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# PTSD Latent Classes and Class Transitions Predicted by Distress and Fear Disorders in Disaster-Exposed Adolescents

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This study aimed to determine the population-based typologies of posttraumatic stress disorder (PTSD) symptomatology, the longitudinal patterns of transitions across these typologies, and the predictive effects of distress and fear disorder symptoms on these transitions in a frequently referred but scantily studied population of traumatized youth. A sample of 1,278 Chinese adolescents (54.0% girls) with a mean age of 13.4 years ( $SD = 0.8$ , range = 12–16) completed 2-wave surveys 2.5 and 3.5 years after a major disaster. Psychopathological symptoms were assessed with the UCLA PTSD Reaction Index for *DSM-IV*, the Depression Self-Rating Scale for Children, and the Screen for Child Anxiety Related Emotional Disorders. Latent class analyses identified 4 classes characterized by high, reexperiencing/hypervigilance, dysphoria, and low symptoms, respectively at each time point. Latent transition analyses revealed relatively high levels of temporal stability within low symptom and dysphoria classes but relatively high probabilities of migration from re-experiencing/hypervigilance and high symptom classes into lower symptom classes. Multinomial logistic regression analyses found that some of the between-class movements during the year were predicted by baseline distress or fear disorders. This study provides an initial depiction of both quantitative and qualitative changes in youth's long-term PTSD symptom patterns over time and gives a further elucidation of other forms of posttrauma psychopathology's impacts on PTSD course. These findings carry implications for ongoing evaluation and adjustable intervention individually tailored to youth's PTSD manifestations and comorbidities in the long-term disaster aftermath.

## INTRODUCTION

From 2006 to 2015, more than 500 disasters occurred annually, which claimed over 80,000 lives, affected 1.7 billion others, and caused economic losses of US \$131.1 billion per year on average (EM-DAT, 2016). As acute-onset

events with high stressfulness, disasters have potentially collective impacts on people's mental health, and youth are especially vulnerable to these impacts (Norris et al., 2002). A systematic review has concluded that up to 50% of youth may develop diagnosable psychopathology that may persist for years after direct exposure to severe disasters (Pfefferbaum, Houston, North, & Regens, 2008). Among the various postdisaster outcomes, posttraumatic stress disorder (PTSD) is the most frequent psychiatric problem with a 10% to 40% prevalence in disaster-exposed youth (Neria,

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Nandi, & Galea, 2008), and the most central abnormal stress reaction linked to comorbidity, suicidality, and functional impairment in this population (Ayer et al., 2011; Lau et al., 2010; Roussos et al., 2005). Thus, youth disaster survivors' PTSD has received extensive attention in both research and clinical practice.

Postdisaster PTSD symptoms may evolve in complex ways, and there may exist heterogeneous populations characterized by distinct PTSD trajectories following disasters (Neria et al., 2008). Accordingly, four subgroups of disaster-exposed youth have been commonly identified in previous studies: *resilient*, with consistently mild symptoms; *chronic*, with persistently severe symptoms; *recovering*, with elevated but abating symptoms; and *delayed*, with late-onset/worsening symptoms (e.g., 0.5–2 years after an earthquake; Fan, Long, Zhou, Zheng, & Liu, 2015). Nevertheless, given the use of PTSD measure scores, such quantitatively differential trajectories only reflected the temporal changes in individuals' symptom severity while overlooking the potential changes in individuals' symptom presentation over time.

As noted in the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*, PTSD symptom presentation varies by person. In some individuals, fear-based reexperiencing, emotional, and behavioral symptoms may be prominent. In others, dysphoric mood states and negative cognitions may predominate. Still others may be bothered by a combination of the preceding symptoms (American Psychiatric Association, 2013). Such clinical observations have also been verified by studies using latent class analysis (LCA) to cluster individuals into subgroups with distinct PTSD symptom patterns in Iraq and Afghanistan female veterans who had received a PTSD diagnosis and U.S. adults with PTSD after unspecified time periods since trauma (Hebenstreit, Madden, & Maguen, 2014; Pietrzak et al., 2014). Specifically, three classes were identified and characterized by a high probability of fear-based symptoms (i.e., reexperiencing, avoidance, hypervigilance, and exaggerated startle), dysphoria symptoms (i.e., emotional numbness, sleep problems, irritability/anger, and concentration problems; representing a general distress/negative affectivity construct of PTSD; Simms, Watson, & Doebbeling, 2002), and all these symptoms, respectively. Subsequent analyses revealed that these classes were differentially associated with trauma and clinical characteristics, PTSD duration, comorbidity, suicidality, quality of life, and mental health service utilization (Hebenstreit, Madden, Koo, & Maguen, 2015; Pietrzak et al., 2014). These findings indicate the qualitative individual differences in PTSD symptomatology and highlight the clinical value of addressing such population heterogeneity. Given the scarcity of LCA studies on youth's disaster-related PTSD, there remains a need to further examine whether youth disaster victims exhibit such qualitatively differential symptom patterns, rather

than patterns generally indicative of overall symptom levels (e.g., Ayer et al., 2011).

Because very few studies have considered the individual differences in symptom presentation when investigating PTSD course, little is known about the extent to which individuals' manifestations of this disorder are temporally stable and, more important, the patterns of transitions across these manifestations over time. Latent transition analysis (LTA), the longitudinal extension of LCA, is an ideal approach for estimating stability and change of class membership between two time points. This approach has been used to identify 1-year PTSD trajectories in conflict-affected youth after unspecified time periods since trauma (Panter-Brick, Grimon, Kalin, & Eggerman, 2015). Given the findings of a retention in low/high symptom class and a migration from low/high into high/low symptom class, this study added to the literature on youth's PTSD course still from a quantitative perspective. To date, only one LTA study has depicted the qualitative changes of PTSD symptom presentation in combat-exposed U.S. Marines from pre- to 8 months postdeployment (Boasso, Steenkamp, Larson, & Litz, 2016). One notable finding of this study was a class membership change from prominent hyperarousal symptom to combined hyperarousal and numbing symptom class. However, this study was unable to provide insight into disaster victims' PTSD class migrations, given that PTSD manifestations may differ for combat versus disaster exposure (DiMauro, Carter, Folk, & Kashdan, 2014). Moreover, although long-term PTSD symptoms in disaster-exposed youth have been documented by plentiful studies (e.g., over 2 years later; Goenjian et al., 2005), most previous studies on youth's postdisaster PTSD course focused on a short-term aftermath (e.g., 0.5–2 years; Fan et al., 2015), whereas very few examined a longer one (e.g., 2–3 years; Kronenberg et al., 2010). Thus, there is a lack of knowledge on evolving patterns of youth's PTSD symptoms in the long-term disaster aftermath. The present study primarily aimed to address this issue by capturing individuals' symptom presentation changes during the 2.5–3.5 years after a major disaster.

Considering that mood and anxiety disorders are significant risk factors for youth's PTSD (Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012) and that these disorders are also highly prevalent among youth disaster victims (Hoven et al., 2005), unfolding their influences on youth's postdisaster PTSD course is another noteworthy issue of both theoretical and practical significance. Previous studies of disaster-exposed youth have demonstrated the prediction of quantitative (i.e., overall symptom levels) changes in PTSD course by mood and anxiety disorders (e.g., La Greca et al., 2013; Lai, La Greca, Auslander, & Short, 2013). However, no study to date has addressed whether and how these disorders predict the qualitative (i.e., symptom presentation) changes, even though cross-sectional relations of these disorders to PTSD symptom

presentation, like a linkage of mood disorders to PTSD's dysphoria symptom prominence, have already been found (Pietrzak et al., 2014). Thus, the current knowledge regarding this issue needs to be expanded by a dynamic perspective. Notably, theoretical and empirical research indicates that for a better capture of psychopathology structure and a better understanding of comorbidity's etiology, mood and anxiety disorders should be reclassified into two subclasses: distress (e.g., depressive disorder and generalized anxiety disorder [GAD]) and fear (e.g., panic disorder [PD], separation anxiety disorder [SAD], and social phobia [SP]) disorders (L. A. Clark & Watson, 2006). Because PTSD comprises both distress and fear components (Forbes et al., 2011) and its dysphoria and fear-related symptoms are closely associated with distress and fear disorders, respectively (Forbes et al., 2010), there is a rationale for applying this taxonomy in examining the predictive effects of mood and anxiety disorders on individuals' PTSD symptom presentation changes.

For the preceding reasons, we investigated the cross-sectional PTSD latent classes, the longitudinal stability and transitions among these classes, and the prediction of class transitions by baseline distress (comprising depressive disorder and GAD) and fear (comprising PD, SAD, and SP) disorders in a Chinese adolescent sample in a long-term disaster aftermath (i.e., 2.5–3.5 years) following the accomplishment of postdisaster reconstruction. Based on prior theoretical and empirical studies (Hebenstreit et al., 2014; Pietrzak et al., 2014; Simms et al., 2002), it was hypothesized that there would exist four subgroups with predominantly fear-based, predominantly dysphoria, combined, and negligible symptoms, respectively, at each time point. Informed by Boasso et al.'s (2016) finding of temporal changes in adults' PTSD symptom presentation, we hypothesized that some adolescents would migrate between these classes over time, though we had no specific hypothesis about the transition patterns. Given the strong long-term associations between distress/fear disorders and PTSD's dysphoria/fear-related dimensions (as revealed by factor analytic study; Forbes et al., 2010), it was further hypothesized that distress and fear disorders would be differentially predictive of adolescents' movements into classes involving dysphoria and fear-based symptoms, respectively.

## METHOD

### Procedure and Participants

On May 12, 2008, southwest China was struck by a very destructive earthquake (known as the Wenchuan 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. The current sample was recruited from two junior high

schools originally located in Beichuan County Town, which was almost completely destroyed by the earthquake with more than 6,000 deaths. For the feasibility of sampling and tracing participants, the first wave of survey was conducted soon after the school reconstruction was finished (approximately 2.5 years after the earthquake), followed by the second wave approximately 1 year later. Students presented at school and in Grade 7 or 8 at Wave 1 voluntarily took part in this study, and informed consent/assent was obtained from all students and their guardians. Before administering self-report questionnaires to the participants in a class-administration format, investigators introduced the aim and significance of the survey in detail. The study protocol was reviewed and approved by the Institutional Review Board of the Institute of Psychology, Chinese Academy of Sciences.

A total of 1,693 adolescents who self-reported being in earthquake-hit areas when the earthquake occurred (screened by the initial question "Where were you when the earthquake occurred?") completed the survey at Wave 1, and 24.5% of these adolescents did not complete the survey at Wave 2, probably due to the transfer to another school during the year, the absence at school when the Wave 2 survey was conducted, or other reasons. The final effective sample consisted of 1,278 adolescents (54.0% girls, 46.0% boys) with a mean age of 13.4 years ( $SD = 0.8$ , range = 12–16) at Wave 1. Ethnicity was self-identified as Qiang (58.6%), Han (40.4%), and other ethnicities in China (1.0%; including Tibetan, Hui, and Tujia). As for earthquake-related exposures, 84.1% witnessed housing damage, 21.5% were injured, 73.2% witnessed an injury to someone, 34.7% were exposed to corpses, and 33.3% lost at least one of their family members.

Boys,  $\chi^2(1) = 18.24$ ,  $p < .001$ , Cramér's  $V = .10$ ; older adolescents,  $t(629.19) = -3.34$ ,  $p < .01$ , Cohen's  $d = .19$ ; and those exposed to corpses,  $\chi^2(1) = 4.60$ ,  $p < .05$ , Cramér's  $V = .05$ , were less likely to complete the follow-up survey. Completers did not differ from dropouts in ethnicity,  $\chi^2(2) = 0.43$ ,  $p > .05$ , Cramér's  $V = .02$ ; any other earthquake-related exposure ( $\chi^2$  ranged from 0.01 to 0.52, all  $ps > .05$ , all Cramér's  $Vs < .02$ ); Wave 1 probable PTSD diagnosis,  $\chi^2(1) = 1.57$ ,  $p > .05$ , Cramér's  $V = .03$ ; or Wave 1 symptom severity of any psychopathological outcome ( $t$  ranged from  $-1.90$  to  $1.04$ , all  $ps > .05$ , all Cohen's  $ds < .11$ ).

### Measures

PTSD symptoms were measured by the Symptom scale of the UCLA PTSD Reaction Index for *DSM-IV* (PTSD-RI; Steinberg, Brymer, Decker, & Pynoos, 2004), a 20-item self-report instrument for assessing child and adolescent posttraumatic stress symptoms. For a one-to-one correspondence between PTSD class indicators and *DSM-IV* PTSD symptom criteria, only 17 items were used: the two additional items (i.e., Items 14 and 20) assessing associated features—trauma-related guilt and fear of recurrence were

excluded; of the two alternative items assessing restricted affect (i.e., Items 10 and 11), the one with a higher score was included (as per the scoring instructions; Steinberg et al., 2004). Each item is rated on a 5-point Likert scale reflecting the frequency of occurrence of a particular symptom from 0 (*none of the time*) to 4 (*most of the time*) during the past month, with endorsement of a score of 2 or higher indicating the presence of a clinically significant symptom (Stimmel, Cruise, Ford, & Weiss, 2014). The PTSD-RI has demonstrated good psychometric properties and been broadly used across a variety of cultures (Steinberg et al., 2004), and its Chinese version has been previously used among Chinese earthquake-impacted adolescents (Wu, Chen, Weng, & Wu, 2009). In the current study, the Symptom scale of the PTSD-RI was completed referring to the earthquake. An example item is “I try not to talk about, think about, or have feelings about the earthquake.” Cronbach’s alphas for the total scale in the final sample at Wave 1 and Wave 2 were 0.88 and 0.90, respectively.

Distress disorder symptoms were assessed with the Depression Self-Rating Scale for Children (DSRSC; Birlson, 1981) and the GAD subscale of the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997). The DSRSC is an 18-item self-report instrument adopting a 3-point Likert scale—0 (*never*), 1 (*sometimes*), 2 (*most of the time*)—to measure current levels of depression in childhood and early adolescence. An example item is “I feel so sad I can hardly stand it.” Sound psychometric properties of the DSRSC have been demonstrated in adolescents (Ivarsson, Lidberg, & Gillberg, 1994), and the validated Chinese version of DSRSC (Su, Wang, Zhu, Luo, & Yang, 2003) has been previously used among Chinese adolescent earthquake survivors (Ye, Fan, Li, & Han, 2014). The SCARED is a widely used self-report questionnaire for screening *DSM-IV*-classified anxiety disorders in children and adolescents (American Psychiatric Association, 1994). Each item is rated on a 3-point Likert scale—0 (*not true or hardly ever true*), 1 (*sometimes true*), 2 (*true or often true*)—and the total score on each subscale reflects symptom severity of a particular anxiety disorder. Example item in the nine-item GAD subscale is “I am a worrier.” The SCARED and its subscales have demonstrated robust psychometric properties and cross-cultural applicability (Hale, Crocetti, Raaijmakers, & Meeus, 2011), and the validated Chinese version of SCARED (Su, Wang, Fan, Su, & Gao, 2008) has been previously used among Chinese adolescents in earthquake-affected areas (Shi, Zhou, & Fan, 2016). Cronbach’s alphas for the DSRSC, the GAD subscale, and the incorporated Distress Disorder scale at Wave 1 were 0.83, 0.82, and 0.88, respectively, in the final sample.

Fear disorder symptoms were assessed with the 13-item PD, eight-item SAD, and four-item SP subscales of the SCARED (Birmaher et al., 1997). Example items in each subscale are “I am afraid of having anxiety/panic attacks,”

“I follow my mother or father wherever they go,” and “I feel nervous with people I don’t know well,” respectively. Cronbach’s alphas for the PD, SAD, and SP subscales, and the incorporated Fear Disorder scale at Wave 1, were 0.88, 0.76, 0.71, and 0.91, respectively, in the final sample.

## Data Analysis

None of the participants included in the final sample missed more than 20% items of the psychopathologically relevant measures. Full information maximum likelihood estimation was used to handle item-level missing data. A three-step analytic process was conducted as follows. In the first step, separate LCAs were used to identify the number and nature of classes of PTSD symptoms at each wave, with the 17 PTSD-RI items dichotomized by a score of 2 or higher serving as indicators (following the approach in Hebenstreit et al., 2014). A series of models with progressively increasing numbers of classes from 1 to 5 were estimated and compared to determine the optimal model solution, based on lower Bayesian information criterion (BIC) values, significant Lo–Mendell–Rubin likelihood ratio test (LMR-LRT), and bootstrap likelihood ratio test (BLRT)  $p$  values, considerable class sizes (at least 5% of the sample), and higher entropy values (Nylund, Asparouhov, & Muthén, 2007). Parsimony and interpretability were also taken into consideration in model selection.

In the second step, an LTA model constructed based on the optimal LCA models was fitted to the data for both waves to evaluate the probability of transitioning from one class at Wave 1 to another class at Wave 2, as well as the stability of each class across waves. The level of measurement invariance that could be assumed for these data was determined using log-likelihood ratio tests (Nylund, 2007), whereby a model in which all/part of the parameter estimates (i.e., the conditional item probabilities estimated for each class) were held equal across time (full/partial measurement invariance) was compared with one in which all parameter estimates were allowed to vary (full measurement variance).

In the final step, because the LTA model’s entropy met the criterion (i.e., 0.80) suggesting the suitability of estimating covariates’ effects outside the model (S. Clark & Muthén, 2009), multinomial logistic regression analyses were conducted to examine the prediction of class transitions by baseline distress, and fear disorder symptoms, which were represented by the sums of  $T$  scores for the DSRSC and the GAD subscale of the SCARED, and for the PD, SAD, and SP subscales of the SCARED at Wave 1, respectively. In each regression model focusing on the migration out of a specific class at Wave 1, Wave 2 class membership obtained from LTA was used as the dependent variable, with the corresponding class at Wave 2 acting as the reference class. All regressions were adjusted for demographic characteristics. The first- and second-step analyses

were implemented in Mplus (Version 7.0 for Windows), and the final-step and descriptive statistical analyses were performed with SPSS (Version 19.0 for Windows).

## RESULTS

### Descriptive Statistics

Psychopathological characteristics of the study sample and bivariate correlations of the study variables are presented in Table 1.

### Cross-Sectional LCAs

Each of the two-, three-, and four-class models was consistently superior to the model with one class fewer at both waves, given a lower BIC value, and significant LMR-LRT and BLRT  $p$  values (despite a lower entropy value). However, given that a nonsignificant LMR-LRT  $p$  value suggests stopping the increase of the number of classes (Nylund et al., 2007), the five-class model did not provide a better fit to the data compared to the four-class model at either Wave 1 or Wave 2 (though the five-class model had significant BLRT  $p$  values). In addition, the five-class model had higher BIC values than the four-class model at both waves and contained one class with less than 5% of the sample at Wave 2. Overall, the more parsimonious four-class model was identified as the optimal model at both waves (see Table 2 for details).

This model solution also possessed good interpretability. The probabilities of each symptom endorsement for the four-class model at Wave 1 are shown in Figure 1a and Wave 2 in Figure 1b. According to the degree of probability

that a symptom was present in a class (high =  $\geq .60$ , moderate =  $\geq .16$  and  $\leq .59$ , and low =  $\leq .15$ ; Forbes et al., 2015), the four classes at each wave were named high symptom, reexperiencing/hypervigilance, dysphoria, and low symptom, respectively. At Wave 1, participants in the high symptom class had a high probability of almost all symptoms, whereas those in the low symptom class had a low probability of almost all symptoms. Reexperiencing/hypervigilance class was characterized by a moderate-to-high probability of reexperiencing symptoms (especially intrusive recollections and psychological cue reactivity), a high probability of hypervigilance, and a low-to-moderate probability of other symptoms, whereas the dysphoria class was characterized by a moderate-to-high probability of dysphoria symptoms (especially concentration problems and restricted affect) except for foreshortened future and a low-to-moderate probability of other symptoms. A similar pattern was observed at Wave 2, with some changes including an increase in the probability of irritability/anger symptom in the dysphoria class from moderate to high and a decrease in the probability of intrusive recollections and hypervigilance symptoms in reexperiencing/hypervigilance class from high to moderate (but still much higher than that in dysphoria or low symptom class).

### Longitudinal LTA

Given the nonsignificant difference in fit between the partially restricted model and the unrestricted model (log-likelihood difference = 35.36,  $df = 54$ ,  $p > .05$ ), partial measurement invariance was assumed for the two-wave data. The estimated transition probabilities from Wave 1 to Wave 2 are presented in Table 3. Coefficients of class

TABLE 1  
Psychopathological Characteristics of the Study Sample and Bivariate Correlations of the Study Variables

	n (%)	M (SD)	Range	1	2	3
Wave 1 Probable PTSD Diagnosis <sup>a</sup>	277 (21.7)					
Wave 2 Probable PTSD Diagnosis <sup>a</sup>	229 (17.9)					
Wave 1 DSRSC Scores		13.0 (5.5)	0–30			
Wave 1 SCARED Subscale Scores						
PD		7.2 (5.2)	0–26			
GAD		6.4 (3.8)	0–18			
SAD		6.1 (3.4)	0–16			
SP		3.6 (2.0)	0–8			
1 Wave 1 PTSD-RI Scores		18.6 (10.3)	0–62	—		
2 Wave 2 PTSD-RI Scores		16.3 (9.8)	0–68	.53***	—	
3 Wave 1 Distress Disorder $T$ Scores		100.0 (17.7)	59.2–161.9	.68***	.52***	—
4 Wave 1 Fear Disorder $T$ Scores		150.0 (25.1)	99.5–237.7	.63***	.49***	.73***

Note:  $N = 1,278$ . PTSD = posttraumatic stress disorder; PTSD-RI = UCLA PTSD Reaction Index for *DSM-IV*; DSRSC = Depression Self-Rating Scale for Children; SCARED = Screen for Child Anxiety Related Emotional Disorders; PD = panic disorder; GAD = generalized anxiety disorder; SAD = separation anxiety disorder; SP = social phobia.

<sup>a</sup>Based on *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) diagnostic algorithm of at least one reexperiencing symptom, three avoidance/emotional numbing symptoms, and two hyperarousal symptoms.

\*\*\* $p < .001$ .

TABLE 2  
Comparative Model Fit Indices Derived from Latent Class Analyses at Each Wave

Models	Wave 1					Wave 2				
	BIC	LMR-LRT p Value	BLRT p Value	Entropy	Smallest Class Proportion	BIC	LMR-LRT p Value	BLRT p Value	Entropy	Smallest Class Proportion
1-Class	24900.51	—	—	—	—	23308.00	—	—	—	—
2-Class	22436.98	< .001	< .001	0.82	35.3%	20445.81	< .001	< .001	0.86	32.7%
3-Class	22050.24	< .001	< .001	0.78	14.1%	19996.08	< .05	< .001	0.81	10.8%
4-Class	21987.17	< .01	< .001	0.73	14.2%	19903.15	< .05	< .001	0.78	10.7%
5-Class	22027.50	.17	< .001	0.70	8.1%	19904.28	.24	< .001	0.77	4.6%

Note: BIC = Bayesian information criterion; LMR-LRT = Lo–Mendell–Rubin likelihood ratio test. BLRT = Bootstrap likelihood ratio test.

stability are represented by the diagonal values. The highest stability was evidenced by low symptom class. Stability was higher within dysphoria class than within high symptom class and reexperiencing/hypervigilance class, which exhibited the lowest stability.

Figure 2 displays the patterns of migrations from each class at Wave 1 into the same or another class at Wave 2. Participants who transitioned out of high symptom class (55.7%) were evenly spread among low symptom, reexperiencing/hypervigilance, and dysphoria classes. From reexperiencing/hypervigilance class, 61.5% transitioned out, and 66.4% and 11.1% moved into low symptom and high symptom classes, respectively. The others moved into dysphoria class. Of the 20.3% who transitioned out of dysphoria class, 60.5% moved into low symptom class, and the rest into high symptom class. Only 18.8% of participants from low symptom class transitioned into a different class, with 62.7% and 21.6% moving into dysphoria and reexperiencing/hypervigilance classes, respectively, and the remainder into high symptom class.

#### Prediction of Transitions Across Classes Over Time

Wave 1 distress and fear disorder symptoms were significant predictors of class transitions from Wave 1 to Wave 2. Specifically, distress disorder symptoms positively predicted the transitions from low symptom to dysphoria class ( $B = 0.03$ ,  $SE = 0.01$ ,  $p < .01$ ), and from reexperiencing/hypervigilance to high symptom class ( $B = 0.04$ ,  $SE = 0.02$ ,  $p < .05$ ), and negatively predicted the transition from high symptom to low symptom class ( $B = -0.05$ ,  $SE = 0.02$ ,  $p < .05$ ). In addition, fear disorder symptoms positively predicted the transition from dysphoria to high symptom class ( $B = 0.04$ ,  $SE = 0.02$ ,  $p < .05$ ). No other predictions were significant.

## DISCUSSION

In the present study, a substantial group of adolescents exhibited apparent PTSD symptoms 2.5 and 3.5 years after

a major disaster, though many others had minimal symptoms. A four-class model characterized by patterns of low, dysphoria, reexperiencing/hypervigilance, and high symptoms optimally represented the population-based typologies of PTSD symptomatology at both time points. Most adolescents remained in the same class or moved into a lower symptom class during this period. Baseline distress and fear disorders differentially predicted some class membership changes. These findings enhance our understanding of youth's long-term PTSD symptomatology and its course, and other forms of posttrauma psychopathology's detrimental influences on long-term PTSD recovery, from a person-centered perspective.

Similar PTSD classes emerged in this study as in some previous studies of adults with traumatic experiences (Hebenstreit et al., 2014; Pietrzak et al., 2014), whereas some important differences from prior research with trauma-exposed adolescents expand the current literature in youth's PTSD symptomatology. Specifically, although the classes with quantitatively differential severity levels (e.g., low, low to moderate/moderate to high, and high, as shown in our study) are evidenced by almost all relevant studies (e.g., Ayer et al., 2011), the classes qualitatively distinguished from one another by dysphoria versus fear-based symptom prominence are not always identified in adolescent samples. A recent study of American youth exposed to the 9/11 terrorist attacks 6 months postevent also found a four-class model of PTSD symptom patterns but in a somewhat different fashion: low symptoms, intermediate symptoms with marked avoidance, intermediate symptoms with marked nightmares and sleep problems, and high symptoms (Guffanti et al., 2016). Such discrepancies between the current and previous findings suggest that disaster types (e.g., natural vs. human-made disasters), periods since disaster (e.g., short- vs. long-term disaster aftermaths), and cultural contexts (e.g., Western vs. Asian cultures) may serve as moderators of youth's postdisaster PTSD symptom presentation. Future research addressing this issue is clearly worthwhile.

During the study period, most adolescents either remained in the same class or shifted into a class with

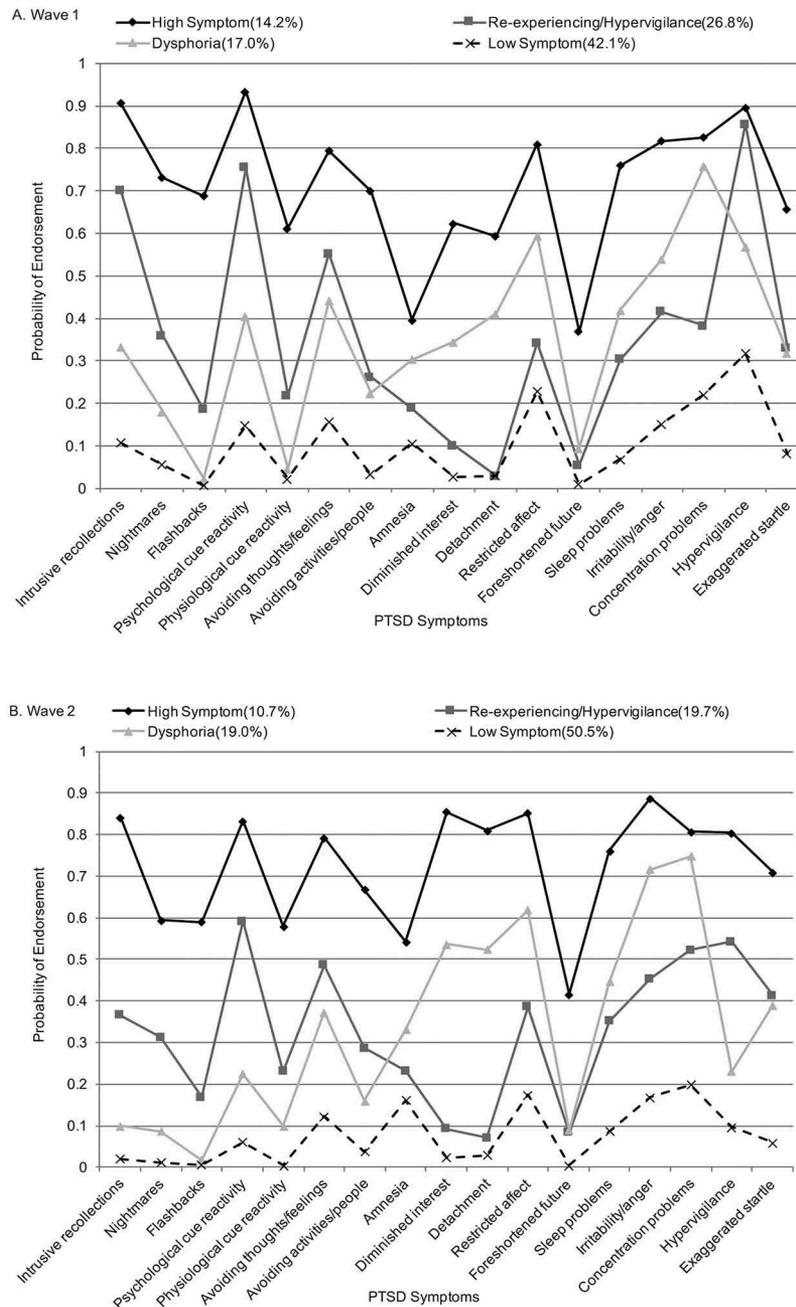


FIGURE 1 Probabilities of posttraumatic stress disorder (PTSD) symptom endorsement for 4-class latent class models at Wave 1 and Wave 2.

fewer PTSD symptoms. Specifically, more than half of adolescents with apparent symptoms at baseline still suffered the same disturbance 1 year later (according to Figure 2), which implies that if PTSD symptoms continue to be present 2.5 years postdisaster, it is likely that they will remain unless treated. Among those whose class membership changed, the majority of adolescents recovered fully/somewhat, and only a small proportion developed worsening symptoms, suggesting that recovery is a main trend in

the late stage of PTSD symptoms' evolution. Similar quantitatively differential trajectories (e.g., chronic disturbance, recovery, and delayed reaction) were identified in adolescents during an earlier postdisaster period (i.e., 0.5–2 years; Fan et al., 2015), indicating some commonalities in evolving patterns of youth's PTSD symptoms between short- and long-term disaster aftermaths. Nonetheless, in line with another study of youth 2–3 years after a disaster (Kronenberg et al., 2010), the proportion of individuals with

TABLE 3  
Latent Transition Probabilities Based on the Estimated Four-Class Latent Transition Model

Wave 1 Class (Class Proportion)	Wave 2 Class (Class Proportion)			
	High Symptom (10.2%)	Reexperiencing/Hypervigilance (15.5%)	Dysphoria (23.3%)	Low Symptom (51.0%)
High Symptom (13.1%)	.423	.203	.190	.184
Reexperiencing/Hypervigilance (29.9%)	.073	.358	.173	.396
Dysphoria (14.6%)	.080	.000	.754	.165
Low Symptom (42.4%)	.029	.049	.130	.792

persistent symptoms during this study period was higher than that during an earlier one, which suggests that untreated youth's PTSD disturbance may become more chronic in the long-term disaster aftermath. Besides, some class transitions also reflect the qualitative (i.e., symptom presentation) changes in youth's PTSD course, for example, from prominent reexperiencing/hypervigilance to dysphoria symptoms. A recent study of U.S. combat-exposed adults' PTSD symptoms likewise revealed this kind of changes but in different forms and without the preceding one (Boasso et al., 2016). The alterations in symptom presentation captured by our study should be further replicated. Potential moderators of PTSD manifestation change patterns (e.g., trauma type, life stage, and cultural background) are also worthy of future investigation.

Some PTSD class transitions were predicted by baseline symptom levels of fear and distress disorders, with fear disorders predicting increased reexperiencing and hypervigilance symptoms and distress disorders predicting increased dysphoria symptoms and persistent overall

symptoms. Fear disorders were found to exacerbate reexperiencing and hypervigilance symptoms among individuals with predominantly dysphoria symptoms. This finding, along with a previous one of pretrauma anxiety (mainly fear-based) disorders as predictors of reexperiencing symptoms (Copeland, Keeler, Angold, & Costello, 2007), suggests that fear disorders may raise individuals' vulnerability to fear-based PTSD symptoms. Distress disorders were found to exacerbate dysphoric PTSD symptoms among individuals with predominantly fear-based or overall low symptoms and, on the other hand, hinder PTSD recovery among those with overall high symptoms. Previous factor analytic studies yielded mixed results regarding the prediction of PTSD by distress disorders (e.g., significant prediction: Schindel-Allon, Aderka, Shahar, Stein, & Gilboa-Schechtman, 2010; nonsignificant prediction: Schweininger et al., 2015), possibly due to overlooking the individual differences in this prediction's nature and/or magnitude. This study, addressing such population

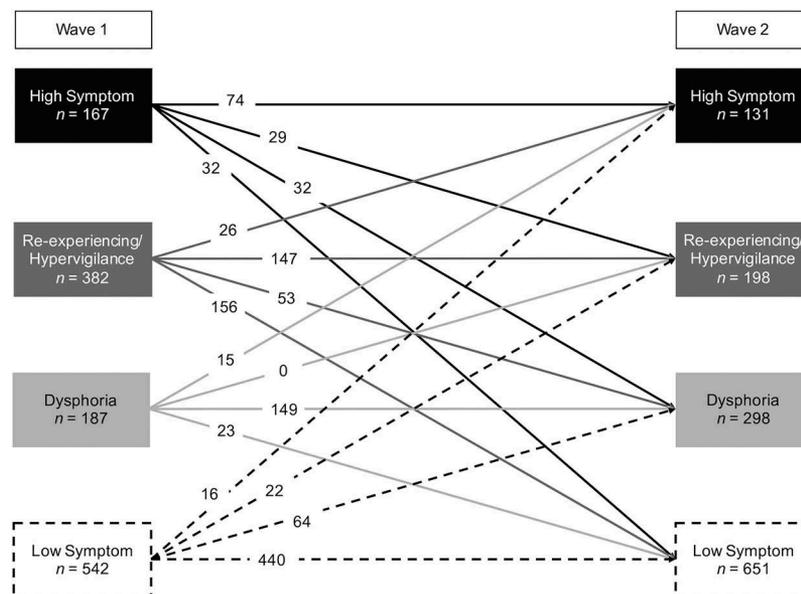


FIGURE 2 Patterns of transitions within and across classes from Wave 1 to Wave 2.

heterogeneity, suggests that distress disorders' effects on PTSD may be salient in individuals with predominantly fear-based or overall high/low PTSD symptoms; they may play an exacerbating role in those with predominantly fear-based or overall low symptoms and a maintaining role in those with overall high symptoms. Altogether, the current findings corroborate the existing theoretical and empirical research indicating the specificity of fear and distress disorders in their relations to PTSD symptomatology (e.g., Forbes et al., 2010; Simms et al., 2002) and extend our knowledge on how comorbid conditions of PTSD affect its course. As several hypotheses may explain the prediction of one disorder by another, such as direct causality; indirect linkage; and common genetic, neurobiological, and environmental risk factors (Cerdá, Sagdeo, & Galea, 2008), future tests of these hypotheses are necessary for a sophisticated understanding of the underlying mechanisms.

### Clinical Implications

The current findings carry important clinical implications for the assessment and treatment of disaster-exposed youth. In this study, 40% of adolescents displayed unremitted or even aggravated PTSD symptomatology during the 2.5–3.5 years following the disaster, which highlights the long-term disaster impacts on youth's mental health and the necessity of long-term mental health services. Although more than 2 years had passed, there still existed temporal changes in PTSD symptom patterns (in quantity and/or quality) among plenty of adolescents with pronounced symptomatology; thus, ongoing assessment and flexible treatment individually tailored to both the severity and presentation of symptoms are recommended, even in the long-term disaster aftermath. Hypervigilance, intrusive recollections, and psychological cue reactivity manifested as the most prominent fear-based symptoms; concentration problems, irritability/anger and restricted affect emerged as the most salient dysphoria symptoms. Of interest, these symptoms have also been found to have the most central roles in PTSD symptom networks (Bryant et al., 2017; McNally et al., 2015; Spiller et al., 2017) and thus should be treated as urgent target symptoms in therapy. Because distress and fear disorders may contribute to the emergence/exacerbation of PTSD symptomatology, early evaluation of these disorders would be beneficial to screening youth with a poor PTSD prognosis. In addition, when dealing with adolescents bothered mainly by fear- and dysphoria-related PTSD symptoms, extra attention should be paid to potentially co-occurring distress and fear disorders, respectively. As for those who endure pervasive PTSD disturbance, comorbid distress rather than fear disorders deserve special consideration because they may hinder PTSD symptom remission.

### Limitations and Future Directions

Several limitations to this study must be acknowledged. First, our utilization of a specific cultural (i.e., Chinese) sample exposed to a specific disaster (i.e., an earthquake) may limit the generalizability of the current findings. Thus, future replications in different cultural contexts and disaster types are warranted. Second, there was a lack of external validation of the four-class model of PTSD symptom patterns. The differences in associations of specific symptom patterns with functional/clinical outcomes, supporting the significance and distinctiveness of the identified classes, should be examined in further studies. Third, this study investigated only a 1-year period with two assessments spaced 2.5 and 3.5 years postdisaster. Whether the current class transition patterns apply to an earlier (e.g., within the first 2.5 years) or later (e.g., during the 3.5–5 years) evolving stage of PTSD symptoms and whether there exist more complicated patterns over a shorter period (e.g., 6 months) await to be answered by further research. Fourth, a single method of assessing psychopathological variables (i.e., adolescent self-ratings) was adopted; thus, future studies using multiple assessment modalities (e.g., structured clinical interviews) are needed. Fifth, predisaster traumatic experiences that may increase individuals' vulnerability to chronic or deteriorating PTSD symptomatology following the disaster were not assessed. Such stress sensitization effects reflected in longitudinal PTSD symptom patterns merit future examination. Finally, because *DSM-5* was not released when we conducted this study, PTSD and other disorder symptoms were assessed based on *DSM-IV* criteria. Given the revisions in *DSM-5* criteria (especially for PTSD), further validation within the *DSM-5* framework is needed.

### Conclusion

The present study found that adolescents continued to exhibit PTSD symptoms with differential manifestations years after a major disaster. Most adolescents maintained the same symptom presentation during the 2.5–3.5 years postdisaster, and among those whose symptom presentation changed, most recovered. Distress and fear disorder symptoms were associated with increased risk for chronic and/or worsening PTSD symptoms. Our findings contribute to the knowledge concerning youth's long-term PTSD course affected by other forms of posttrauma psychopathology and emphasize more flexible mental health services adapted to youth's PTSD manifestations and comorbidities in the long-term disaster aftermath.

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## REFERENCES

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Ayer, L., Danielson, C. K., Amstader, A. B., Ruggiero, K., Saunders, B., & Kilpatrick, D. (2011). Latent classes of adolescent posttraumatic stress disorder predict functioning and disorder after 1 year. *Journal of the American Academy of Child & Adolescent Psychiatry*, *50*, 364–375. doi:10.1016/j.jaac.2011.01.004
- Birleson, P. (1981). The validity of depressive disorder in childhood and the development of a self-rating scale: A research report. *Journal of Child Psychology and Psychiatry*, *22*, 73–88. doi:10.1111/jcpp.1981.22.issue-1
- Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The Screen for Child Anxiety Related Emotional Disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*, 545–553. doi:10.1097/00004583-199704000-00018
- Boasso, A. M., Steenkamp, M. M., Larson, J. L., & Litz, B. T. (2016). Posttraumatic stress symptoms across the deployment cycle: A latent transition analysis. *Journal of Psychiatric Research*, *83*, 54–60. doi:10.1016/j.jpsychires.2016.08.002
- Bryant, R. A., Creamer, M., O'Donnell, M., Forbes, D., McFarlane, A. C., Silove, D., & Hadzi-Pavlovic, D. (2017). Acute and chronic posttraumatic stress symptoms in the emergence of posttraumatic stress disorder: A network analysis. *JAMA Psychiatry*, *74*, 135–142. doi:10.1001/jamapsychiatry.2016.3470
- Cerdá, M., Sagdeo, A., & Galea, S. (2008). Comorbid forms of psychopathology: Key patterns and future research directions. *Epidemiologic Reviews*, *30*, 155–177. doi:10.1093/epirev/mxn003
- Clark, L. A., & Watson, D. (2006). Distress and fear disorders: An alternative empirically based taxonomy of the “mood” and “anxiety” disorders. *British Journal of Psychiatry*, *189*, 481–483. doi:10.1192/bjp.bp.106.03825
- Clark, S., & Muthén, B. (2009). *Relating latent class analysis results to variables not included in the analysis*. Retrieved from <https://www.statmodel.com/download/relatinglca.pdf>
- Copeland, W. E., Keeler, G., Angold, A., & Costello, E. J. (2007). Traumatic events and posttraumatic stress in childhood. *Archives of General Psychiatry*, *64*, 577–584. doi:10.1001/archpsyc.64.5.577
- DiMauro, J., Carter, S., Folk, J. B., & Kashdan, T. B. (2014). A historical review of trauma-related diagnoses to reconsider the heterogeneity of PTSD. *Journal of Anxiety Disorders*, *28*, 774–786. doi:10.1016/j.janxdis.2014.09.002
- EM-DAT. (2016). The CRED/OFDA international disaster database. Retrieved from <http://www.emdat.be/database>.
- Fan, F., Long, K., Zhou, Y., Zheng, Y., & Liu, X. (2015). Longitudinal trajectories of post-traumatic stress disorder symptoms among adolescents after the Wenchuan earthquake in China. *Psychological Medicine*, *45*, 2885–2896. doi:10.1017/S0033291715000884
- Forbes, D., Lockwood, E., Elhai, J. D., Creamer, M., O'Donnell, M., Bryant, R., ... Silove, D. (2011). An examination of the structure of posttraumatic stress disorder in relation to the anxiety and depressive disorders. *Journal of Affective Disorders*, *132*, 165–172. doi:10.1016/j.jad.2011.02.011
- Forbes, D., Nickerson, A., Alkemade, N., Bryant, R. A., Creamer, M., Silove, D., ... O'Donnell, M. (2015). Longitudinal analysis of latent classes of psychopathology and patterns of class migration in survivors of severe injury. *Journal of Clinical Psychiatry*, *76*, 1193–1199. doi:10.4088/JCP.14m09075
- Forbes, D., Parslow, R., Creamer, M., O'Donnell, M., Bryant, R., McFarlane, A., ... Shalev, A. (2010). A longitudinal analysis of posttraumatic stress disorder symptoms and their relationship with Fear and Anxious-Misery disorders: Implications for DSM-V. *Journal of Affective Disorders*, *127*, 147–152. doi:10.1016/j.jad.2010.05.005
- Goenjian, A. K., Walling, D. P., Steinberg, A. M., Karayan, I., Najarian, L. M., & Pynoos, R. S. (2005). A prospective study of posttraumatic stress and depressive reactions among treated and untreated adolescents 5 years after a catastrophic disaster. *American Journal of Psychiatry*, *162*, 2302–2308. doi:10.1176/appi.ajp.162.12.2302
- Guffanti, G., Geronazzo-Alman, L., Fan, B., Duarte, C. S., Musa, G. J., & Hoven, C. W. (2016). Homogeneity of severe posttraumatic stress disorder symptom profiles in children and adolescents across gender, age, and traumatic experiences related to 9/11. *Journal of Traumatic Stress*, *29*, 430–439. doi:10.1002/jts.22134
- Hale, W. W., Crocetti, E., Raaijmakers, Q. A. W., & Meeus, W. H. J. (2011). A meta-analysis of the cross-cultural psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED). *Journal of Child Psychology and Psychiatry*, *52*, 80–90. doi:10.1111/j.1469-7610.2010.02285.x
- Hebenstreit, C. L., Madden, E., Koo, K. H., & Maguen, S. (2015). Minimally adequate mental health care and latent classes of PTSD symptoms in female Iraq and Afghanistan veterans. *Psychiatry Research*, *230*, 90–95. doi:10.1016/j.psychres.2015.08.028
- Hebenstreit, C., Madden, E., & Maguen, S. (2014). Latent classes of PTSD symptoms in Iraq and Afghanistan female veterans. *Journal of Affective Disorders*, *166*, 132–138. doi:10.1016/j.jad.2014.04.061
- Hoven, C. W., Duarte, C. S., Lucas, C. P., Wu, P., Mandell, D. J., Goodwin, R. D., ... Susser, E. (2005). Psychopathology among New York city public school children 6 months after September 11. *Archives of General Psychiatry*, *62*, 545–552. doi:10.1001/archpsyc.62.5.545
- Ivarsson, T., Lidberg, A., & Gillberg, C. (1994). The Birleson Depression Self-Rating Scale (DSRS). Clinical evaluation in an adolescent inpatient population. *Journal of Affective Disorders*, *32*, 115–125. doi:10.1016/0165-0327(94)90069-8
- Kronenberg, M., Hansel, T. C., Brennan, A. M., Osofsky, H. J., Osofsky, J. D., & Lawrason, B. (2010). Children of Katrina: Lessons learned about postdisaster symptoms and recovery patterns. *Child Development*, *81*, 1241–1259. doi:10.1111/(ISSN)1467-8624
- La Greca, A. M., Lai, B. S., Llabre, M. M., Silverman, W. K., Vernberg, E. M., & Prinstein, M. J. (2013). Children's postdisaster trajectories of PTSD symptoms: Predicting chronic distress. *Child and Youth Care Forum*, *42*, 351–369. doi:10.1007/s10566-013-9206-1
- Lai, B. S., La Greca, A. M., Auslander, B. A., & Short, M. B. (2013). Children's symptoms of posttraumatic stress and depression after a natural disaster: Comorbidity and risk factors. *Journal of Affective Disorders*, *146*, 71–78. doi:10.1016/j.jad.2012.08.041
- Lau, J. T. F., Yu, X., Zhang, J., Mak, W. W. S., Choi, K. C., Lui, W. W. S., & Chan, E. Y. Y. (2010). Psychological distress among adolescents in Chengdu, Sichuan at 1 month after the 2008 Sichuan earthquake. *Journal of Urban Health*, *87*, 504–523. doi:10.1007/s11524-010-9447-3
- McNally, R. J., Robinaugh, D. J., Wu, G. W., Wang, L., Deserno, M. K., & Borsboom, D. (2015). Mental disorders as causal systems: A network approach to posttraumatic stress disorder. *Clinical Psychological Science*, *3*, 836–849. doi:10.1177/2167702614553230

- Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine, 38*, 467–480. doi:10.1017/S0033291707001353
- Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981–2001. *Psychiatry, 65*, 207–239. doi:10.1521/psyc.65.3.207.20173
- Nylund, K. L. (2007). *Latent transition analysis: Modeling extensions and an application to peer victimization* (Doctoral dissertation). University of California, Los Angeles, CA.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling, 14*, 535–569. doi:10.1080/10705510701575396
- Panter-Brick, C., Grimon, M. P., Kalin, M., & Eggerman, M. (2015). Trauma memories, mental health, and resilience: A prospective study of Afghan youth. *Journal of Child Psychology and Psychiatry, 56*, 814–825. doi:10.1111/jcpp.12350
- Pfefferbaum, B., Houston, J. B., North, C. S., & Regens, J. L. (2008). Youth's reactions to disasters and the factors that influence their response. *Prevention Researcher, 15*, 3–6.
- Pietrzak, R. H., el-Gabalawy, R., Tsai, J., Sareen, J., Neumeister, A., & Southwick, S. M. (2014). Typologies of posttraumatic stress disorder in the U.S. adult population. *Journal of Affective Disorders, 162*, 102–106. doi:10.1016/j.jad.2014.03.024
- Roussos, A., Goenjian, A., Steinberg, A., Sotiropoulou, C., Kakaki, M., Kabakos, C., ... Manouras, V. (2005). Posttraumatic stress and depressive reactions among children and adolescents after the 1999 earthquake in Ano Liosia, Greece. *American Journal of Psychiatry, 162*, 530–537. doi:10.1176/appi.ajp.162.3.530
- Schindel-Allon, I., Aderka, I. M., Shahar, G., Stein, M., & Gilboa-Schechtman, E. (2010). Longitudinal associations between post-traumatic distress and depressive symptoms following a traumatic event: A test of three models. *Psychological Medicine, 40*, 1669–1678. doi:10.1017/S0033291709992248
- Schweininger, S., Forbes, D., Creamer, M., McFarlane, A. C., Silove, D., Bryant, R. A., & O'Donnell, M. L. (2015). The temporal relationship between mental health and disability after injury. *Depression and Anxiety, 32*, 64–71. doi:10.1002/da.22288
- Shi, X., Zhou, Y., & Fan, F. (2016). Longitudinal trajectories and predictors of anxiety symptoms among adolescent survivors exposed to Wenchuan earthquake. *Journal of Adolescence, 53*, 55–63. doi:10.1016/j.adolescence.2016.08.015
- Simms, L. J., Watson, D., & Doebbeling, B. N. (2002). Confirmatory factor analyses of posttraumatic stress symptoms in deployed and nondeployed veterans of the Gulf War. *Journal of Abnormal Psychology, 111*, 637–647. doi:10.1037/0021-843X.111.4.637
- Spiller, T. R., Schick, M., Schnyder, U., Bryant, R. A., Nickerson, A., & Morina, N. (2017). Symptoms of posttraumatic stress disorder in a clinical sample of refugees: A network analysis. *European Journal of Psychotraumatology, 8*, 1318032. doi:10.1080/20008198.2017.1318032
- Steinberg, A., Brymer, M., Decker, K., & Pynoos, R. (2004). The University of California at Los Angeles post-traumatic stress disorder reaction index. *Current Psychiatry Reports, 6*, 96–100. doi:10.1007/s11920-004-0048-2
- Stimmel, M. A., Cruise, K. R., Ford, J. D., & Weiss, R. A. (2014). Trauma exposure, posttraumatic stress disorder symptomatology, and aggression in male juvenile offenders. *Psychological Trauma: Theory Research Practice and Policy, 6*, 184–191. doi:10.1037/a0032509
- Su, L., Wang, K., Fan, F., Su, Y., & Gao, X. (2008). Reliability and validity of the Screen for Child Anxiety Related Emotional Disorders (SCARED) in Chinese children. *Journal of Anxiety Disorders, 22*, 612–621. doi:10.1016/j.janxdis.2007.05.011
- Su, L., Wang, K., Zhu, Y., Luo, X., & Yang, Z. (2003). Norm of the Depression Self-Rating Scale for children in Chinese urban children. *Chinese Mental Health Journal, 17*, 547–549.
- Trickey, D., Siddaway, A. P., Meiser-Stedman, R., Serpell, L., & Field, A. P. (2012). A meta-analysis of risk factors for post-traumatic stress disorder in children and adolescents. *Clinical Psychology Review, 32*, 122–138. doi:10.1016/j.cpr.2011.12.001
- Wu, C. H., Chen, S. H., Weng, L. J., & Wu, Y. C. (2009). Social relations and PTSD symptoms: A prospective study on earthquake-impacted adolescents in Taiwan. *Journal of Traumatic Stress, 22*, 451–459. doi:10.1002/jts.20447
- Ye, Y., Fan, F., Li, L., & Han, Q. (2014). Trajectory and predictors of depressive symptoms among adolescent survivors following the Wenchuan earthquake in China: A cohort study. *Social Psychiatry and Psychiatric Epidemiology, 49*, 943–952. doi:10.1007/s00127-014-0821-4