowest levels, while the representatives of the TBI group ($p \leq 0.00903$) had the highest, which corresponds to logic. The connection is only a comparison of indicators of the scale of assessment of craniocerebral injuries received after returning from the combat zone (RO) in the group of respondents with PTSD and TBI, in the case of which no statistically significant differences were found ($p = 0.77224$).

It should also be noted that the indicators of the scales of receiving TBI during hostilities (MV and MO) in the representatives of the PTSD group were equal to "0", the largest indicators of these scales were in the respondents of the TBI group ($\mu = 4.85$ and $\mu = 2.24$, respectively) and significantly smaller among the respondents of the PTSD/TBI group ($\mu = 3.58$ and $\mu = 2.02$, respectively). The specified features confirm the correctness and strict adherence to the criteria for including respondents in the research groups.

The results of the calculation of the ρ -Spearman rank correlation coefficient for the indicators obtained during the examination of the TBI and TBI groups are shown in Table 2.

As a result of the analysis of the BAT-L and CAPC techniques, statistically significant negative correlations between the values of the integral indicator of cluster D of the CAPS methodology (cognitive and emotional symptoms) and the integrated BATL indicator ($\rho = -0.206$; $p = 0.029$) were found in the TBI group and the MO scale ($\rho = -0.262$; $p = 0.005$). There was also a positive correlation between the integral indicator E of the CAPC technique and the MO scale of the BAT-L test ($\rho = -0.189$; $p = 0.046$). The identified features make it possible to assume the statement that patients with pronounced consequences of combat craniocerebral trauma have more pronounced symptoms of excitement and hyperactivation.

The calculation of the ρ -Spearman rank correlation coefficient of the indicators of the BAT-L and CAPS methods in the representatives of the PTSD/TBI group did not reveal any statistically significant correlations ($p \geq 0.053$), and this, in our opinion, can be interpreted in general as the quality of the evidence of the absence of relationships between the characteristics and symptoms of craniocerebral injury, which were studied by the BAT-L technique, and the symptoms of PTSD, which were studied using the SARS scale.

The calculation of the ρ -Spearman rank correlation coefficient of the 4DSQ and BAT-L indicators of the representatives of the studied groups (Table 3) revealed correlations only in the representatives of the TBI group between the DEP and PO scales ($\rho = 0.1881$; $p = 0.047$) – a positive correlation. Thus, according to the results of the calculations, we can only notice the relationship between the expressiveness of TBI, not related to combat trauma, and the level of depressive symptoms.

Table 1. Comparing the BAT-L test indicators of the representatives of the studied groups – results of the calculation of the Mann-Whitney U coefficient.

Scale	Group	μ	min	max	Group	Scale	U	p
MB	PTSD	0	0	0	PTSD-TBI	MB	0	<0.001
	TBI	4.85	3	9		MO	436	<0.001
	PTSD/TBI	3.58	0	9		PM	0	<0.001
MO	PTSD	0	0	0		PO	288.5	<0.001
	TBI	2.24	0	3		BAT	0	<0.001
	PTSD/TBI	2.02	0	4	PTSD-TBI/PTSD/TBI	MB	436	<0.001
PM	PTSD	2.0	2	2		MO	490.5	<0.001
	TBI	3.93	3	5		PM	2234.5	<0.001
	PTSD/TBI	3.05	2	5		PO	2670.5	<0.001
						BAT	0	<0.001
PO	PTSD	1.0	1	1	TBI-PTSD/TBI	MB	4180	<0.001
	TBI	1.53	1	2		MO	4870	0,009
	PTSD/TBI	1.55	1	2		PM	3130.5	<0.001
BATL	PTSD	3.0	3	3		PO	5930	0.77224
	TBI	12.5	7	18		BATL	3191	<0.001
	PTSD/TBI	10.2	4	18				

MB – military mine-explosive TBI; MO - other military TBI; PM - pre-war TBI; PO – TBI received after demobilization.

Table 2. Results of the calculation of the ρ -Spearman rank correlation coefficient of the indicators of the BAT-L method and the integral scales of the SARS of representatives of the TBI and PTSD/TBI groups.

Scale		B	C	D	E	G	CAPS
Group		TBI					
MB	ρ	-0.003	-0.112	-0.146	0.157	-0.06	-0.01
	p	0.979	0.24	0.124	0.097	0.532	0.92
MO	ρ	-0.006	0.065	-0.262	0.189	-0.162	-0.019
	p	0.948	0.499	0.005	0.046	0.087	0.841
PM	ρ	0.088	0.143	-0.055	-0.046	0.137	0.004
	p	0.354	0.132	0.564	0.628	0.149	0.968
PO	ρ	-0.01	0.066	0.112	-0.054	-0.014	0.048
	p	0.916	0.491	0.241	0.574	0.885	0.614
BATL	ρ	0.029	-0.016	-0.206	0.174	-0.074	2E-04
	p	0.762	0.868	0.029	0.067	0.441	0.998
Group		PTSD/TBI					
MB	ρ	0.187	0.06	0.029	0.064	0.037	0.106
	p	0.053	0.535	0.764	0.51	0.701	0.273
MO	ρ	0.031	-0.024	0.018	0.093	-0.012	0.07
	p	0.753	0.804	0.85	0.341	0.901	0.474
PM	ρ	-0.053	0.097	0.078	0.09	0.094	0.046
	p	0.585	0.316	0.424	0.354	0.335	0.638
PO	ρ	-0.018	-0.034	0.044	-0.036	0.111	0.02
	p	0.856	0.729	0.653	0.709	0.255	0.837
BATL	ρ	0.12	-0.018	0.073	0.107	0.051	0.111
	p	0.215	0.857	0.455	0.269	0.603	0.253

MB – military mine-explosive TBI; MO - other military TBI; PM - pre-war TBI; RO – TBI received after demobilization. B - CAPS criterion ("invasion" symptoms); C - CAPS criterion (avoidance symptoms); D - CAPS criterion (cognitive and emotional symptoms. E - CAPS criterion (disruption and hyperactivation symptoms); G - CAPS criterion (clinically significant distress or functional impairment); CAPS - total CAPS score.

Table 3. Results of the calculation of the ρ -Spearman rank correlation coefficient of the indicators of the 4DSQ and BAT-L methods of representatives of the TBI and PTSD/TBI groups during the first examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
TBI						
MB	ρ	0.1199	-0.1103	-0.0606	0.1066	0.0697
	p	0.2081	0.2472	0.5256	0.2634	0.4655
MO	ρ	0.0554	0.0733	0.006	-0.2163	-0.0035
	p	0.5617	0.4423	0.9501	0.062	0.971
PM	ρ	0.0289	0.0403	-0.1069	0.0613	-0.0587
	p	0.762	0.6732	0.2617	0.5211	0.5384
PO	ρ	-0.0054	0.1881	-0.118	-0.0259	-0.1199
	p	0.9552	0.047	0.2152	0.786	0.2081
BATL	ρ	0.1618	-0.0142	-0.0622	-0.0141	0.0463
	p	0.0882	0.8819	0.5145	0.8831	0.628
PTSD/TBI						
MB	ρ	-0.0469	-0.1436	-0.0152	0.0163	-0.099
	p	0.6297	0.1382	0.8759	0.8674	0.3079
MO	ρ	-0.0239	-0.1139	-0.0104	-0.088	-0.1187
	p	0.8059	0.2403	0.9149	0.3653	0.2213
PM	ρ	-0.0373	-0.0733	0.0553	0.0581	0.0484
	p	0.7012	0.4511	0.5694	0.5505	0.619
PO	ρ	0.0372	0.115	-0.0545	0.1081	0.0332
	p	0.7027	0.2359	0.5756	0.2653	0.7333
BATL	ρ	-0.0439	-0.1689	-0.0145	0.0462	-0.1003
	p	0.6517	0.0805	0.8818	0.6352	0.3015

MB – military mine-explosive TBI; MO - other military TBI; PM - pre-war TBI; PO – TBI received after demobilization. DIS – distress; DEP - depression; ANX – anxiety; SOM - somatization.

In order to check the relationships that may exist between certain characteristics of clinical symptoms and functionality of the studied veterans from different clinical groups, studied using the 4DSQ and WHODAS 2.0 methods, Spearman's correlation analysis was conducted (Tables 4-9).

According to the results of the analysis, it was found that in the representatives of the PTSD group (Table 4) there were statistically significant negative correlations ($\rho \geq -0.254$; $p \leq 0.009$) between the indicator of the SOM scale of the 4DSQ technique at the first examination and

the CW, SW scales and WHO of the WHODAS 2.0 method, as well as a positive correlation ($\rho = 0.256$; $p = 0.007$) between the DEP scale of the 4DSQ method and PW of the WHODAS 2.0 method.

That is, the obtained data make it possible to assume that at the time of the first examination, respondents of the PTSD group with more pronounced depressive symptoms had more pronounced disorders of social activity, and patients with more pronounced disorders of the cognitive sphere, the sphere of self-care and the general level of disabling factors, had less pronounced somatoform symptoms.

Table 4. Results of the calculation of the ρ -Spearman rank correlation coefficient of the indicators of the 4DSQ and WHODAS 2.0 methods of representatives of the PTSD group during the first examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
CW	ρ	0.13424	-0.0154	-0.009	-0.26	0.00071
	p	0.16401	0.87338	0.92634	0.00638	0.99414
MW	ρ	-0.0199	-0.151	0.03828	-0.1091	-0.0665
	p	0.83767	0.11713	0.69269	0.25857	0.4919
SW	ρ	-0.0475	0.13378	0.04545	-0.254	-0.0543
	p	0.62392	0.16548	0.63886	0.00759	0.5749
RW	ρ	0.08074	0.0599	0.03754	-0.1042	0.00714
	p	0.40394	0.5361	0.69834	0.2811	0.9413
LW	ρ	-0.1185	-0.1049	0.01776	-0.1194	-0.1292
	p	0.21984	0.2779	0.85456	0.21641	0.18057
PW	ρ	-0.0074	0.256	-0.0734	-0.0207	0.02212
	p	0.93925	0.00728	0.44827	0.83085	0.81944
WHO	ρ	0.00871	0.12033	0.00257	-0.248	-0.0645
	p	0.92841	0.21263	0.97881	0.00929	0.50521

4DSQ - The Four-Dimensional Symptom Questionnaire (The Four-Dimensional Symptom Questionnaire); DIS - distress; DEP - depression; ANX - anxiety; SOM - somatization. WHODAS 2.0. - WHO test for functional assessment; - CW - cognitive sphere; MW - mobility; SW - self-care; RW - relationships; LW - daytime activity; PW - social activity; WHO - total score.

Table 5. Results of the calculation of the ρ -Spearman rank correlation coefficient of the indicators of the 4DSQ and WHODAS 2.0 methods of the PTSD group representatives during the re-examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
CW	ρ	0.11292	-0.071	-0.009	-0.0744	0.02785
	p	0.24238	0.46299	0.9257	0.4418	0.77374
MW	ρ	-0.0821	0.05745	-0.0277	0.16986	-0.0123
	p	0.39582	0.55296	0.77494	0.07742	0.89871
SW	ρ	0.03557	0.03211	0.09006	0.207	0.09975
	p	0.7135	0.74028	0.35171	0.03067	0.3021
RW	ρ	-0.0873	-0.0085	-0.223	0.05219	-0.1826
	p	0.36665	0.93035	0.01975	0.58989	0.05738
LW	ρ	0.04415	-0.1321	-0.0205	-0.0499	-0.038
	p	0.6485	0.1708	0.83215	0.60605	0.69476
PW	ρ	0.09918	0.03958	-0.0474	0.02317	0.09029
	p	0.30485	0.68282	0.62463	0.81098	0.35045
WHO	ρ	0.09633	-0.0963	-0.1358	0.00912	-0.0377
	p	0.31902	0.31898	0.15922	0.925	0.69718

4DSQ - The Four-Dimensional Symptom Questionnaire (The Four-Dimensional Symptom Questionnaire); DIS - distress; DEP - depression; ANX - anxiety; SOM - somatization. WHODAS 2.0. - WHO test for functional assessment; - CW - cognitive sphere; MW - mobility; SW - self-care; RW - relationships; LW - daytime activity; PW - social activity; WHO - total score.

At the same time, when comparing the indicators of the WHODAS 2.0 test and the 4DSQ method during re-examination (Table 5), significant correlations were found only between the SOM and SW scales ($p=0.207$; $p=0.031$) – a positive correlation, and between ANX and RW scales ($p=-0.223$; $p=0.0198$) – a positive correlation. Therefore, after the therapy, the representatives of this research group with the most pronounced somatoform symptoms had, on the contrary, more pronounced disorders in the field of self-care, and the respondents with more pronounced disorders in the sphere of social activity were no longer depressed, but had anxious symptoms.

Table 6. Results of the calculation of the p -Spearman rank correlation coefficient of the indicators of the 4DSQ and WHODAS 2.0 methods of representatives of the TBI group during the first examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
CW	ρ	-0.0016	-0.1756	-0.1149	0.0649	-0.0576
	p	0.98644	0.06396	0.22772	0.49657	0.54639
MW	ρ	-0.0885	0.08362	0.14768	0.09011	0.12176
	p	0.3536	0.38075	0.12021	0.34474	0.20092
SW	ρ	-0.1521	-0.0576	0.00461	0.00921	-0.0707
	p	0.10929	0.54655	0.96154	0.92325	0.45871
RW	ρ	0.06169	0.11441	0.13346	-0.0774	0.11279
	p	0.51816	0.22967	0.16066	0.41754	0.23639
LW	ρ	-0.1583	0.106	-0.0036	0.08413	-0.0566
	p	0.09545	0.26598	0.97007	0.37783	0.55348
PW	ρ	-0.0895	0.03476	-0.1619	0.13775	-0.1028
	p	0.34789	0.71594	0.08807	0.14752	0.28071
WHO	ρ	-0.0805	-0.0258	-0.0463	0.14213	-0.0059
	p	0.39909	0.7868	0.62764	0.13495	0.95042

4DSQ - The Four-Dimensional Symptom Questionnaire (The Four-Dimensional Symptom Questionnaire); DIS – distress; DEP - depression; ANX – anxiety; SOM - somatization. WHODAS 2.0. - WHO test for functional assessment; - CW – cognitive sphere; MW – mobility; SW – self-care; RW – relationships; LW – daytime activity; PW – social activity; WHO – total score.

Table 7. Results of the calculation of the p -Spearman rank correlation coefficient of the indicators of the 4DSQ and WHODAS 2.0 methods of the representatives of the TBI group during the re-examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
CW	ρ	-0.0873	0.06378	0.04647	-0.0105	-0.0497
	p	0.3599	0.50406	0.62658	0.91269	0.60295
MW	ρ	-0.0845	0.01093	-0.2037	-0.0166	-0.1704
	p	0.37569	0.90896	0.08126	0.8623	0.07237
SW	ρ	-0.0068	0.10827	0.09992	0.1291	0.12826
	p	0.943	0.25582	0.29452	0.17491	0.17773
RW	ρ	-0.1348	-0.0521	-0.1296	-0.0605	-0.1238
	p	0.15662	0.58532	0.17318	0.52649	0.1933
LW	ρ	-0.0292	0.16746	-0.07	0.04282	0.0445
	p	0.75967	0.07759	0.46332	0.65391	0.64132
PW	ρ	-0.0201	-0.1036	0.07113	-0.0033	0.02729
	p	0.83379	0.27692	0.45614	0.97278	0.77514
WHO	ρ	-0.1455	0.02857	0.02309	0.00709	-0.0894
	p	0.12579	0.76493	0.80909	0.94088	0.34837

4DSQ - The Four-Dimensional Symptom Questionnaire (The Four-Dimensional Symptom Questionnaire); DIS – distress; DEP - depression; ANX – anxiety; SOM - somatization. WHODAS 2.0. - WHO test for functional assessment; - CW – cognitive sphere; MW – mobility; SW – self-care; RW – relationships; LW – daytime activity; PW – social activity; WHO – total score.

However, in the group of comorbid pathology of KChSM, we again find significant correlations. Thus, during the initial examination, a positive correlation was found ($\rho=0.20751$; $p=0.03117$) between the DIS indicator (distress) of the 4DSQ methodology and the CW indicator (cognitive sphere) of the WHODAS 2.0 scale (Table 8), which indicates a special relationship between the expressiveness of the subjective feeling of distress and the depth of cognitive disorders in such patients, in contrast to the PTSD group, where no such pattern was found.

During the re-examination of the representatives of the PTSD/TBI group (Table 9), a negative correlation was established ($\rho=-0.1987$; $p=0.03927$) between the DEP (depression) indicator of the 4DSQ method and the LW (daily activity) indicator of the WHODAS 2.0 method. This indicates that, in contrast to the PTSD group, there is little room for an increase in daytime activity with a reduction in depressive symptoms.

Table 8. Results of the calculation of the ρ -Spearman rank correlation coefficient of the indicators of the 4DSQ and WHODAS 2.0 methods of the representatives of the PTSD/TBI group during the first examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
CW	ρ	0.05735	0.20751	0.01651	0.16792	0.12757
	p	0.55546	0.03117	0.86532	0.08237	0.18827
MW	ρ	0.03473	0.14154	-0.1671	0.11651	0.04745
	p	0.72118	0.14397	0.08382	0.22981	0.62576
SW	ρ	-0.1325	0.06151	0.02571	-0.052	-0.0766
	p	0.17175	0.52713	0.79172	0.59329	0.43044
RW	ρ	0.06617	-0.0826	0.17058	-0.0013	0.09719
	p	0.49624	0.39516	0.07756	0.98925	0.31702
LW	ρ	0.00045	-0.0344	0.03237	-0.0139	0.00187
	p	0.99633	0.72393	0.73947	0.8865	0.9847
PW	ρ	0.02162	0.12661	0.00938	0.0896	0.10054
	p	0.82426	0.19164	0.92322	0.35644	0.30051
WHO	ρ	0.03254	0.17557	0.05508	0.15566	0.1316
	p	0.73811	0.06914	0.57128	0.1077	0.17458

4DSQ - The Four-Dimensional Symptom Questionnaire (The Four-Dimensional Symptom Questionnaire); DIS - distress; DEP - depression; ANX - anxiety; SOM - somatization. WHODAS 2.0. - WHO test for functional assessment; - CW - cognitive sphere; MW - mobility; SW - self-care; RW - relationships; LW - daytime activity; PW - social activity; WHO - total score.

Table 9. Results of the calculation of the ρ -Spearman rank correlation coefficient of the indicators of the 4DSQ and WHODAS 2.0 methods of representatives of the PTSD/TBI group during the re-examination.

Scale	Indicator	DIS	DEP	ANX	SOM	4DSQ
CW	ρ	-0.0289	0.1704	-0.0677	0.01766	0.00163
	p	0.76642	0.07788	0.48659	0.85608	0.98663
MW	ρ	-0.0611	-0.0776	-0.0021	-0.0258	-0.1002
	p	0.53004	0.42493	0.98307	0.7913	0.30227
SW	ρ	-0.189	0.05892	-0.1633	0.10535	-0.1602
	p	0.0501	0.54472	0.09125	0.27788	0.09759
RW	ρ	0.04207	0.08822	0.07966	0.02029	0.05105
	p	0.66551	0.36395	0.41246	0.83489	0.59982
LW	ρ	0.06095	-0.1987	-0.1679	-0.0262	-0.0621
	p	0.53089	0.03927	0.08245	0.78749	0.52304
PW	ρ	0.00548	-0.1032	0.04398	0.00202	-0.0251
	p	0.95509	0.28808	0.65133	0.98345	0.79618
WHO	ρ	0.02651	-0.0837	-0.059	0.02482	-0.0343
	p	0.78539	0.38927	0.54426	0.79874	0.72424

4DSQ - The Four-Dimensional Symptom Questionnaire (The Four-Dimensional Symptom Questionnaire); DIS - distress; DEP - depression; ANX - anxiety; SOM - somatization. WHODAS 2.0. - WHO test for functional assessment; - CW - cognitive sphere; MW - mobility; SW - self-care; RW - relationships; LW - daytime activity; PW - social activity; WHO - total score.

DISCUSSION

In previous publications (18), we demonstrated that according to the Boston Assessment of Traumatic Brain Injury in Lifetime (BAT-L), where 63.2% of examined veterans noted the presence of at least one mTBI during their lifetime, only 2.2% had civilian mTBI confirmed by medical documentation.

Moreover, in the early period of the Russian-Ukrainian war, up to 50% of veterans did not seek medical help at all after receiving a TBI (in 100%, according to the anamnestic criteria, 1st degree TBI was recognized), so they did not have documentary confirmation of a military TBI. It is worth noting that in comparison with the analysis of mechanisms of traumatization of veterans in the USA (16), almost twice the specific weight of military injuries with a combined complex mechanism of brain damage was noted.

The presence of pronounced symptoms of excitement and hyperactivation in TBI patients with pronounced consequences of combat craniocerebral trauma, even in the absence of clinically defined PTSD, as well as the relationship between the expressiveness of TBI, not related to combat trauma, and the level of depressive symptoms indicate the need for routine examination of all patients with TBI for the presence of comorbid PTSD and depression.

Features of the clinical presentation of PTSD patients are, on the one hand, depressive symptoms with impaired social activity, and on the other hand, impaired functioning due to the disease, self-care defects in patients with more pronounced cognitive impairments, implying a low level of somatization of emotional disorders.

On the other hand, the presence of pronounced somatoform symptoms in patients with PTSD is associated with disorders in the field of self-care even after treatment. Also, in patients with more pronounced disturbances in the sphere of social activity against the background of reduction of depressive symptoms, some activation of anxiety is noted.

In the PTSD/TBI group, a distinct subjective feeling of distress was associated with the depth of cognitive impairments, in contrast to the PTSD group, where no such pattern was found. Also, in contrast to the PTSD group, there was a noticeable increase in daytime activity with a reduction in depressive symptoms.

Thus, our study confirmed the relationship between the expressiveness of clinical symptoms and the functioning and cumulative severity of craniocerebral injuries in veterans with PTSD and ITBI, including after an 8-week complex intervention (combination of a psychotherapy program with transcranial direct current stimulation (tDCS)).

ABBREVIATIONS

PTSD – posttraumatic stress disorder

TBI – traumatic brain injury

mTBI – mild traumatic brain injury

tDCS – transcranial direct current stimulation

4DSQ - The Four-Dimensional Symptom Questionnaire

WHODAS 2.0 - The World Health Organization Disability Assessment Schedule

BAT-L - The Boston Assessment of Traumatic Brain Injury–Lifetime

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