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Factor Structure of Posttraumatic Stress Disorder (PTSD) in Persons with Serious Mental Illness

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Abstract

Posttraumatic Stress Disorder (PTSD) is highly prevalent and contributes to worsened impairment among individuals with serious mental illness (SMI; e.g., schizophrenia, schizoaffective disorder, bipolar disorder, treatment refractory major depressive disorder). However, previous research has not examined the factor structure of PTSD symptoms in SMI populations. This review summarizes a published article evaluating the factor structure of PCL in two large SMI samples (N=11425; n=842 in study 1, n=583 in study 2). The latest edition of the DSM-5 4-aspect framework was shown to be the most appropriate one for PTSD amongst individuals suffering from SMI, exhibiting consistent measurement results across ethnic background, classifications of diagnosis, and generations. The review further discusses the suitability of DSM-5 4-factor model of PTSD among people with SMI, as well as future directions for PTSD research among this population.

Keywords: PTSD • Serious Mental Illness (SMI) • Factor structure • PTSD checklist • Trauma assessment • Schizophrenia

Abbreviations: SABIC: Sample Size Adjusted Bayesian Information Criterion; TLI: Tucker Lewis Index; CFI: Comparative Fit Index; SRMR: Standardized Root Mean Square Residual; RMSEA: Root-Mean Square Error of Approximation

Introduction

Research has supported the high prevalence of comorbid Posttraumatic Stress Disorder (PTSD) in person with serious mental illnesses (SMI, i.e., schizophrenia, bipolar disorder, and treatment refractory Major Depressive Disorder (MDD) [1]. For example, one review found that PTSD prevalence rates in schizophrenia ranged between 20%-30% [2]. Previous studies have also highlighted the association with Adverse Childhood Experiences (ACEs) with SMI development, as well as increased rates of comorbid PTSD among individuals with SMI compared to the general population.

Symptoms of PTSD could be hidden or under-detected in SMI due to SMI-associated illnesses and deficits. Identification of schizophrenia/schizoaffective illness or bipolar disorder contributed to lower PTSD record preservation [3]. Examples of barriers in recognizing PTSD symptoms in SMI include distinguishing between paranoid delusions in psychosis from the chronic mistrust common in PTSD, or distinguishing between mania symptoms such as irritability, risk-taking behaviours, and decreased need for sleep from anger outbursts, reckless or self-destructive behaviours, and sleep difficulties in PTSD. Considering the difficulty in diagnosing signs of PTSD in people with SMI, physicians should adopt PTSD screening techniques for patients in order to improve identification. To educate the medical community, it is vital to investigate the PCL component architecture among people with SMI.

The PTSD Checklist is commonly used as a PSTD screening measure [4]. The factor structure of the PCL has been assessed by various Confirmatory Factor Analyses (CFAs) in non-SMI samples such as veterans, college students, substance dependent clients and firefighters. Six of the eleven investigations accepted Elhai's 5-factor Dysphoric Arousal as the greatest match, three accepted King's Diagnostic and Statistical Manual of Mental Disorders (DSM-5) 4-factor model as the second best fit, and two supported Simms' 5-factor Dysphoria model. The DSM-IV 3-factor model includes re-experiencing, avoidance and over-arousal; the King's 4-factor Numbing model (aka DSM-5 model) involves all three of those variables in the inclusion of alleviating factor; the Simms' 4-factor Dysphoria model also incorporates those three factors with the addition of dysphoria; the DSM-5 4-factor model proposed symptom clusters of re-experiencing, avoidance, negative cognitions/mood, and over-arousal; Elhai's 5-factor model suggested factor. However, these previous CFA studies have not examined the factor structure of the Posttraumatic Checklist (PCL) utilizing a large SMI sample, which could be informative both clinically and for research.

Literature Review

This review summarizes a published article evaluating the factor structure of PTSD symptoms measured with the PCL in two large samples of people with SMI (n=842 in study 1, n=583 in study 2) [5]. It investigated whether the PCL factor structure in the SMI population is similar to the factor structures reported in other populations [6]. One previous study, using the

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PCL with a veteran sample, supported Elhai's 5-factor and DSM-5 4-factor models, while another study, using the PTSD Checklist for the DSM-5 (PCL-5) with an SMI sample, supported the DSM-5 4-factor model and the 7-factor model of PTSD [7]. Based on earlier findings from 10 reviewed studies, the hypothesis anticipated that the DSM-5 4-factor model would have the best fit, while Elhai's 5-factor, Simms' Dysphoria 4-factor, and the DSM-IV 3-factor models would each have adequate fit [5].

Participants in Study 1 were drawn from a larger investigation of patients with SMI receiving treatment through public mental health systems in four U.S. states. Among the 1114 people in the larger study, 842 participants had PCL data. Of these, 50.8% had schizophrenia, 21.7% had schizoaffective disorder, 25.3% had bipolar disorder, and 8.3% had recurrent MDD. Study 2 included data from 583 participants with SMI diagnoses who were screened for PTSD in a large public mental health outpatient system in the US. The breakdown of participants was as follows: 11.1% had schizophrenia, 20.6% had schizoaffective disorder, 34.7% had bipolar disorder, and 33.9% had major MDD [5]. All participants met the state criteria for SMI. Participants in both studies were racially and ethnically diverse (45.7% African American; 40.6% Caucasian; 6.5% Hispanic; 3.5% American Indian; 0.6% Asian; 3.1% other). (Table 1).

There were also notable differences among participants. In terms of gender, Study 1 had a large percentage (63.2%) of men compared to Study 2 (35.3%). Moreover, schizophrenia/schizoaffective disorder was more common than mood disorders in Study 1 (72.5% *vs* 27.5%), while mood disorders were more common than schizophrenia/schizoaffective disorder in Study 2 (31.7% *vs* 69.3%). Finally, while PTSD levels varied among participants in Study 1, 78% of participants in Study 2 had a PCL score of 45 or higher, indicating probable PTSD. CFAs were conducted with Mplus 8.7 to assess how well the four models fit the data across the combined sample, the Study 1 sample, study 2 sample and schizophrenia, bipolar, and MDD samples separately (Table 2) [5].

Multiple indicators were used to assess the model's quality of fit. The outcomes somewhat confirmed the hypothesis. The findings showed that while the DSM-5 4-factor model had the best overall fit, the Simms' model was the next best fit. The results did not support Elhai's 5-factor model, which displayed a poor fit for data in the schizophrenia sample, the MDD sample, and the Study 1 sample. It was noted, upon comparison fit indices across the various samples, that the DSM-5 model performed well compared to the DSM-IV and the Simms models. Furthermore, while PTSD symptoms in the overall SMI sample, and the schizophrenia and bipolar samples were best explained by DSM-5 4-factor model, Simms's model did perform better in the MDD sample than the DSM-5 model, which suggests a need for further research focused on PCL for individuals with MDD.

Measurement invariance was evaluated using multi-group CFA across various groups: psychotic *vs*. nonpsychotic, gender (male *vs*. female), race (white *vs*. black), age (18-35 *vs*. 35+), and diagnostic categories (schizophrenia/schizoaffective *vs*. bipolar *vs*. MDD) for the best fitting DSM-5 model (Table 2). Among psychotic and nonpsychotic groups, the DSM-5 4-factor model showed configure uniformity and high fit. The DSM-5 4-factor model showed outstanding match among genders and ethnicities.

The factor loadings and inter correlations of the DSM-5 4-factor model across the total sample and each diagnostic group (Figure 1). Most items strongly fit their assigned factors, with loadings ranging from 0.70 to 0.86. However, three items-C3 (numbing), D1 (hypervigilance), and D4 (hypervigilance) exhibited weaker loadings, between 0.52 and 0.68. The inter correlations among the four factors showed acceptable to excellent fit for most groups. Additionally, the reliability of the intrusion, avoidance, numbing and hypervigilance subscales was acceptable to excellent for both the total sample and the diagnostic groups.

Table 1. Demographics and clinical characteristics of participants (N=1425).

Demographics/Clinical characteristics	Study 1-5 Site (n=842)		Study 2-NJ (n=583)		Total (N=1425)			
Gender	n	%	n	%	n	%	χ^2 107	P <0.001
Male	310	63	206	35.3	738	51.8		
Female	310	37	377	64.7	687	48.2		
		Race/Ethnicity					3.94	<0.001
African American	388	46	262	44.9	650	45.7		
Caucasian	379	45	199	34.1	578	40.6		
Hispanic	24	2.9	68	11.7	92	7		
American Indian	49	5.8	1	0.2	50	4		
Asian	0	0	8	1	8	1		
Other	0	0	44	8	44	3		
Missing	0	0	1	0	1	0		
		Married					4	0
Yes	93	11	46	8	139	9.8		
No	746	89	536	91.9	1282	90		
Missing	3	0.4	1	0	4	0		

Education							37.06	<0.001
Less than HS	310	37	153	463	463	32.5		
HS	242	29	28.7	42.2	488	34.2		
Beyond HS	285	34	173	29.7	458	32.1		
Missing	5	0.6	11	2	16	1		
Primary diagnosis	363.49	<0.001	-	-	-	-	-	-
Schizophrenia	428	51	65	11.1	493	34.6		
Schizoaffective	183	22	120	20.6	303	21.3		
Bipolar I without psychotic	45	13	92	6.0	200	14.0		
Bipolar I with psychotic	45	5.3	35	6	80	6		
Bipolar II	6	0.7	33	6	39	3		
Bipolar NOS	2	0.2	42	7	44	3		
MDD recur. w/o psychotic	49	5.8	150	25.7	199	14.0		
MDD recur. w/ psychotic	21	2.5	46	8	67	5		
Secondary diagnosis							547.71	<0.001
Borderline personality disorder	7	0.8	22	7	29	3		
PTSD	14	1.7	51	16	65	6		
Substance use disorder	99	12	89	27.9	188	16.3		
Alcohol use disorder	143	17	56	17.6	199	17.2		
Personality disorder other than BPD	19	2.3	9	3	28	2		
		PCL					234.10	<0.001
< 45	533	63	129	22.2	662	46.5		
> 45	309	37	453	77.8	762	53.5		
	M	SD	M	SD	M	SD	t	P
Age*	41.93	10	41	11.36	41.53	10.60	2	0.1
PCL sum	39.11	16	55	16.59	45.75	18.1	-18.4	<0.001

Note. Age range: 19-80 for study 1, 18-70 for study 2.

Table 2. Model fit indices for independent samples.

Total Sample (N=1425)	χ^2	**df**	χ^2/**df**	**P**	**CFI**	**TLI**	**RMSEA**	**SRMR**	**SABIC**
DSM IV 3-factor	643.390	116	5.546	<0.001	0.961	0.954	0.056	0.030	75204.426
DSM-5 4-factor	452.280	113	4.002	<0.001	0.975	0.970	0.046	0.022	75025.570
Simms 4-factor	459.216	113	4.064	<0.001	0.974	0.969	0.046	0.022	75032.511
Elhai 5-factor	448.507	109	4.115	<0.001	0.975	0.968	0.047	0.022	75038.143
Note: Model fit for total sample (N=1425): DSM5> Simms> 5-factor> 3-factor.									
Study 1 (5-Site, n=842)									
DSM IV 3-factor	402.439	116	3.469	<0.001	0.958	0.950	0.054	0.031	43123.073

DSM-5 4-factor	289.873	113	2.565	<0.001	0.974	0.969	0.043	0.024	43021.188
Simms 4-factor	289.087	113	2.558	<0.001	0.974	0.969	0.043	0.024	43020.401
Elhai 5-factor	model inadmissible; correlation>1 between two factors (anxious and dysphoric arousal)								
Note: Model fit for study 1 sample (5-Site, n=842): DSM5 ≈ Simms> 3-factor> 5-factor.									
Study 2 (NJ, n=583)									
DSM IV 3-factor	452.268	116	3.899	<0.001	0.930	0.918	0.071	0.044	31164.165
DSM-5 4-factor	356.162	113	3.152	<0.001	0.949	0.939	0.061	0.034	31077.640
Simms 4-factor	358.936	113	3.176	<0.001	0.949	0.938	0.061	0.033	31080.414
Elhai 5-factor	352.633	109	3.235	<0.001	0.949	0.937	0.062	0.033	31086.885
Note: Model fit for study 2 sample (NJ, n=583): DSM5>Simms>5-factor>3-factor.									
Schizophrenia (n= 796)									
DSM IV 3-factor	461.689	116	3.980	<0.001	0.949	0.941	0.061	0.034	41162.892
DSM-5 4-factor	320.055	113	2.832	<0.001	0.970	0.964	0.048	0.025	41031.771
Simms 4-factor	323.692	113	2.865	<0.001	0.969	0.963	0.048	0.025	41035.307
Elhai 5-factor	model inadmissible; correlation >1 between two factors (anxious arousal with dysphoric arousal)								
Note: Model fit for schizophrenia sample (n=796): DSM5>Simms>3-factor>5-factor.									
Bipolar (n=363)									
DSM IV 3-factor	244.535	116	2.108	<0.001	0.960	0.953	0.055	0.037	19745.545
DSM-5 4-factor	203.305	113	1.799	<0.001	0.972	0.966	0.047	0.034	19712.480
Simms 4-factor	215.113	113	1.904	<0.001	0.968	0.962	0.050	0.034	19724.288
Elhai 5-factor	202.192	109	1.855	<0.001	0.971	0.964	0.049	0.034	19722.255
Note: Model fit for bipolar sample (n=363): DSM5> 5-factor> Simms> 3 factor.									
MDD (n=266)									
DSM IV	16	16	16	16	16	16	16	16	16
3-factor	316.611	116	2.729	<0.001	0.922	0.908	0.081	0.050	13447.810
DSM-5 4-factor	236.466	113	2.093	<0.001	0.952	0.942	0.064	0.039	13374.904
Simms 4-factor	220.519	113	1.951	<0.001	0.958	0.950	0.060	0.037	13358.957
Elhai 5-factor	model inadmissible; correlation>1 between two factors (anxious arousal with dysphoric arousal)								
Note: Model fit for MDD sample (n=266): Simms> DSM5> 3-factor> 5-factor.									

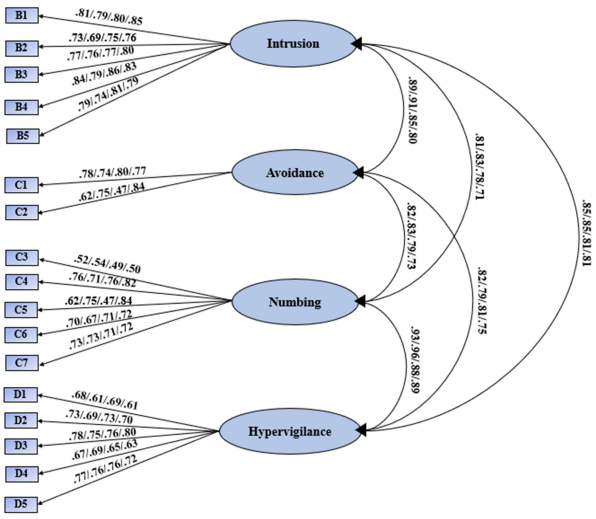

Figure 1. Factor pattern matrix and inter-factor correlation of DSM-5 4-factor model of PTSD for total sample (n=1425), schizophrenia/schizoaffective (n=796), bipolar disorder (n=363) and major depressive disorder (n=266).**Note:** Factor loadings and inter-factor-correlations are listed in the order of total sample/schizophrenia-schizoaffective/bipolar/major depressive disorder. Sample; CFI=0.97, 0.97, 0.97, 0.95 respectively.

Discussion

CFA was used to evaluate the fit of four PTSD models described in the prior literature in two distinct sets of people with SMI. These findings differ where the sample consisted of participants from the Million Veteran Program (MVP), which found that Elhai's 5-factor model was the best fit model instead of the DSM-5 4-factor model [6]. In this study involving SMI populations, Elhai's 5-factor model was inadmissible with the Study 1 sample, schizophrenia sample, and MDD sample, and did not achieve convergence. While [6] utilized veterans from all branches of the U.S. military, the current study focused on individuals with severe psychopathology and severe functional impairment due to SMI. However, findings are consistent with the evaluation of PTSD factor structure in SMI population using the PCL-5 [7] which supported the DSM-5 model.

Limitations from the present study should be noted. Data collected were from individuals with SMI receiving treatment through public mental health systems including community mental health centres and state psychiatric hospitals, thus findings may not generalize to other treatment settings or to those not in treatment. While the focus on the PCL for DSM-IV rather than the more updated PCL-5 for DSM-5 allowed for direct comparison with existing research of the factor structure of PTSD, It additionally excluded the study of the PCL-5's newer notion of PTS [8].

Conclusion

The findings support the use of DSM-5 model of PTSD among individuals with SMI, suggesting that similar diagnostic algorithms can be used for detecting and assessing PTSD in the SMI population. To gain a deeper and more current understanding of PTSD in individuals with SMI, future research should utilize the PCL-5 and incorporate clinician interviews, such as the Clinician Administered PTSD Scale for DSM-5 to evaluate the latest models of PTSD and examine the factor structure of PTSD among SMI populations. Future studies should further evaluate the utility of Elhai's 5-factor model among individuals with SMI, as well as examine the PTSD factor models in people with MDD and co-occurring PTSD. PTSD assessment leads to increased PTSD detection among individuals with SMI, which is essential for providing trauma-informed treatment access for this underserved population.

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