



Factor structure of acute stress disorder symptoms in Chinese earthquake victims: A confirmatory factor analysis of the acute stress disorder scale

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ABSTRACT

This study examined the factor structure of the acute stress disorder scale (ASDS; Bryant, Moulds, & Guthrie, 2000), a self-report measure for acute stress disorder (ASD). The study was completed 6 to 10 days following an earthquake; it included 353 Chinese earthquake victims (173 women, 180 men; mean age = 29.36, SD = 11.45 years). The results of confirmatory factor analyses indicate that a 4-factor model (dissociation, reexperiencing, avoidance and arousal) is consistent with the conceptualization of ASD, which is defined in the *Diagnostic and Statistical Manual of Mental Disorder-Fourth Edition (DSM-IV)*. Implications and limitations for the results are discussed.

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1. Introduction

Acute stress disorder (ASD) is introduced in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)* to describe posttraumatic stress reactions that occur in the initial month after a trauma (American Psychiatric Association, 1994). According to the *DSM-IV*, ASD diagnosis requires an individual to satisfy the stressor criterion (i.e., exposure to an extreme traumatic stressor; Criterion A). During or immediately after the traumatic event, an individual displays at least three of the following acute dissociative symptoms: a subjective sense of numbing, a reduction in awareness of his or her surroundings, depersonalization, derealization, or dissociative amnesia (Criterion B). Following the event, the individual has at least one reexperiencing symptom (e.g., recurrent images, thoughts, dreams, illusions, or a sense of reliving the experience; or distress on exposure to reminders of the traumatic event; Criterion C); displays marked avoidance of stimuli that may arouse recollections of the trauma (e.g., thoughts, feelings, conversations, activities, places, people; Criterion D); and has marked symptoms of anxiety or increased arousal (e.g., diffi-

culty in sleeping, irritability, poor concentration, hypervigilance, exaggerated startle response, motor restlessness; Criterion E). There is evidence of significant distress or impairment in social, occupational, or other important areas of functioning (Criterion F), and the disturbance must last for a minimum of 2 days and a maximum of 4 weeks (Criterion G).

The diagnosis of ASD appears to be a strong predictor of subsequent posttraumatic stress disorder (PTSD) (Bryant & Harvey, 1998; Harvey & Bryant, 2000). A significant proportion of studies investigating the relationship between PTSD and ASD have indicated that approximately three-quarters of those trauma survivors who display ASD symptoms subsequently develop PTSD (Brewin, Andrews, Rose, & Kirk, 1999; Harvey & Bryant, 1998, 1999, 2000; Holeva, Tarrier, & Wells, 2001). Given that early intervention would effectively reduce the likelihood of developing a long-term psychiatric disorder (Bryant & Harvey, 1999; Bryant, Moulds, Guthrie, & Nixon, 2005; Bryant, Moulds, & Nixon, 2003; Ehlers, Mayou, & Bryant, 2003), ASD diagnosis is helpful to early identify people at risk for developing PTSD, and effective treatments may be implemented shortly after exposure to a traumatic event.

Although the diagnosis of ASD has appeared in the diagnostic and statistical manual for more than 25 years, there are very few studies employed to examine if the four dimensional conceptualization of ASD (i.e., dissociation, reexperiencing, avoidance, and arousal) are supported by empirical data (Brooks et al., 2008). Using exploratory

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factor analysis (EFA), Bryant et al. (2000) found that the acute stress disorder scale (ASDS; Bryant, 1999; Bryant et al., 2000), a self-report measure for ASD, yielded a 3-factor model including acute posttraumatic stress reactions, dissociative symptoms, and dissociative amnesia in 99 adult victims (34 women, 65 men; mean age = 31.59, SD = 11.28 years) of motor vehicle/industrial accidents and nonsexual assault, and yielded a 4-factor model (partially consistent with the *DSM-IV* conceptualization of ASD) including dissociative symptoms, intrusion-arousal symptoms, avoidance and reactivity in 107 adult fire victims (58 women, 49 men; mean age = 38.56, SD = 16.88 years). Using confirmatory factor analysis (CFA), Brooks et al. (2008) examined the acute stress disorder interview (ASDI; Bryant, Harvey, Dang, & Sackville, 1998), a clinician-rated version of the ASDS, in a sample of 587 adult victims (170 women, 417 men; mean age = 38.30, SD = 13.60 years) who suffered from different accidents or assaults. The results supported a 4-factor model which was consistent with the *DSM-IV* conceptualization of the disorder.

Despite the promising findings, the 4-factor model described for ASD has only been supported by limited empirical studies. Moreover, the previous studies were all conducted in the Western world with samples from man-made trauma populations. Although the types of trauma and culture have important effects on traumatic responses in victims (e.g., Rubonis & Bickman, 1991; Marsella & Christopher, 2004), little is known as to whether the proposed 4-factor model of the ASD symptoms would be found in non-Western samples who experienced natural disasters. To expand the limited literatures related to ASD symptom structure, the present study was designed to determine the factor structure of the ASD symptoms in a sample of individuals from China who recently experienced an earthquake. The ASD symptoms were assessed with the ASDS (Bryant, 1999; Bryant et al., 2000). The ASDS was developed to address the need for a standardized self-report measure in the field.

2. Methods

2.1. Participants

On August 30, 2008, an earthquake measured 6.1 on the Richter scale occurred in Panzhihua-Huili district, an area across Sichuan and Yunnan provinces in southwest China. During the earthquake, 38 people were killed, 589 injured, and about 152,000 left homeless. It was the deadliest and strongest earthquake to hit southwest China after the “5.12” Wenchuan earthquake.

The sample was collected by a psychological relief team for the purpose of identifying vulnerable populations, and implementing effective psychological assistance and interventions in the earthquake-affected area. The sample consisted of 173 (49%) women and 180 (51%) men with age ranging from 17 to 68 years ($M = 29.36$, $SD = 11.45$). Of the participants, 157 (44.5%) were married, 196 (55.5%) were unmarried (never married, divorced, separated, widowed). Three hundred and eighteen 318 (90.1%) were Han people, and 35 (9.9%) were people belonging to other subnationalities (including Tibetan, Yi, Tujia, Miao, and Hui) in China. In terms of educational levels, 48 (13.6%) did not complete high school, 130 (36.8%) completed high school, and 175 (49.6%) completed college. All the participants experienced the earthquake in Panzhihua district. A total of 24 (6.8%) participants were slightly injured, and 7 (2%) were bereaved during the disaster.

2.2. Measure

The ASD symptoms were assessed with the acute stress disorder scale (ASDS; Bryant, 1999; Bryant et al., 2000). The ASDS is a 19-item scale based on the *DSM-IV* criteria, and each of the items

is scored on a 5-point scale that indicates the severity of ASD symptoms from 1 (*not at all*) to 5 (*very much*). The items that compose the scale include: 5 assessing dissociation symptoms, 4 assessing reexperiencing symptoms, 4 assessing avoidance symptoms, and 6 assessing arousal symptoms. The ASDS now is a widely used self-report measure in trauma-related research and clinical settings, and has been demonstrated to have sound psychometric properties (e.g., Bryant, 1999; Bryant et al., 2000; Orsillo, 2001). Based on data from a sample of 107 bushfire survivors, Bryant et al. (2000) found that the Cronbach's alpha was .96 for the total ASDS, .84 for dissociation, .87 for reexperiencing, .92 for avoidance and .93 for arousal, respectively. Two-to seven-day test-retest reliability for the ASDS was also found to be good indicated by .94 for the total scale, .85 for dissociation, .94 for reexperiencing, .89 for avoidance and .94 for arousal, respectively (Bryant et al., 2000). By using a cutoff for the dissociation cluster of ≥ 9 combined with a cutoff of ≥ 28 for the reexperiencing, avoidance, and arousal clusters, researchers found that the ASDS possessed good sensitivity (.95), specificity (.83) and efficiency (.87) to identify ASD against the ASD interview in 99 civilian trauma survivors (Bryant et al., 2000). By using an optimal cutoff of ≥ 56 for the total scale, the ASDS could predict 91% of those who developed PTSD and 93% of those who did not in 82 bushfire survivors (Bryant, 1999).

2.3. Procedure

Based on the diagnostic criteria for ASD listed on the English version and the Chinese version of the *DSM-IV*, the Chinese version of the ASDS was adapted from the English version. As recommended by Merenda (e.g., 1994, 2006), the ASDS items were translated with a two-stage process of translation and back-translation by two Chinese clinical psychologists who are fluent in both Chinese and English. The translators are sophisticated experts in trauma-related research, and have rich experience in the translation between Chinese and English.

The data were collected 6–10 days after the earthquake by a psychological relief team including trained clinical psychologists, psychiatrists, and psychotherapists. Before giving self-report questionnaires to the participants, interviewers obtained oral consents and introduced the aim and significance of the survey in detail.

3. Results

Means, standard deviations, ranges, and internal consistency of the total ASDS and the individual subscales are presented in Table 1. According to optimal formula for scoring the ASDS (Bryant et al., 2000), a cutoff for the dissociation cluster of ≥ 9 combined with a cutoff of ≥ 28 for the reexperiencing, avoidance, and arousal clusters indicate probable ASD. Based on the above-mentioned criteria, a total of 54 (15.3%) participants in this study were identified as probable ASD.

Three models were first compared in the current study (see Table 2 for item mapping). The competing models included: the 4-factor model based on *DSM-IV* clusters (Model 1), the 3-factor model developed using EFA by Bryant et al. (2000) in 99 civilian

Table 1
Means, standard deviations, ranges, and internal consistency of the ASDS.

ASDS	<i>M</i>	<i>SD</i>	Range	Cronbach's alpha
Total scale	31.22	10.14	19–71	.92
Dissociation	8.06	2.09	5–22	.70
Reexperiencing	7.08	2.77	4–20	.77
Avoidance	5.86	2.34	4–18	.77
Arousal	10.23	4.20	6–30	.85

Note. $N = 353$.

Table 2
Item mapping for confirmatory factor analysis.

Item	Model 1	Model 2	Model 3
Emotional numbness	Dis	Dis	Dis
Feeling in a daze	Dis	Dis	Int-Aro/Dis
Things seem unreal	Dis	Dis	Dis
Feeling different	Dis	Dis	Dis
Amnesic of trauma	Dis	Dis amn	Avo/Dis
Intrusive memories	Ree	Acute PTSD	Int-Aro
Nightmares	Ree	Acute PTSD	Int-Aro/Avo
Sense of reexperiencing	Ree	Acute PTSD	Rea
Distress on trauma reminders	Ree	Acute PTSD	Int-Aro/Avo
Avoid thinking about trauma	Avo	Acute PTSD	Avo
Avoid talking about trauma	Avo	Acute PTSD	Avo
Avoid reminders of trauma	Avo	Acute PTSD	Avo
Avoid emotions of trauma	Avo	Acute PTSD	Int-Aro/Dis
Difficulty sleeping	Aro	Acute PTSD	Int-Aro
Feeling irritable	Aro	Acute PTSD	Int-Aro
Difficulty concentrating	Aro	Acute PTSD	Int-Aro
Feeling more alert to danger	Aro	Acute PTSD	Rea
Feeling jumpy since trauma	Aro	Acute PTSD	Int-Aro/Rea
Physiologically reactivity	Aro	Acute PTSD	Int-Aro

Note. Model 1 = 4-factor model based on *DSM-IV* clusters; Model 2 = 3-factor model developed using EFA by Bryant et al. (2000) in 99 civilian trauma survivors; Model 3 = 4-factor model developed using EFA by Bryant et al. (2000) in 107 fire victims. Factor loadings: Dis = dissociation, Ree = reexperiencing, Avo = avoidance, Aro = arousal, Dis Amn = dissociative amnesia, Acute PTSD = acute posttraumatic stress reactions (reexperiencing, avoidance, and arousal), Int-Aro = intrusion-arousal, Rea = reactivity.

trauma survivors (Model 2), and the 4-factor model developed using EFA by Bryant et al. (2000) in 107 fire victims (Model 3). The CFA were conducted to evaluate proposed models of ASD using Lisrel 8.72 (Jöreskog & Sörbom, 2005). The maximum likelihood method was used as estimator, and the factors were permitted to correlate. The indices used to assess goodness-of fit for the models included the root-mean square error of approximation (RMSEA; values of .08 or less indicate good fit), the comparative fit index (CFI; values of .90 or greater indicate good fit), the Tucker–Lewis index (TLI; values of .90 or greater indicate good fit) (Byrne, 2001; McDonald & Ho, 2002). Given that these models were not nested with each other, the Akaike information criterion (AIC, Akaike, 1987) was used to compare the models. Smaller AIC values indicate a more parsimonious solution.

The multivariate normality test was first used to examine whether the data met the normality assumptions underlying the maximum likelihood method used to test the models in this study. The result indicated that the data were not multivariate normal, $\chi^2(2, N = 353) = 4512.014, p < .001$. Therefore, the scaled χ^2 statistics developed by Satorra and Bentler (1988) would be used in subsequent analyses to adjust the impact of non-normality.

Fit statistics for all models are presented in Table 3. According to the above-mentioned criteria, both Model 1 and Model 3 achieved acceptable fit. However, compared with Model 3, Model 1 had smaller value of the AIC. Therefore, Model 1 was superior to Model 3. Fig. 1 presents the factor structure and standardized

estimates derived from CFA for Model 1. The standardized factor loadings of each item on its proposed factor were all above .42. Therefore, all of the latent factors appeared to have been adequately measured by their respective indicators.

The high correlation (.94, see Fig. 1) between the reexperiencing factor and arousal factor in Model 1 may implicate that they may belong to one factor. Therefore, an alternative 3-factor model (Model 4, reexperiencing symptoms were combined with arousal symptoms to form a factor) was examined. In addition, due to the strong correlations between the four factors (also see Fig. 1), it is also possible that a general factor underlies them. Consequently, a 1-second-order-factor and 4-first-order-factor model (Model 5) was also proposed for examination. The results of CFA indicated that the two models also had acceptable fit values (see Table 3). However, based on parsimony considerations, as well as the AIC, the two models were rejected in favor of Model 1.

4. Discussion

By analyzing a data set of the ASDS completed by Chinese earthquake victims, this study contributes to the limited literatures related to ASD symptom structure. The results of confirmatory factor analyses indicated that the proposed 4-factor structure of ASD described by *DSM-IV* was supported. The findings suggest that acute stress responses can be explained by the dissociation, reexperiencing, avoidance, and arousal clusters in Chinese earthquake victims, and support the idea that the *DSM-IV* conceptualization of ASD can be extended to different trauma types and cultures. Moreover, this study also provides empirical support for the structure validity of the ASDS, which was developed purely on the basis of theoretical considerations (Bryant et al., 2000).

Previous studies concerning the factor structure of ASD found that the reexperiencing, avoidance, and arousal clusters correlated strongly with each other, and correlated relatively poorly with the dissociative cluster (e.g., Bryant et al., 2000; Brooks et al., 2008). Therefore, Bryant et al. (2000) recommended that the optimal formula for scoring the ASDS relative to the ASD diagnosis needed to consider the dissociative cluster and other clusters separately. Not in line with previous findings, we found that the dissociative cluster correlated strongly with the three other clusters (see Fig. 1). This disparity may be due to the cultural differences between China and the Western world. As noted by researchers (e.g., Rhoades, 2006), although psychiatric disorders appear in all cultures, their form and expression may often vary in a way that is linked to cultural belief systems. According to traditional Chinese medicine, there is a close relationship between physical and mental disorders, as psychological factors are also implicated in physical illnesses (see Tang, 2007). Many Chinese people tend to attribute their psychological distress to physical or external origins, rather than openly expressing them (e.g., Wang et al., 2000). Consequently, their psychological distress is expressed by somatization and/or dissociative symptoms. In a recent study, Kleindorfer (2006) investigated the differences in dissociative experiences

Table 3
Model goodness-of fit indices.

Model	df	χ^2	Scaled χ^2	AIC	CFI	TLI	RMSEA	RMSEA 90% CI
Model 1	146	402.94	215.88	490.94	.99	.99	.038	.027–.049
Model 2	149	605.99	234.21	687.99	.99	.99	.042	.031–.052
Model 3	140	410.19	220.68	510.19	.99	.99	.042	.031–.052
Model 4	149	417.56	222.23	499.56	.99	.99	.039	.028–.049
Model 5	148	417.01	222.64	501.01	.99	.99	.039	.028–.050

Note. $N = 353$. Model 4 = 3-factor model in which reexperiencing symptoms were combined with arousal symptoms to form a factor; Model 5 = 1-second-order-factor and 4-first-order-factor model based on model 1. AIC = Akaike information criterion; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root-mean square error of approximation; CI = confidence interval.

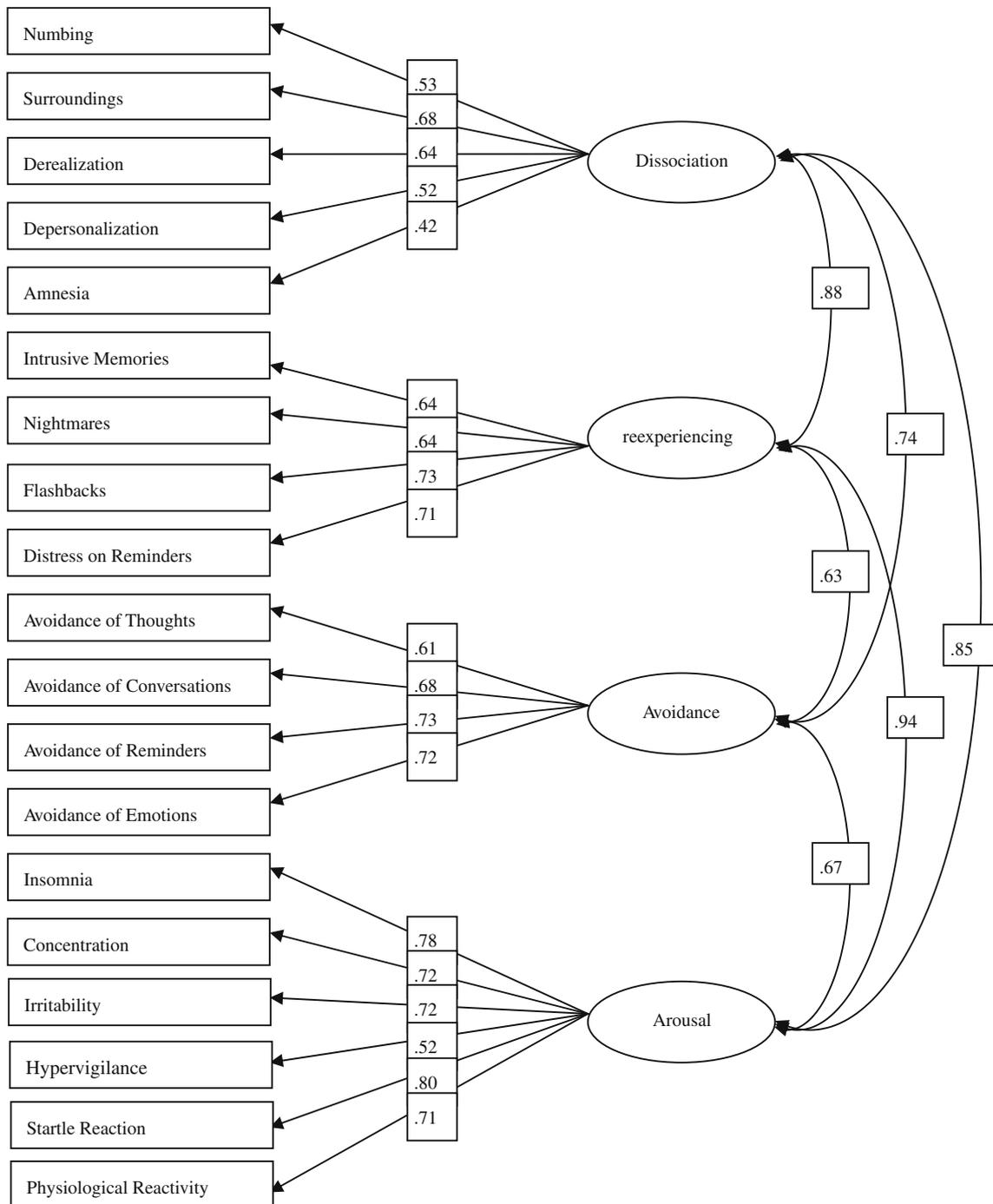


Fig. 1. Factor structure of ASD symptoms in Chinese earthquake victims. Note. The boxed numbers were standardized estimates.

among normal college students in China and Japan. Japan's culture is more similar to that in the Western world than China, and found that Chinese students rated higher scores on the dissociative experiences scale than Japanese students.

This finding has important clinical and research implications for further applications. First, regarding using the ASDS to screen probable ASD in China, the optimal formula for scoring the ASDS recommended by Bryant et al. (2000) may be not applicable to the Chinese population. Therefore, an alternative optimal cutoff should be developed in China in future studies. Second, a major reason for the introduction of ASD in the *DSM-IV* was to identify acute post-traumatic stress reactions that are precursors of chronic PTSD (Bryant & Harvey, 1997). An important difference between the

structure of ASD and PTSD is that ASD emphasizes a separate dissociative cluster. However, previous findings about the association between the dissociative cluster and chronic PTSD are contrary (e.g., Briere, Scott, & Weathers, 2005; Bryant, 2007; Ozer, Best, Lipse, & Weiss, 2003; Pole, Best, Metzler, & Marmar, 2005). Given the strong correlation between the dissociative cluster and the three other clusters in the present study, the dissociative cluster might be a stronger risk factor for PTSD in the Chinese population than in Western populations.

Several limitations in this study should be noted. First, the generalizability of our findings is limited by our utilization of a small sample who were earthquake victims. These findings need to be further tested with larger samples and representative

samples from a range of trauma populations in China. Second, the results of this study did not support the consideration that the dissociative and other clusters were separate when the ASDS was used to screen probable ASD. In this study, we proposed that an alternative optimal cutoff might need to be developed. However, the data were collected through questionnaires, which does not allow for clarification of clinical judgment. To further explore this issue, clinical diagnoses made by psychiatrists and/or clinical psychologists in addition to the administration of the ASDS should be employed in future studies. Third, an important goal of ASD diagnosis is to identify people who would develop chronic PTSD. However, due to the lack of information about subsequent PTSD symptoms, we could not further clarify the symptomatological associations between ASD and subsequent PTSD in the current sample. This should be an interesting topic of further study.

Notwithstanding these limitations, this study provides empirical support for the four dimensional conceptualization of ASD in the *DSM-IV*, and suggests that this conceptualization can also be extended to natural disasters such as earthquakes in China. Considering the discrepant findings concerning the relationship between the dissociative cluster and the three other clusters in the present sample and in Western populations, future studies need to further test the applicability of traumatic models originated from the Western context and engage in developing cultural specific models for research and clinical applications in China.

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