DSM-5 Posttraumatic Stress Disorder Symptoms in Nonclinical Samples of Chinese and Pakistani Trauma-Exposed Adults

Factor Structure and Invariance Across Culture

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Abstract: The purpose of the current study was to examine the latent structure and cross-cultural measurement validity of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*) posttraumatic stress disorder (PTSD) symptoms assessed by the PTSD Checklist for *DSM-5*. Participants comprised trauma-exposed Chinese and Pakistani undergraduate students ($N = 495$ and $N = 186$, respectively). Confirmatory factor analysis (CFA) indicated that a seven-factor hybrid model involving intrusion, avoidance, negative affect, anhedonia, externalizing behaviors, anxious arousal, and dysphoric arousal factors provided good fit in both samples. This model fit significantly better than three alternative models including the *DSM-5* four-factor model and six-factor anhedonia and externalizing behaviors models. The subsequent multigroup CFA showed that the best-fitting hybrid model demonstrated cross-cultural measurement invariance. Our findings provide further empirical support for the seven-factor PTSD hybrid model and its cross-cultural invariance, and have implications for understanding and application of *DSM-5*'s PTSD symptoms.

Key Words: Posttraumatic stress disorder, *DSM-5*, cross-cultural invariance, undergraduate student, confirmatory factor analysis

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Trauma is a public health issue in societies worldwide (Magruder et al., 2017). According to the World Mental Health surveys, more than 70% of individuals experienced at least one traumatic event at some time during their lifetimes, and 30.5% experienced four or more (Benjet et al., 2016). Posttraumatic stress disorder (PTSD) is one of the most critical issues related to trauma exposure. With the globalization of trauma-related research, an increasing number of researchers have focused their attention from within-sample comparisons to between-group comparisons on PTSD symptoms and severity (Caldas et al., 2020; Contractor et al., 2015), including ethnicity, race, cultures, and so on. However, the validity and meaning of comparing PTSD symptoms/severity across diverse groups depend on a conceptually equivalent structure of PTSD. The aim of current study was to examine invariance (also referred to as measurement invariance/equivalence) of PTSD symptom structure assessed by the PTSD Checklist for *DSM-5* (PCL-5) between trauma-exposed Chinese and Pakistani undergraduate student samples.

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According to the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; American Psychiatric Association, 2013), the diagnostic criteria and factor structure of PTSD have substantially changed in the shift from *DSM-IV* to *DSM-5*. Specifically, three important changes to the symptom criteria are worth mentioning: 1) the three-factor model in *DSM-IV* was substituted by the four-factor model in *DSM-5*, including intrusion (criterion B), avoidance (criterion C), negative alterations in cognition and mood (NAMC; criterion D), and alterations in arousal and reactivity (AAR; criterion E); 2) the current criterion D is composed of *DSM-IV* emotional numbing symptoms with several revised symptoms and two new dysphoria-related symptoms; and 3) the present criterion E includes *DSM-IV* hyperarousal symptoms with a revised symptom and new reckless or self-destructive behavior symptom. As a consequence, the criteria for *DSM-5* PTSD consists of 20 clinical symptoms.

Examining the latent factor structure of PTSD symptoms has an important role in applicability of the diagnostic criteria and assessment tools, use of accurate therapeutic modalities, and decision of policy and resource allocation for trauma intervention. Accordingly, a number of studies have been conducted to examine the latent factor structure of *DSM-5* PTSD symptoms. However, there is currently an ongoing debate regarding this topic. Based on the original four-factor model of *DSM-5* PTSD, which generally resembled King et al.'s (1998) emotional numbing model with additional emphasis on negative emotion and externalizing behavior symptoms, three alternative models were proposed to represent the latent structure of *DSM-5* PTSD symptoms. These alternative models included the six-factor anhedonia model of Liu et al. (2014), the six-factor externalizing behavior model of Tsai et al. (2015), and the seven-factor hybrid model of Armour et al. (2015). The models were all informed by the latest development of research on the latent structure of *DSM-5* PTSD symptoms and separated a unique dysphoric arousal factor from *DSM-5* AAR symptoms (Armour et al., 2016a).

On the basis of empirical studies and theoretical rationale supporting negative and positive affects as distinct constructs, the six-factor anhedonia models further divided the NAMC cluster into negative affect and anhedonia factors, and thus comprised intrusion (B1–B5), avoidance (C1–C2), negative affect (D1–D4), anhedonia (D5–D7), dysphoria arousal (E1–E2 and E5–E6), and anxious arousal factors (E3 and E4). On the basis of empirical studies and theoretical rationale that externalizing behaviors might be due to emotion dysregulation and difficulties in impulse control, and are conceptually differentiable from the other internalizing PTSD symptoms, the six-factor externalizing behavior model further specified an externalizing behavior factor distinct from AAR symptoms, and thus included intrusion (B1–B5), avoidance (C1–C2), NAMC (D1–D7), externalizing behavior (E1–E2), anxious arousal (E3–E4), and dysphoria arousal factors (E5–E6). The models were confirmed in an epidemiological sample of Chinese earthquake survivors (Liu et al., 2014) and a nationally representative sample of US veterans (Tsai et al., 2015), respectively.

By consolidating salient features of the anhedonia and externalizing behaviors models, Armour et al. (2015) constructed a seven-factor hybrid model, which is consisted of intrusion, avoidance, negative affect, anhedonia, externalizing behaviors, anxious arousal, and dysphoric arousal factors. Earlier empirical support was built on samples of US veterans and trauma-exposed undergraduate students (Armour et al., 2015). Subsequent confirmatory factor analysis (CFA) studies provided increasing support for the hybrid model in samples of undergraduate students experiencing diverse traumatic events (Armour et al., 2016a), veterans with military-related trauma (Bovin et al., 2016), survivors of typhoon (Mordeno et al., 2017), trauma-exposed community populations (Seligowski and Orcutt, 2016), frontline health care workers (Cheng et al., 2020), and internally displaced persons (Mordeno et al., 2016).

Despite promising findings, as was the case for *DSM-IV*, there is ongoing debate regarding the optimal latent factor structure of *DSM-5* PTSD symptoms. More research is clearly needed to evaluate the newly proposed models. Examining and comparing the competing models and ascertaining which of these primarily represents the underlying structure of *DSM-5* PTSD were important for refining the construct and diagnosis of PTSD. Moreover, it should be noted that the majority of extant studies on the newly refined model of *DSM-5* PTSD symptoms were constrained to single/diverse samples from similar cultural backgrounds. Given that the expression, prevalence, and latent construct of PTSD symptoms might be moderated by culture, and the increasing cross-cultural applicability of *DSM-5* PTSD criteria (Caldas et al., 2020; Contractor et al., 2015; King et al., 2009; Magruder et al., 2017), further cross-cultural validity studies on the latent structure of *DSM*-5 PTSD symptoms could help to elucidate the psychopathological mechanisms of PTSD, and then guide the development of more tailored intervention.

However, the implementation and clinical applicability of this aforementioned issue depended on a conceptually equivalent construct of PTSD across diverse cultures, known as measurement invariance. With PTSD's invariance, cross-cultural differences on PTSD scores accurately reflected true differences on the latent construct of PTSD symptoms. Following the procedure recommended by Meredith and Teresi (2006), a series of progressively increasing constraints were imposed on the examined model: 1) configural invariance that requires the same factor configuration across samples; 2) weak factorial invariance (*i.e.*, metric invariance) that additionally requires equal magnitude of factor loadings across samples based on configural invariance; 3) strong factorial invariance (*i.e.*, scalar invariance) that additionally requires identical item intercepts across samples based on metric invariance; 4) strict factorial invariance that further requires identical item residual variances across samples based on scalar invariance; and 5) factor variance and covariance invariance (factor variances and covariances restricted to be equal across culture on the foundation of strong factorial invariance).

As neighboring countries, China and Pakistan have been strongly struck by many kinds of natural disasters, such as earthquakes, floods, hurricanes, tsunamis, brushfires, and so on. Prior work showed that Asia is a continent most struck by natural disasters (44.4%), with the most disaster victims (69.5%) and damage (64.4% of worldwide natural disasters reported costs) (Eichfeld et al., 2019). Those disasters not only could lead to economic losses, physical injuries, and deaths, but also cause serious mental health outcomes such as PTSD (Wang et al., 2009). To further promote cooperation and exchange in the field of research and practice of postdisaster PTSD in both China and Pakistan, and expand extant knowledge about the effect of culture on the expression and latent structure of *DSM-5* PTSD symptoms, the present study first evaluated four competing models including the *DSM-5* four-factor model, six-factor externalizing behaviors model, six-factor anhedonia model, and seven-factor hybrid model (see Table 1 for symptom mappings) in Chinese/Pakistani trauma-exposed college students, respectively, and then examined cross-cultural measurement invariance of the best-fitting model using a multigroup CFA approach.

TABLE 1. Symptom Mappings for CFA

PTSD Symptoms	Model 1	Model 2	Model 3	Model 4
B1. Intrusive thoughts	In	In	In	In
B2. Nightmares	In	In	In	In
B3. Flashbacks	In	In	In	In
B4. Emotional cue reactivity	In	In	In	In
B5. Physiological cue reactivity	In	In	In	In
C1. Avoidance of thoughts	Av	Av	Av	Av
C2. Avoidance of reminders	Av	Av	Av	Av
D1. Trauma-related amnesia	NACM	NACM	NA	NA
D2. Negative beliefs	NACM	NACM	NA	NA
D3. Distorted blame	NACM	NACM	NA	NA
D4. Persistent negative emotional state	NACM	NACM	NA	NA
D5. Lack of interest	NACM	NACM	An	An
D6. Feeling detached	NACM	NACM	An	An
D7. Inability to experience positive emotions	NACM	NACM	An	An
E1. Irritability/aggression	Hy	EB	DA	EB
E2. Recklessness	Hy	EB	DA	EB
E3. Hypervigilance	Hy	AA	AA	AA
E4. Exaggerated startle	Hy	AA	AA	AA
E5. Difficulty concentrating	Hy	DA	DA	DA
E6. Sleep disturbance	Hy	DA	DA	DA

Model 1, the *DSM-5* model; Model 2, the externalizing behaviors model; Model 3, the anhedonia model; Model 4, the seven-factor hybrid model; In, intrusion; Av, avoidance; Hy, hyperarousal; EB, externalizing behaviors; AA, anxious arousal; DA, dysphoric arousal; NA, negative affect; An, anhedonia.

METHODS

Participants and Procedure

China Sample

This sample/study was approved by the Institutional Review Board of the Institute of Psychology, Chinese Academy of Sciences. The samples were recruited from a university in Hunan province, China, and included a total of 1845 college students (542 males and 1269 females). All students who presented at school voluntarily took part in this survey. Before administering the self-report questionnaire, the aim and significance of the survey were introduced in detail, and written informed consent was obtained from all students. The survey was conducted in class groups and monitored by trained research assistants.

The first part of the Posttraumatic Diagnostic Scale for *DSM-5* (Foa et al., 2016; Su et al., 2020) was used to screen lifetime traumatic experience and identify an index traumatic event for assessing PTSD symptoms. Among the initial sample, 1221 participants did not report any traumatic events, 97 participants did not designate an index traumatic event for PTSD assessment, and 32 participants missed at least 20% of items on the PCL-5. After excluding these participants from final analysis, the final effective sample included 495 college students (130 males and 358 females) with age ranging from 17 to 23 years (M = 20.11, SD = 1.13).

Pakistan Sample

This sample/study was approved by the local ethical committee of the university. Using the same tool (English original measures) and

procedure as in the China sample, a total of 405 college students were recruited from Pakistan's Gilgit City. Among the participants, 218 did not endorse any traumatic event, and one missed at least 20% of items on the PCL-5. After excluding these participants, final effective sample included 186 college students with age ranging from 17 to 29 years (M = 21.76, SD = 2.17). Approximate half of the participants were female (n = 93, 50.00%), and one participant did not report sex information (0.54%).

Table 2 provides a summary of participants' lifetime traumatic events for rating PTSD symptoms of the final effective sample.

Measures

The PCL-5 (Weathers et al., 2013), a self-report instrument comprising 20 items, was used to assess PTSD symptoms descripted in the *DSM-5*. Responders were required to rate how much a particular symptom bothers them over the past month on a 5-point Likert scale from 0 (not at all) to 4 (extremely). The Chinese version was adapted by a two-stage process of translation and back translation, and has been demonstrated with good psychometric properties in terms of Cronbach's alpha (α = 0.94, *e.g.*, Cao et al., 2017; Liu et al., 2016). Considering that English is one of the official languages for Pakistani sample, we used the English version of the PCL-5 in Pakistani participants (α = 0.86, *e.g.*, Zaman and Munib, 2020). In the present study, Cronbach's alpha values for the total scale were 0.94 and 0.91 in the Chinese and Pakistani samples, respectively.

Data Analysis

All descriptive statistical analyses were implemented with SPSS (Version 19.0 for Windows). Full information maximum likelihood (ML) procedures were used to handle missing values on the PCL-5 with all available item data. CFAs were performed with Mplus (Version 7.0 for Windows) to estimate the fit of four alternative models of PTSD symptoms for China and Pakistan samples, respectively. ML estimation with a mean-adjusted scale Satorra-Bentler chi-square (Satorra and Bentler, 1988) was conducted to estimate model parameters. For all of the models examined, error covariances were fixed to 0, and factors were allowed to correlate. Overall model fit was evaluated with three indices, including the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). According to Hu and Bentler (1998, 1999), CFI and TLI (≥0.90/0.95) and RMSEA (≤0.08/0.06) were considered as acceptable/excellent fit. For comparisons of nested/nonnested models, the corrected scaled chi-square difference test (Satorra and Bentler, 2001) was used to compare nested models, and the Bayesian information criterion (BIC; Schwarz, 1978) was used to compare nonnested models. Regarding the BIC difference, Raftery (1995) recommended that a difference of 6 to 10/more than 10 provides strong/very strong evidence for the model with the lower BIC value.

TABLE 2. Index Traumatic Events for Rating PTSD Symptoms

	China Sample (n = 495)		Pakistan Sample (n = 186)	
	n	Percentage	n	Percentage
Serious, life-threatening illness	136	27.47	12	6.45
Physical assault	45	9.09	19	10.22
Sexual assault	9	1.82	3	1.61
Military combat or lived in a war zone	0	0	10	5.38
Childhood abuse	16	3.23	4	2.15
Accident	115	23.23	28	15.05
Natural disaster	72	14.55	68	36.56
Other trauma	102	20.61	42	22.58

The optimal model was subsequently submitted to multigroup CFA for assessment of measurement invariance across different culture groups. As outlined earlier in the introduction section, the procedure recommended by Meredith and Teresi (2006) was followed. Given that ΔCFI is independent of model complexity and sample size, and accordingly is superior to $\Delta\chi^2$ in measurement invariance testing (Cheung and Rensvold, 2002), it was used to assess fit differences between models. An absolute value of ΔCFI ≤0.01 provides support for equivalence of the constrained parameters across samples.

RESULTS

Descriptive Statistics

Mean scores on the PCL-5 for the China sample were 9.93 (SD = 11.01; range, 0–57), 29.63 for the Pakistan sample (SD = 15.70; range, 0–72). A significant difference was found between China and Pakistan college students in term of PCL scores, indicated by $t(679) = -18.38$, $p < 0.001$, Cohen's d = 1.45. According to the *DSM-5* diagnostic criteria with at least one intrusion symptom, one avoidance symptom, two NAMC symptoms, and two arousal symptoms endorsed as 2 or greater, the prevalence rate of probable PTSD cases for the China sample was 7.07% (35 of 495) and 48.39% for Pakistan sample (90 of 186). The chi-square test showed that the prevalence rate significantly differed between China and Pakistan samples, $\chi^2(1) = 154.00$, $p < 0.001$, $\varphi = -0.476$.

Model Fit Comparison

Goodness of fit indices for four alternative models for China and Pakistan samples are summarized in Table 3. For the China sample, on the basis of aforementioned criteria, all four alternative models provided excellent fit to the data. With regard to nonnested comparisons, model 3 (the anhedonia model) fit better than model 2 (the externalizing behaviors model), supported by a ΔBIC of 75.36. In term of nested model comparisons (see Table 4), model 2 (the externalizing behaviors model) and model 3 (the anhedonia model) significantly fit better than model 1 (the *DSM-5* model), and model 4 (the hybrid model) significantly fit better than all the other models. For the Pakistan sample, similar patterns were found with all four competing models offering acceptable, even excellent, fit to the data. Model 3 fit better than model 2, supported by a ΔBIC of 15.25. Regarding to nested model comparisons (see Table 4), model 2 and model 3 significantly fit better than model 1, and model 4 significantly fit better than all the other models.

In sum, the seven-factor hybrid model provided the best fit to the data for both China and Pakistan samples, and thus was selected as the optimal model for subsequent analyses. Table 5 provides standardized factor loadings and factor correlations for the seven-factor hybrid model in both samples.

Measurement Invariance Across Two Culturally Different Groups

Table 6 presents results of measurement invariance testing for the optimal model (*i.e.*, the seven-factor hybrid model) across groups. Excellent fit to the data was attained with a freely estimated model, indicating configural invariance. When factor loadings were constrained to be equal across groups, excellent fit to the data was demonstrated with the absolute value of ΔCFI smaller than 0.01, indicating weak factorial/metric invariance. In the same vein, strong factorial/scalar, strict factorial, and factor variance and covariance invariance were also supported, with progressively constraining item thresholds, residual error variance, and factor variances and covariances to be equal across groups generating an absolute value of ΔCFI smaller than 0.01. In sum, on the basis of the stringent changes in CFI tests, results yielded support for

TABLE 3. Model Goodness of Fit Indices

Models	χ^2	*df*	CFI	TLI	RMSEA (90% CI)	BIC
China's data (n = 495)						
Model 1 (*DSM-5*)	470.50	164	0.980	0.976	0.061 (0.055, 0.068)	18,631.07
Model 2 (externalizing behaviors)	440.97	155	0.981	0.977	0.061 (0.054, 0.068)	18,612.05
Model 3 (anhedonia)	373.12	155	0.986	0.982	0.053 (0.046, 0.060)	18,536.69
Model 4 (hybrid)	360.36	149	0.986	0.982	0.054 (0.047, 0.061)	18,536.53
Pakistan's data (n = 186)						
Model 1 (*DSM-5*)	324.70	164	0.942	0.933	0.073 (0.061, 0.084)	11,574.71
Model 2 (externalizing behaviors)	284.93	155	0.953	0.943	0.067 (0.055, 0.079)	11,580.27
Model 3 (anhedonia)	258.21	155	0.963	0.954	0.060 (0.047, 0.072)	11,565.02
Model 4 (hybrid)	235.63	149	0.969	0.960	0.056 (0.042, 0.069)	11,565.53

Model 1, the *DSM-5* model; Model 2, the externalizing behaviors model; Model 3, the anhedonia model; Model 4, the hybrid model; CI, confidence interval.

measurement invariance on all statistical parameters between two sets of PTSD items assessed in traumatized Chinese and Pakistani samples.

DISCUSSION

In the present study, four theoretically and empirically supported factor models of *DSM-5* PTSD symptoms were examined using cross-cultural data collected from trauma-exposed Chinese and Pakistani college students. Although there were significant differences in the symptom severity and prevalence rate of PTSD between the samples, CFA showed that a seven-factor hybrid model consisted of intrusion, avoidance, negative affect, anhedonia, externalizing behaviors, anxious arousal, and dysphoric arousal factors provided a superior fit to the data in both samples compared with other competing models. More importantly, measurement invariance testing using multigroup CFA further validated the cross-cultural invariance for this best-fitting model. These findings offer further empirical evidence for the newly refined seven-factor hybrid model proposed by Armour et al. (2015), and expand our knowledge on the cultural invariance of the latent structure of *DSM-5* PTSD symptoms.

On the basis of the new developments in the CFA literature on *DSM-5* PTSD symptoms, the present study primarily investigated four competing models, including the *DSM-5* four-factor model, six-factor externalizing behaviors model, six-factor anhedonia model, and seven-factor hybrid model. The findings revealed that all four competing models demonstrated acceptable fit in both the Chinese and Pakistani traumatized samples. In line with previous studies with samples from different culture backgrounds and differing in symptom severity and prevalence of PTSD (*e.g.*, Armour et al., 2016a; Bovin et al., 2016; Caldas et al., 2020; Liu et al., 2016; Mordeno et al., 2017), the hybrid model demonstrated the most optimal fit relative to other alternative *DSM-5* models of PTSD. The current findings provide additional robust evidence in favor of the reconceptualization of *DSM-5* PTSD symptoms by Armour et al. (2015), and extend the present understanding of the latent structure of human reactions to traumatic stressors.

In the past decade, a growing body of researchers recognized that comparing the scores/severity of PTSD symptoms across culture relies on a prerequisite, the PTSD symptom construct having equivalent psychometric properties in diverse cultures (Caldas et al., 2020; King et al., 2009; Tay et al., 2017). The current study further examined measurement invariance of the seven-factor hybrid model of *DSM-5* PTSD symptoms across culture, and found that the best-fitting hybrid model held cross-cultural invariance between the Chinese and Pakistani traumatized samples. Specifically, culture did not demonstrate a robust moderating effect on basic factorial structure, PTSD factor loadings, item intercepts, factor score variation, and factor intercorrelations. The findings suggest that differences in observed PTSD scores directly represent the true differences in symptom severity rather than measurement error. Consequently, researchers in the field of traumatic stress could more confidently use the *DSM-5* and seven-factor hybrid model in the clinical assessment, diagnosis, and meaningful comparison of PTSD symptomatology across diverse cultures, at least as measured by the PCL-5 in the trauma-exposed populations in Chinese and Pakistani individuals. Given the significance of transcultural settings and the dearth of studies investigating cross-cultural measurement invariance of the newly refined seven-factor hybrid model, the findings of this study add to current knowledge regarding culture effects on posttraumatic responses and provide support for further applications of this model in diverse cultural populations.

The findings of this study results have some implications. First, precisely identifying the underlying structure of *DSM-5* PTSD symptoms is critical for establishing clinically useful diagnostic criteria. On the one hand, the hybrid model is an integration of several models (Mordeno et al., 2016), including the *DSM-5*, dysphoric arousal, anhedonia, and externalizing behaviors models. The empirical verification of the model provides strong evidence for all aforementioned PTSD models and adds to its potential as a theoretical model of PTSD. On the other hand, discriminating the first-rank dimensional representation of PTSD symptoms could lead to substantial practice implications for diagnostic algorithms, prevalence rates, individual diagnostic status, and further refining the present classification of PTSD symptoms. Second, our results could aid in clarifying the psychopathological mechanisms of PTSD. Numerous previous studies indicated that different PTSD symptom clusters may play different roles in the maintenance and development of posttraumatic stress symptomatology (Pietrzak et al., 2014), link to diverse functional impairments (Wang et al., 2012),

TABLE 4. Chi-Square Difference Test for Comparing Nested Models

	China			Pakistan		
Models	$\Delta\chi^2$	*df*	*p*	$\Delta\chi^2$	*df*	*p*
Model 1 *vs.* model 2	40.90	9	<0.001	45.65	9	<0.001
Model 1 *vs.* model 3	84.82	9	<0.001	65.04	9	<0.001
Model 1 *vs.* model 4	103.70	15	<0.001	88.14	15	<0.001
Model 2 *vs.* model 4	61.21	6	<0.001	43.19	6	<0.001
Model 3 *vs.* model 4	20.40	6	0.002	23.01	6	<0.001

Model 1, the *DSM-5* model; Model 2, the externalizing behaviors model; Model 3, the anhedonia model; Model 4, the hybrid model.

TABLE 5. Standardized Factor Loadings and Factor Correlations for the Hybrid Model

Symptoms	In	AV	NA	An	EB	AA	DA
B1. Intrusive thoughts	0.75 (0.69)						
B2. Nightmares	0.81 (0.81)						
B3. Flashbacks	0.76 (0.68)						
B4. Emotional cue reactivity	0.82 (0.77)						
B5. Physiological cue reactivity	0.87 (0.74)						
C1. Avoidance of thoughts		0.92 (0.93)					
C2. Avoidance of reminders		0.91 (0.86)					
D1. Trauma-related amnesia			0.69 (0.50)				
D2. Negative beliefs			0.83 (0.75)				
D3. Distorted blame			0.82 (0.69)				
D4. Persistent negative emotional state			0.90 (0.78)				
D5. Lack of interest				0.86 (0.72)			
D6. Feeling detached				0.91 (0.82)			
D7. Inability to experience positive emotions				0.88 (0.78)			
E1. Irritability/aggression					0.85 (0.83)		
E2. Recklessness					0.80 (0.72)		
E3. Hypervigilance						0.93 (0.38)	
E4. Exaggerated startle						0.78 (0.72)	
E5. Difficulty concentrating							0.87 (0.74)
E6. Sleep disturbance							0.80 (0.80)
Av	0.87 (0.70)	—					
NA	0.84 (0.62)	0.82 (0.63)	—				
An	0.74 (0.50)	0.67 (0.40)	0.89 (0.77)	—			
EB	0.79 (0.48)	0.70 (0.39)	0.93 (0.71)	0.92 (0.89)	—		
AA	0.75 (0.69)	0.73 (0.74)	0.86 (0.84)	0.75 (0.82)	0.95 (0.73)	—	
DA	0.76 (0.56)	0.70 (0.41)	0.81 (0.73)	0.86 (0.80)	0.86 (0.64)	0.85 (0.89)	—

Note: The standardized factor loading and factor correlations for China/Pakistan sample are presented outside/inside the parentheses. All factor loadings and correlations are statistically significant ($p < 0.01$). In, intrusion; Av, avoidance; NA, negative affect; An, anhedonia; EB, externalizing behaviors; AA, anxious arousal; DA, dysphoric arousal.

and contribute to specific comorbidity with other psychopathology (Armour et al., 2014). Using the empirically supported hybrid model to address these issues might further improve extant understanding on the underlying processes of posttraumatic psychopathology, and then develop more sophisticated prevention and treatment. Third, previous studies demonstrated that substantial discrepancies across various cultures existed in the salience, manifestation, and expression of PTSD symptoms (Magruder et al., 2017). When a PTSD measure is used for the purpose of clinical assessment and diagnosis with a sample from culturally different populations, it is exceedingly essential that the scores assessed by this tool should endorse transcultural construct validity. The current findings support the cross-cultural invariance of *DSM-5*'s seven-factor hybrid model, indicating that comparing the *DSM-5* PTSD symptoms across Chinese and Pakistani traumatized samples is viable.

Several limitations in the present study needed to be noted. First, the current findings only relied on a self-report measure. Thus, further studies using clinical structured/semistructured interviews to assess PTSD symptoms are warranted. Second, this study focused on nonclinical undergraduate populations, which limited the generalizability of the present findings. Additional studies using clinical samples are required. Finally, no external variables were used to investigate the convergent and discriminant validity of the seven-factor hybrid PTSD model in the present study. Armour et al. (2016b) commented that without external validity, a PTSD model cannot be substantially confirmed, and the diagnostic utility of such model also was constrained. Therefore, future studies involving psychological, behavioral, and biological variables theoretically and empirically associated with PTSD symptoms are warranted.

TABLE 6. Results of Measurement Invariance Testing for the Hybrid Model Across Two Culturally Different Groups

Type of Invariance	χ^2	*df*	CFI	TLI	RMSEA (90% CI)	ΔCFI
Configural	573.67	298	0.985	0.981	0.052 (0.046, 0.059)	
Weak factorial/metric	600.49	311	0.984	0.981	0.052 (0.046, 0.059)	−0.001
Strong factorial/scalar	697.36	364	0.982	0.981	0.052 (0.046, 0.058)	−0.002
Strict factorial	697.37	364	0.982	0.981	0.052 (0.046, 0.058)	0.000
Factor variance and covariance	759.65	392	0.980	0.0981	0.052 (0.047, 0.058)	−0.002

CI, confidence interval.

CONCLUSIONS

Notwithstanding these limitations, the present study provide empirical support for the newly refined seven-factor hybrid model and its invariance across samples from distinct culture backgrounds, and contribute to contemporary literature on the cross-cultural invariance of the latent dimensionality of *DSM-5* PTSD symptoms.

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DISCLOSURE

Dr. Elhai notes that he receives royalties for several books published on posttraumatic stress disorder (PTSD); is a paid, full-time faculty member at University of Toledo; occasionally serves as a paid, expert witness on PTSD legal cases; and receives grant research funding from the US National Institutes of Health.

The other authors declare no conflicts of interest.

The study was approved by the Ethics Committee of Human Experimentation at the Institute of Psychology, Chinese Academy of Sciences.

REFERENCES

American Psychiatric Association (2013) *Diagnostic and statistical manual of mental disorders* (5th ed). Washington: American Psychiatric Association.

Armour C, Contractor A, Shea T, Elhai JD, Pietrzak RH (2016a) Factor structure of the PTSD checklist for *DSM-5*: Relationships among symptom clusters, anger, and impulsivity. *J Nerv Ment Dis*. 204:108–115.

Armour C, Contractor AA, Palmieri PA, Elhai JD (2014) Assessing latent level associations between PTSD and dissociative factors: Is depersonalization and derealization related to PTSD factors more so than alternative dissociative factors? *Psychol Inj Law*. 7:131–142.

Armour C, Műllerová J, Elhai JD (2016b) A systematic literature review of PTSD's latent structure in the *Diagnostic and Statistical Manual of Mental Disorders*: *DSM-IV* to *DSM-5*. *Clin Psychol Rev*. 44:60–74.

Armour C, Tsai J, Durham TA, Charak R, Biehn TL, Elhai JD, Pietrzak RH (2015) Dimensional structure of *DSM-5* posttraumatic stress symptoms: Support for a hybrid anhedonia and externalizing behaviors model. *J Psychiatr Res*. 61:106–113.

Benjet C, Bromet E, Karam EG, Kessler RC, McLaughlin KA, Ruscio AM, Shahly V, Stein DJ, Petukhova M, Hill E, Alonso J, Atwoli L, Bunting B, Bruffaerts R, Caldas-de-Almeida JM, de Girolamo G, Florescu S, Gureje O, Huang Y, Lepine JP, Kawakami N, Kovess-Masfety V, Medina-Mora ME, Navarro-Mateu F, Piazza M, Posada-Villa J, Scott KM, Shalev A, Slade T, ten Have M, Torres Y, Viana MC, Zarkov Z, Koenen KC (2016) The epidemiology of traumatic event exposure worldwide: Results from the World Mental Health survey consortium. *Psychol Med*. 46:327–343.

Bovin MJ, Marx BP, Weathers FW, Gallagher MW, Rodriguez P, Schnurr PP, Keane TM (2016) Psychometric properties of the PTSD checklist for *Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition* (PCL-5) in veterans. *Psychol Assess*. 28:1379–1391.

Caldas SV, Contractor AA, Koh S, Wang L (2020) Factor structure and multi-group measurement invariance of posttraumatic stress disorder symptoms assessed by the PCL-5. *J Psychopathol Behav Assess*. 42:364–376.

Cao X, Wang L, Cao C, Zhang J, Elhai JD (2017) *DSM-5* posttraumatic stress disorder symptom structure in disaster-exposed adolescents: Stability across gender and relation to behavioral problems. *J Abnorm Child Psychol*. 45:803–814.

Cheng P, Xu LZ, Zheng WH, Ng RMK, Zhang L, Li LJ, Li WH (2020) Psychometric property study of the Posttraumatic Stress Disorder Checklist for *DSM-5* (PCL-5) in Chinese healthcare workers during the outbreak of corona virus disease 2019. *J Affect Disord*. 277:368–374.

Cheung GW, Rensvold RB (2002) Evaluating goodness-of-fit indexes for testing measurement invariance. *Struct Equ Modeling*. 9:233–255.

Contractor AA, Claycomb MA, Byllesby BM, Layne CM, Kaplow JB, Steinberg AM, Elhai JD (2015) Hispanic ethnicity and Caucasian race: Relations with posttraumatic stress disorder's factor structure in clinic-referred youth. *Psychol Trauma*. 7:456–464.

Eichfeld C, Farrell D, Mattheß M, Bumke P, Sodemann U, Ean N, Phoeun B, Direzkia Y, Firmansyah F, Sumampouw NEJ, Mattheß H (2019) Trauma stabilisation as a sole treatment intervention for post-traumatic stress disorder in Southeast Asia. *Psychiatr Q*. 90:63–88.

Foa EB, McLean CP, Zang Y, Zhong J, Powers MB, Kauffman BY, Rauch S, Porter K, Knowles K (2016) Psychometric properties of the posttraumatic diagnostic scale for *DSM-5* (PDS-5). *Psychol Assess*. 28:1166–1171.

Hu L, Bentler PM (1998) Fit indices in covariance structure modeling: Sensitivity to under parameterized model misspecification. *Psychol Methods*. 3:424–453.

Hu L, Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Modeling*. 6:1–55.

King DW, Leskin GA, King LA, Weathers FW (1998) Confirmatory factor analysis of the clinician-administered PTSD scale: Evidence for the dimensionality of posttraumatic stress disorder. *Psychol Assess*. 10:90–96.

King DW, Orazem RJ, Lauterbach D, King LA, Hebenstreit CL, Shalev AY (2009) Factor structure of posttraumatic stress disorder as measured by the impact of event scale-revised: Stability across cultures and time. *Psychol Trauma*. 1:173–187.

Liu L, Wang L, Cao C, Qing Y, Armour C (2016) Testing the dimensional structure of *DSM-5* posttraumatic stress disorder symptoms in a nonclinical trauma-exposed adolescent sample. *J Child Psychol Psychiatry*. 57:204–212.

Liu P, Wang L, Cao C, Wang R, Zhang J, Zhang B, Wu Q, Zhang H, Zhao Z, Fan G, Elhai JD (2014) The underlying dimensions of *DSM-5* posttraumatic stress disorder symptoms in an epidemiological sample of Chinese earthquake survivors. *J Anxiety Disord*. 28:345–351.

Magruder KM, McLaughlin KA, Elmore Borbon DL (2017) Trauma is a public health issue. *Eur J Psychotraumatol*. 8:1375338.

Meredith W, Teresi JA (2006) An essay on measurement and factorial invariance. *Med Care*. 44:S69–S77.

Mordeno IG, Carpio JG, Nalipay MJ, Saavedra RL (2017) PTSD's underlying dimensions in typhoon Haiyan survivors: Assessing *DSM-5* symptomatology-based PTSD models and their relation to posttraumatic cognition. *Psychiatry Q*. 88:9–23.

Mordeno IG, Nalipay MJ, Sy DJ, Luzano JG (2016) PTSD factor structure and relationship with self-construal among internally displaced persons. *J Anxiety Disord*. 44:102–110.

Pietrzak RH, Feder A, Schechter CB, Singh R, Cancelmo L, Bromet EJ, Katz CL, Reissman DB, Ozbay F, Sharma V, Crane M, Harrison D, Herbert R, Levin SM, Luft BJ, Moline JM, Stellman JM, Udasin IG, El-Gabalawy R, Landrigan PJ, Southwick SM (2014) Dimensional structure and course of post-traumatic stress symptomatology in world trade center responders. *Psychol Med*. 44:2085–2098.

Raftery AE (1995) Bayesian model selection in social research. *Sociol Methodol*. 25: 111–163.

Satorra A, Bentler PM (1988) Scaling corrections for chi-square statistics in covariance structure analysis. In *American Statistical Association 1988 proceedings of the business and economic section* (pp 308–313). Alexandria, VA: American Statistical Association.

Satorra A, Bentler PM (2001) A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*. 66:507–514.

Schwarz G (1978) Estimating the dimension of a model. *Ann Stat*. 6:461–464.

Seligowski AV, Orcutt HK (2016) Support for the 7-factor hybrid model of PTSD in a community sample. *Psychol Trauma*. 8:218–221.

Su YJ, Kung YW, Hung FC, Chen SH (2020) Dimensionality of *DSM-5* PTSD symptoms: Validation of the Chinese version of the posttraumatic diagnostic scale for *DSM-5* across multiple trauma samples. *J Anxiety Disord*. 74:102261.

Tay AK, Jayasuriya R, Jayasuriya D, Silove D (2017) Assessing the factorial structure and measurement invariance of PTSD by gender and ethnic groups in Sri Lanka: An analysis of the modified Harvard trauma questionnaire (HTQ). *J Anxiety Disord*. 47:45–53.

Tsai J, Harpaz-Rotem I, Armour C, Southwick SM, Krystal JH, Pietrzak RH (2015) Dimensional structure of *DSM-5* posttraumatic stress disorder symptoms: Results from the National Health and resilience in veterans study. *J Clin Psychiatry*. 76:546–553.

Wang L, Cao C, Wang R, Zhang J, Li Z (2012) The dimensionality of PTSD symptoms and their relationship to health-related quality of life in Chinese earthquake survivors. *J Anxiety Disord*. 26:711–718.

Wang L, Zhang Y, Wang W, Shi Z, Shen J, Li M, Xin Y (2009) Symptoms of posttraumatic stress disorder among adult survivors three months after the Sichuan earthquake in China. *J Trauma Stress*. 22:444–450.

Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr PP (2013) The PTSD Checklist for *DSM-5* (PCL-5). Scale available from the National Center for PTSD at www.ptsd.va.gov.

Zaman NI, Munib PM (2020) Post traumatic stress disorder and resilience: An exploratory study among survivors of Bacha Khan University Charsadda, Pakistan. *FWU J Soc Sci*. 14:25–35.