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Posttraumatic Stress Disorder Symptom Structure in Chinese Adolescents Exposed to a Deadly Earthquake

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Abstract This present study examined the structure of posttraumatic stress disorder (PTSD) symptoms in a large sample of Chinese adolescents exposed to a deadly earthquake. A total of 2,800 middle school students aged 12 to 18 years participated in the study 6 months after the "Wenchuan Earthquake". Results of confirmatory factor analysis indicated that a five-factor intercorrelated model composed of intrusion, avoidance, numbing, dysphoric arousal, and anxious arousal, fit data significantly better than both the four-factor numbing model King et al. (Psychological Assessment 10:90–96, 1998) and the four-factor dysphoria model Simms et al. (Journal of Abnormal Psychology 111:637–647, 2002). Further examination of the external convergent and discriminant validity revealed that except for the dysphoric arousal factor, the remaining four PTSD factors yielded significantly different correlations with external measures of anxiety vs. depression. The findings add to the limited literature on the factor structure of PTSD in youths and on the five-factor PTSD model. In addition, they provide more detail into the latent psychopathological processes of PTSD, and inform the forthcoming *DSM-5*.

Keywords Posttraumatic stress disorder · Confirmatory factor analysis · Adolescents · Earthquake · China

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Introduction

In the current version of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association [APA] 2000), the diagnostic model of posttraumatic stress disorder (PTSD) includes three symptom clusters: intrusion (Criterion B), effortful avoidance and emotional numbing (Criterion C), and hyperarousal (Criterion D). This tripartite diagnostic model was mainly derived by expert consensus rather than empirical methods. Over the past two decades, a growing body of evidence yielded by factor analytic studies has challenged the *DSM-IV* PTSD model, and several alternative models have been proposed to explain PTSD symptoms across a range of trauma-exposed populations (e.g., Elhai et al. 2011; King et al. 1998; Lancaster et al. 2009; Rasmussen et al. 2007; Simms et al. 2002; Smith et al. 1999; Taylor et al. 1998). It should be noted that most of the extant studies on the factor structure of PTSD have been conducted exclusively with adults. This is despite a wealth of studies which have revealed that children and adoles-

cents can develop PTSD after exposure traumatic stressors (cf. Hoven et al. 2009; Yule 2001). Notably, there are only a limited number of factor analytic studies focusing on children and adolescents (e.g., Armour et al. 2011; Elhai et al. 2009b; Saul et al. 2008). To extend the extant knowledge on the structure of PTSD symptoms, we tested three alternative PTSD diagnostic models developed with adults in a large sample of Chinese adolescents exposed to a deadly earthquake. Given the impending arrival of the *DSM-5*, the work is especially timely.

In the literature focusing on adults, two alternative four-factor PTSD models have received the most empirical support (cf. King et al. 2006; Yufik and Simms 2010). The first four-factor PTSD model was developed and supported by King et al. (1998), namely the four-factor emotional numbing model. This model generally keeps the basic *DSM–IV* structure, while the avoidance and numbing symptoms (Criterion C) are split into two separate factors. Another alternative four-factor PTSD model was proposed and supported by Simms et al. (2002), namely the four-factor dysphoria model. In this model, the intrusion and avoidance symptoms of King et al. model remain unchanged, while three hyperarousal symptoms (i.e., sleep difficulty, irritability, and concentration problems) load together with the numbing symptoms on a dysphoria factor (reflecting general negative affectivity which is shared with several mood and anxiety disorders). The remaining two hyperarousal symptoms (i.e., hypervigilance and exaggerated startle response) form a smaller hyperarousal factor.

In recent PTSD confirmatory factor analytic (CFA) studies, both the four-factor models are the most popular competing models submitted to empirical testing, and have demonstrated fitting better than other models (Yufik and Simms 2010). However, neither of the four-factor models seems to fit best across studies. Some studies have found support for the King et al. model (e.g., Elhai et al. 2009a; Hoyt and Yeater 2010; Mansfield et al. 2010; McDonald et al. 2008; Naifeh et al. 2008), while others yielded evidence in favor of the Simms et al. model (e.g., Armour and Shevlin 2010; Carragher et al. 2010; Elklit et al. 2010; Naifeh et al. 2010; Pietrzak et al. 2010; Yufik and Simms 2010).

The difference between the four-factor PTSD models only regards which factor (dysphoria or hyperarousal) includes symptoms D1–D3 (i.e., sleep difficulty, irritability, and concentration problems). A more recent model attempts to clarify mixed results in the PTSD CFA literature (Elhai et al. 2011). In this model, the three symptoms are reconceptualized as a separate dysphoric arousal factor which differs conceptually from both PTSD's anxious arousal construct (indicated by hypervigiliance and exaggerated startle response) and PTSD's depression/dysphoric construct (i.e., emotional numbing), despite that they are both somewhat anxiety-related and depression-related. By analyzing response to the PTSD Symptom Scale (PSS; Foa et al. 1993), Elhai et al. found that the alternative five-factor model (intrusion, avoidance, numbing, dysphoric arousal, and anxious arousal) fit the data significantly better than both the four-factor models in a sample of 252 women victims of domestic violence (Elhai et al. 2011). By using data from the PTSD Checklist (PCL; Weathers et al. 1993), Wang and colleagues found further support for the five-factor model in two large adult Chinese samples varying in type of trauma exposure (an earthquake vs. a violent riot), demographics, symptom severity, and elapsed time since trauma exposure (Wang et al. 2011).

As previously mentioned, in contrast to a large volume of studies with adults, there are only a few PTSD CFA studies in children and adolescents. Most of the studies also found that the tripartite *DSM-IV* model does not adequately represent the latent structure of PTSD. Anthony and colleagues proposed an alternative hierarchical model with three first-order factors (intrusion/active avoidance, numbing/passive avoidance, and arousal) and a second-order general PTSD factor, and validated the model in samples of adolescents exposed to hurricane (Anthony et al. 1999; Anthony et al. 2005). However, subsequent studies indicated that the hierarchical model fit data worse than the four-factor numbing model (Kassam-Adams et al. 2010; Saul et al. 2008). From the available literature, a clear majority of youth CFA studies have tended to replicate findings in adults, and found support for either the four-factor numbing model or the four-factor dysphoria model (e.g., Armour et al. 2011; Ayer et al. 2011; Elhai et al. 2009b; Ford et al. 2009; Kassam-Adams et al. 2010; Saul et al. 2008; Stewart et al. 2004; Wang et al. 2009). These findings provide empirical evidence supporting the downward extension of adult models of PTSD. To the best of our knowledge, the promising five-factor PTSD model recently proposed by Elhai et al. has never been tested with children and adolescents.

To address the gap typically transpiring in modern PTSD CFA studies with youths and to further inform the forthcoming *DSM-5*, we investigated the factor structure of PTSD in a large sample of adolescents from China who personally experienced a deadly earthquake. In the present study, we first tested three competing PTSD models (i.e., the four-factor numbing model, the four-factor dysphoria model and the five-factor model), and subsequently examined relationships between PTSD symptom factors and external measures of anxiety and depression. On the basis of previous theoretical and empirical work (e.g., Elhai et al. 2011; Wang et al. 2011; Watson 2005, 2009), we hypothesized that 1) the five-factor model would fit data significantly better than both the four-factor models; 2) the five PTSD factors would display significantly different correlations with external measures of anxiety vs. depression. Specifically, the anxiety-related PTSD constructs (i.e.,

intrusion, avoidance and anxious arousal factors) would be more associated with external measure of anxiety than depression; the depression-related PTSD construct (i.e., numbing) would be more associated with depression than anxiety; and the dysphoric arousal factor, as a unique PTSD construct, would be associated with anxiety and depression equally.

Methods

Participants

On May 12, 2008, southwest China was hit by a very destructive earthquake that measured 8.0 on the Richter scale. During the earthquake, 69,227 people were killed, 374,643 injured, 17,923 listed as missing, and about 4.8 million left homeless.

For the purpose of assessing disaster-related mental health needs, and implementing effective psychological assistance and interventions in the earthquake-affected area, the sample was collected by a psychological relief workstation established by the Institute of Psychology, Chinese Academy of Sciences in a middle school of Beichuan County. The school was almost completely destroyed by the earthquake, and more than 800 students were killed there. The sample of this study consisted of 1,473 (52.6%) females and 1,327 (47.4%) males with age ranging from 12 to 18 years (M=15.2, SD=1.7). Of the participants, 2,029 (72.5%) were of Qiang nationality, 702 (25.1%) were Han, and 69 (2.5%) belonged to other sub-nationalities (including Tibetan, Hui, and Tujia). All participants were directly exposed to the deadly earthquake and thus all satisfied for PTSD's Criterion A1. During the earthquake, a total of 1,471 (52.5%) participants lost at least one of their family members, 713 (25.5%) participants were injured, and 2,476 (88.4%) felt intense fearful.

Measures

PTSD symptoms were assessed with the 17-item PTSD Checklist-Specific Stressor Version (PCL-S; Weathers et al. 1993). The PCL is a short, easily administered self-report measure that corresponds directly to the *DSM-IV* PTSD criteria. Each item is rated on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*extremely*), reflecting the extent to which a particular symptom bothers the respondent during the past month. The reliability and validity of the PCL have been well-documented in previous psychometric studies (reviewed in McDonald and Calhoun 2010; Norris and Hamblen 2004). The Chinese version of the PCL was adapted via a two-stage process of translation and back translation (Wu et al. 2008). Adequate levels of internal consistency (Cronbach's α above 0.77) and test-retest reliability (3-week interval, 0.84) for the total scale have been previous reported (e.g., Wang et al. 2009; Wu et al. 2008; Yang et al. 2007). The convergent and discriminant validity of the Chinese PCL are supported through large associations with other PTSD measures including the Impact of Event Scale-Revised (IES-R; Weiss and Marmar 1997), Clinician-Administered Posttraumatic Stress Disorder Scale (CAPS; Blake et al. 1995), and the General Health Questionnaire-20 (GHQ-20; Goldberg 1978) (Wu et al. 2008). Although the PCL was primarily validated in adults (age 18 and over), its applicability in adolescents has been demonstrated by previous studies with Western and Chinese samples (e.g., Barnes et al. 2005; Calderoni et al. 2006; Liu et al. 2010; Wang et al. 2009). In this study, participants were instructed to complete the PCL referring to the "Wenchuan Earthquake". Cronbach's α for the scale was 0.91 in the current sample.

Anxiety and depression symptoms were assessed with two corresponding subscales of the 21-item Depression Anxiety Stress Scales (DASS-21, Lovibond and Lovibond 1995). The DASS-21 is an easy administrated self-report inventory designed to measure negative emotional states of depression, anxiety and stress. Each subscale contains 7 items, and each item is scored on a 4-point Likert scale ranging from 1 (*did not apply to me at all*) to 5 (*applied to me very much of the time*), reflecting the extent to which the respondent has experienced over the past week. Numerous studies have found support for reliability, validity and factor structure of the DASS-21 (e.g., Antony et al. 1998; Gloster et al. 2008; Norton 2007; Szabó 2010; Tully et al. 2009; Willemsen et al. 2011). The Chinese version of the DASS-21 was translated via a two-stage process of translation and back translation (Taouk et al. 2001). The factor structure of the Chinese DASS-21 was supported (e.g., Taouk et al. 2001; Gong et al. 2010). Adequate levels of internal consistency have been previous reported for the anxiety subscale (Cronbach's α ranging from 0.79 to 0.87) and the depression subscale (Cronbach's α ranging from 0.77 to 0.82) (Gong et al. 2010; Liu et al. 2006; Oei et al. 2008). The convergent and discriminant validity of the anxiety subscale and depression subscale have been demonstrated through associations with the Beck Depression Inventory (BDI; Beck 1972) and the State-Trait Anxiety Inventory (STAI; Spielberger et al. 1983) (Gong et al. 2010). In the current sample, Cronbach's α was 0.79 for the anxiety subscale, and 0.83 for the depression subscale.

Procedure

The data were collected 6 months after the "Wenchuan Earthquake". The investigators included trained clinical psychologists, psychiatrists, and psychotherapists. Before

administrating self-reported questionnaires to the participants, investigators obtained oral informed consent and introduced the aim and significance of the survey in detail.

Data analysis

Descriptive statistics were calculated in the Statistical Package for the Social Sciences (SPSS) version 11.5 for Windows. All measurement models were evaluated with CFA using Lisrel 8.72 (Jöreskog and Sörbom 2005). Of participants, there were 114 (4.1%) missing one to three PCL items, 66 (2.3%) one or two anxiety items, and 101 (3.6%) one or two depression items. As recommended by Schafer and Graham (2002), we used full information maximum likelihood (ML) procedures to estimate these missing item-level values.

Based on most recent PTSD CFA studies outlined early, we chose to test three alternative models in the current study (cf. Table 1 for item mappings). These models included the four-factor numbing model of King et al. (1998) (Model 1), the four-factor dysphoria model of Simms et al. (2002) (Model 2), and the five-factor model of Elhai et al. (2011) (Model 3). As the preliminary normality test indicated that the data were not multivariate normal, χ^2 (2, N=2,800)= 9720.06, p<0.001, maximum likelihood estimation was implemented using the mean-adjusted, scaled Satorra-Bentler chi-square statistic (S-B χ^2; Satorra and Bentler 1988) to correct for non-normality. For all measurement models, error covariances were fixed to zero, and factors were permitted to correlate. Indices used to aid in model fit evaluation included the root-mean square error of approximation (RMSEA; values of 0.06 or less indicate excellent fit), the standardized root mean square residual (SRMR; values of 0.08 or less indicate excellent fit), the comparative fit index (CFI; values of 0.95 or greater indicate excellent fit), and the Tucker-Lewis index (TLI; values of 0.95 or greater indicate excellent fit) (Hu and Bentler 1998, 1999). The corrected scaled χ^2 difference test developed by Satorra and Bentler (2001) was used to compare nested models (i.e., Model 3 vs. Models 1 and 2), and the Bayesian information criterion (BIC; Schwarz 1978) was used to compare non-nested models (i.e., Model 1 vs. Model 2). As suggested by Raftery (1995), a BIC difference of 6–10 points strong support, and a difference of >10 points very strong support for the model with lower BIC value. The BIC is not included in LISREL 8.72 output, and was thus calculated separately using the following formula: $\mathrm{BIC} = \mathrm{S} - \mathrm{B}\chi^2 + \ln(N)^*t$, where N = sample size and t = number of parameters estimated in the model (Raftery 1995).

To evaluate external convergent and discriminant validity, we subsequently included the five-factor PTSD model and two additional factors (i.e., an anxiety factor and a depression factor measured by the DASS-21 anxiety and depression subscales, respectively) within a larger CFA (cf. Fig. 1). Following above-mentioned procedure and methods used to test the PTSD models, we submitted this seven-factor model to CFA to calculate correlation coefficients between the PTSD factors and the anxiety and depression factors. We used Fisher's z-test to compare the strength of associations between the PTSD factors and each of the anxiety and depression factors. All p values reported for the z statistics are two-tailed.

Table 1 Item mapping for confirmatory factor analysis

PTSD symptoms	Model 1 (King et al. 1998)	Model 2 (Simms et al. 2002)	Model 3 (Elhai et al. 2011)
B1. Intrusive thoughts	I	I	I
B2. Nightmares	I	I	I
B3. Flashbacks	I	I	I
B4. Emotional reactivity	I	I	I
B5. Physical reactivity	I	I	I
C1. Avoidance of thoughts	A	A	A
C2. Avoidance of reminders	A	A	A
C3. Amnesia for aspects	N	D	N
C4. Loss of interest	N	D	N
C5. Feeling distant	N	D	N
C6. Feeling numb	N	D	N
C7. Foreshortened future	N	D	N
D1. Sleep disturbance	H	D	DA
D2. Irritability	H	D	DA
D3. Difficulty concentrating	H	D	DA
D4. Hypervigilance	H	H	AA
D5. Exaggerated startle	H	H	AA

I Intrusion, *A* Avoidance, *N* Numbing, *H* Hyperarousal, *D* Dysphoria, *DA* Dysphoric Arousal, *AA* Anxious Arousal

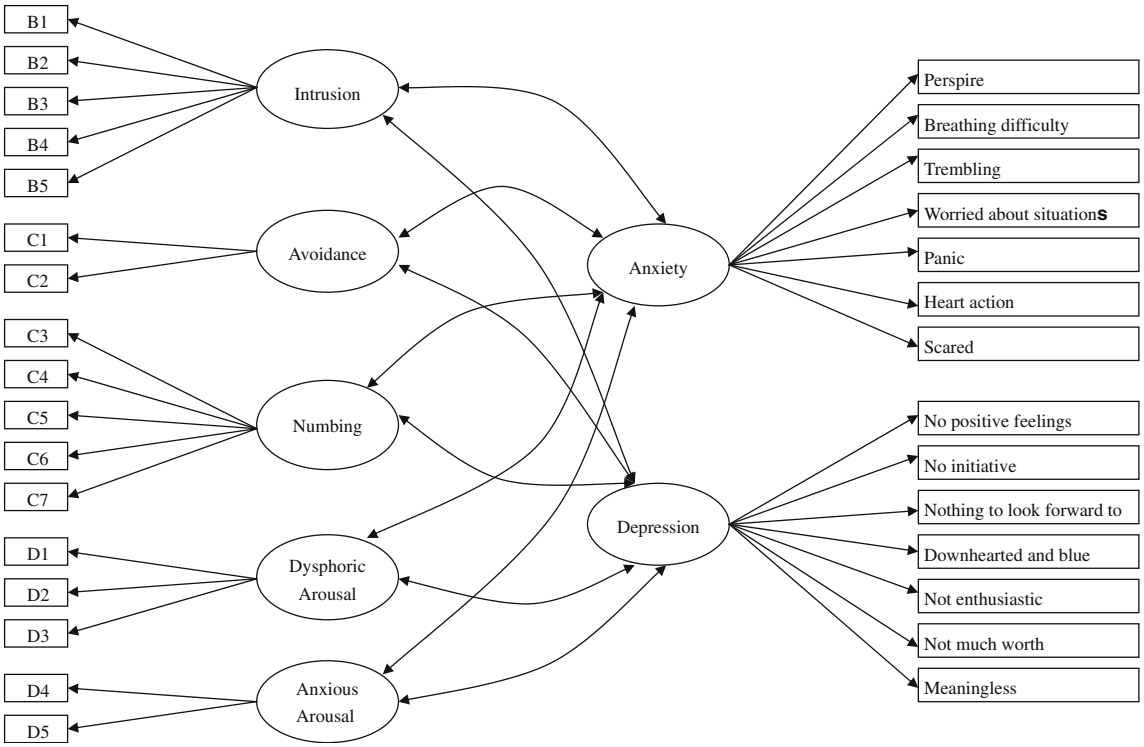

Fig. 1 Structure of the model comprising seven intercorrelated factors: five PTSD factors, one anxiety factor and one depression factor

Results

Descriptive statistics

The mean PCL score was 36.1 (*SD*=11.2, range: 17–80) for the present sample. As suggested by previous studies using civilian trauma victim samples in United States (cf. McDonald and Calhoun 2010) and using earthquake survivor samples in China (Li et al. 2010; Zhao et al. 2009), we used a clinical cutoff score of 44 on the PCL. According to this criterion, a total of 609 (21.8%) participants were identified as probable PTSD cases. With respect to the severity of anxiety and depression symptoms, mean scores on the DASS-21 anxiety and depression subscales were 4.7 (*SD*=3.8, range: 0–21), and 4.9 (*SD*=4.2, range: 0–21), respectively.

Testing factor structure of PTSD symptoms

Fit statistics for three competing models are shown in Table 2. According to the aforementioned criteria, all models provided excellent fit. Regarding non-nested models comparison, despite apparently trivial differences in goodness of fit indices, a ΔBIC of 22.84 indicated very strong support that Model 2 (the four-factor dysphoria model) fit better than Model 1 (the four-factor numbing model). In terms of nested model comparisons, The results of the corrected scaled χ^2 difference tests revealed that Model 3 (the five-factor model) fit significantly better than both Model 1 (ΔS-Bχ^2 (4, N=2,800)=185.21, p<0.001) and Model 2 (ΔS-Bχ^2 (4, N=2,800)=178.99, p<0.001). Accordingly, Model 3 emerged as the best fitting model in the current sample. Table 3 presents the standardized factor

Table 2 Model goodness of fit indices

Models	χ^2	S-Bχ^2	*df*	CFI	TLI	SRMR	RMSEA	RMSEA 90% CI	BIC
Model 1	1600.17	1155.36	113	0.980	0.976	0.043	0.057	0.054–0.060	1472.86
Model 2	1562.17	1132.52	113	0.980	0.976	0.041	0.057	0.054–0.060	1450.02
Model 3	1311.07	951.06	109	0.984	0.980	0.041	0.053	0.050–0.056	1300.30

S-Bχ^2 scaled Satorra-Bentler χ^2, *CFI* Comparative fit index, *TLI* Tucker-Lewis index, *SRMR* Standardized root mean square residual, *RMSEA* Root mean square error of approximation, *CI* Confidence interval, *BIC* Bayesian information criterion

loadings and factor correlations of Model 3. Cronbach's α was 0.82 for the intrusion subscale, 0.76 for the avoidance subscale, 0.72 for the numbing subscale, 0.73 for the dysphoric arousal subscale, and 0.78 for the anxious arousal subscale in the current sample.

Examining external validity

The seven-factor model also provided excellent fit, indicated by χ^2 (413, N=2,800)=3513.57, S-Bχ^2=2885.66, CFI=0.983, TLI=0.981, SRMR=0.042, RMSEA=0.046 (90% CI: 0.045–0.048), and BIC=3544.46. Table 4 presents correlation coefficients between the five PTSD factors and each of the anxiety and depression factors. The results of Fisher's z-tests revealed that all but one of PTSD's five factors displayed significantly different correlations with the anxiety vs. depression factors (also see Table 4). The intrusion, avoidance and anxious arousal factors associated more strongly with the anxiety factor than with the depression factor (all p<0.001). In contrast, the numbing factor demonstrated significantly higher correlations with the depression factor than with the anxiety factor (p<0.001). Finally, the dysphoric arousal factor associated with the anxiety and depression factors equivalently (p=0.472).

Table 3 Standardized factor loadings and factor correlations for the five-factor PTSD model

	I	A	N	DA	AA
B1. Intrusive thoughts	0.68				
B2. Nightmares	0.63				
B3. Flashbacks	0.69				
B4. Emotional reactivity	0.74				
B5. Physical reactivity	0.70				
C1. Avoidance of thoughts		0.72			
C2. Avoidance of reminders		0.85			
C3. Amnesia for aspects			0.46		
C4. Loss of interest			0.65		
C5. Feeling distant			0.68		
C6. Feeling numb			0.59		
C7. Foreshortened future			0.59		
D1. Sleep disturbance				0.65	
D2. Irritability				0.72	
D3.Difficulty concentrating				0.71	
D4. Hypervigilance					0.81
D5. Exaggerated startle					0.80
Factor correlations					
A	0.67				
N	0.65	0.60			
DA	0.72	0.61	0.85		
AA	0.78	0.59	0.74	0.86	

N 2800, *I* Intrusion, *A* Avoidance, *N* Numbing, *DA* Dysphoric Arousal, *AA* Anxious Arousal

Table 4 Comparison of the strength of correlations between the five PTSD factors and each of the anxiety and depression factors

Factors	Anxiety	Depression	*Z*	*p*
Intrusion	0.74	0.54	12.41	< 0.001
Avoidance	0.58	0.50	4.11	< 0.001
Numbing	0.78	0.85	−8.43	< 0.001
Dysphoric arousal	0.80	0.79	0.72	0.472
Anxious arousal	0.81	0.64	13.94	< 0.001

N=2,800. The correlation coefficient between the anxiety and depression factors was 0.79

Discussion

Using data yielded from a large sample of Chinese adolescents exposed to the "Wenchuan Earthquake", this study tested three alternative diagnostic models for PTSD. The results of CFA indicated that a five-factor intercorrelated model composed of intrusion, avoidance, numbing, dysphoric arousal, and anxious arousal, fit data significantly better than both two well-supported four-factor models: the King et al. (1998) numbing model and the Simms et al. (2002) dyphoric model. Further analyses revealed that all factors, except the dysphoric arousal factor, presented significantly different correlations with external measures of anxiety vs. depression. The findings suggest that PTSD symptoms can be best explained by the intrusion, avoidance, numbing, dysphoric arousal, and anxious arousal clusters, and support the idea that the newer reconceptualization of PTSD symptoms proposed by Elhai et al. (2011) can be extended to trauma-exposed youths.

In light of the impending *DSM-5*, ongoing examination of the structure of PTSD is pertinent for further organizing clinically useful diagnostic criteria that can guide sophisticated assessment and intervention for traumatized people including youths. As outlined earlier, both the four-factor numbing model proposed by King et al. (1998) and the four-factor dysphoria model proposed by Simms et al. (2002) have received extensive empirical support in CFA studies with adults. This support has been replicated in samples of youths, albeit across a fewer number of studies. The models only differ in placement of PTSD's D1-D3 symptoms. In this study, in addition to the well-supported four-factor models, we further investigated a newly proposed and supported five-factor model in which the three symptoms were treated as a unique construct. The results

indicated that the five-factor model fit the data significantly better than the four-factor models. From a developmental perspective, the current findings are encouraging since they are generally consistent with recent CFA studies using adult samples (e.g., Elhai et al. 2011; Wang et al. 2011). The developmentally robust findings yield strong empirical support for the five-factor PTSD diagnostic model, and expand our knowledge regarding underlying dimensions of human response to trauma.

As highlighted by several researchers (e.g., Miller 2010; Miller et al. 2010), validating a diagnostic model can not only rely on internal fit statistics. In the present study, we further evaluated external convergent and discriminant validity of the five-factor model by examining relationships between PTSD symptom factors and external measures of anxiety and depression. We developed hypotheses derived by previous work (e.g., Elhai et al. 2011; Watson 2005, 2009) about differentiable relations between the five PTSD factors and the anxiety vs. depression constructs. The results indicated that the intrusion, avoidance and anxious arousal factors (i.e., anxiety-related PTSD constructs) showed significantly higher correlations with anxiety than with depression; the numbing factor (i.e., a depression-related PTSD construct) displayed significantly higher correlations with depression than with anxiety; and as a both anxiety-related and depression-related PTSD construct, the dysphoric arousal factor presented statistically identical correlations with anxiety and depression. These findings confirmed our hypotheses, and lend further support for external convergent and discriminant validity of the five-factor PTSD model.

Taken together, our findings not only provide but also extend empirical support for the newer five-factor conceptualization of PTSD symptoms. The findings implicate that a separate symptom cluster of dysphoric arousal may deserve special consideration in organizing PTSD criteria. Moreover, the findings also provide more detail into the latent psychopathological processes of PTSD. It has been previous reported that hyperarousal cluster composed of PTSD's D1–D5 symptoms are closely associated with functional impairment in trauma-exposed adults (Heir et al. 2010) and youths (Kassam-Adams et al. 2010). Further studies treating the dysphoric arousal and anxious arousal as separate clusters may help to clarify the appropriate role of the clusters in clinical presentation and impact of posttraumatic responses in youths and adults. Furthermore, not all PTSD symptoms are created equal (Schell et al. 2004). There are numerous conceptual models positing particular causal pathways regarding the emergence and progression of psychological distress symptoms in traumatized individuals (reviewed in Schell et al. 2004). To empirically test these conceptual models hinges on conceptually and empirical differentiable PTSD symptom clusters. The new validated five-factor model can serve this purpose. It is important to note that two recent longitudinal studies (Marshall et al. 2006; Schell et al. 2004) have demonstrated the prominent role of the hyperarousal cluster (defined in the *DSM-IV*) in the natural course of posttraumatic psychological distress. Future longitudinal studies should specify the distinct role of the dysphoric arousal and anxious arousal clusters, which in turn can benefit further understanding of the pathogenesis and nature of PTSD, and develop sophisticated intervention programs.

Several limitations of the present study should be noted. First, we used data from an adolescent sample exposed to a deadly earthquake. The limitations of studies with a single type of traumatic event have been explicitly acknowledged by several researchers (e.g., Anthony et al. 2005; Elhai et al. 2007). Therefore, the findings need to be subjected to further testing with samples from a range of trauma-exposed populations. Second, the generalizability of the finding is also limited as we relied on self-report measures. Such has been clearly noted as a limitation in many previous studies (e.g., Elhai et al. 2011; Heir et al. 2010). Thus, additional studies using clinician-rated and/or parent-report measures are warranted. Third, there are only two indicators tapping the avoidance and anxious arousal factors, which may lead to estimation problems in structural equation modeling contexts (e.g., Kline 2004). It is an inherent problem faced by all PTSD CFA studies using measures whose items mirror the 17 *DSM-IV* PTSD symptoms. To yield a more stable factor solution, future research should include additional indicators for the avoidance and anxious arousal factors. Fourth, we only used limited external variables to evaluate the external convergent and discriminant validity of the five-factor PTSD model. Future studies need to further examine a range of external psychological, biological, and behavioral correlates of the model.

Notwithstanding the limitations, by drawing data from a large sample of Chinese adolescents suffering from a deadly earthquake, the current study provides but extends empirical support for the five-factor PTSD model recently proposed by Elhai et al. (2011), and suggests that the newer conceptualization of PTSD symptoms can also be extended to trauma-exposed youths. The findings add to the limited literature on the factor structure of PTSD in youths and on the five-factor PTSD model. Futhermore, they provide more detail into the latent psychopathological processes of PTSD, and inform the forthcoming *DSM-5*.

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