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ORIGINAL ARTICLE

Understanding the Impact of Natural Disasters on Psychological Outcomes in Youth from Mainland China: a Meta-Analysis of Risk and Protective Factors for Post-Traumatic Stress Disorder Symptoms

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Abstract Post-traumatic Stress Disorder (PTSD) is a mental illness that causes significant distress and impairment. Studies generally indicate lower rates of PTSD post-disaster in Chinese child populations. Irrespective of population examined, findings suggest that trauma alone cannot account for the development of PTSD (Ma et al. 2011). It is important to understand what other variables may contribute to the onset of PTSD. This was the first meta-analysis conducted to investigate risk and protective factors for PTSD (as well as mediating/moderating variables) in children directly impacted by natural disasters in China. Understanding these factors can help guide disaster readiness efforts, as well as post-disaster interventions (Yule et al. 2000). Also, this study is extremely relevant given recent earthquakes in China that have devastated many.

Keywords Adolescent · Children · Cultural issues · Mental health · Natural disasters

Introduction

Acute Stress Disorder and Post-traumatic Stress Disorder (PTSD) are mental illnesses that develop in reaction to a traumatic event and commonly co-occur with other psychological disorders. Research suggests that associated symptoms cause significant distress and impairment in social, academic, occupational, and cognitive functioning (Danckwerts & Leathem 2003). Although studies indicate that individuals who show significant stress reactions within 30 days following a trauma may not develop PTSD, a sizable number goes on to meet full diagnostic criteria for PTSD (Scheeringa et al. 2011).

Natural disasters are defined as major adverse events resulting from natural processes of the earth (Cutter et al. 2006). They have the capacity to negatively impact large groups of individuals at once, often causing destruction and injuries, as well as mortality (Neria et al. 2008; Norris et al. 2002). A subgroup of trauma investigators has focused on understanding this occurrence of PTSD relative to natural disasters. The most common natural disasters in China are earthquakes and floods (Liu et al. 2006). Studies conducted in Mainland China show that a notable percent of child natural disaster victims meet criteria for PTSD post-trauma (though lower compared to purported Western rates; approximately 11–13 %; Fan et al. 2011a, b; Liu et al. 2011).

Collectively, these studies indicate that trauma alone cannot account for the development of PTSD, as most children do not go on to develop severe and impairing symptoms. Thus, it is important to understand what other variables may contribute to the onset of atypical stress reactions. Past studies identified potential risk and protective factors including demographic variables (e.g., gender, socioeconomic status), pre-trauma variables (e.g., previous trauma, parent psychopathology), objective and subjective trauma characteristics (e.g., disaster exposure, fear/threat), and post-trauma variables (e.g., displacement, social support) in children exposed to natural disasters (Ma et al. 2011; Ying et al. 2013).

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Demographic Variables

Age and grade are examined variables in many studies investigating correlates and/or predictors of PTSD. Overall, results from studies exploring the role of age and grade on PTSD status post-natural disaster are inconclusive, with some finding age and grade to significantly predict PTSD and others not (Fan et al. 2011a, b; Green et al. 1991; Piyasil et al. 2007; Wang et al. 2012). One explanation for the inconsistencies in the literature regarding the influence of age and grade on the development of PTSD post-natural disaster is the idea that they may interact with other variables such as degree of natural disaster exposure and indirectly influence PTSD symptomatology (Groome and Soureti 2004).

In regards to gender, studies conducted in China mirror those of the vast array of studies conducted in Western countries examining psychological outcomes in children exposed to natural disasters—female child participants, generally, reported a significantly greater number of PTSD symptoms than their male counterparts (Bokszczanin 2007; Fan et al. 2011a, b; Ma et al. 2011). In regards to understanding factors related to stress response in children post-trauma, a variable that differentiates studies conducted in China from those of other countries is the reported number of children in a family. For many years, China has enforced a one child per couple policy for families living within the country; although the majority of Chinese families only consist of one child, a small number of families defy this expectation (namely families residing in distal rural communities; Hesketh et al. 2005). Studies conducted in China which observed the influence of sibling presence on child psychological adjustment following natural disasters suggest that an only child tends to fair better psychologically and emotionally than children with siblings; however, these studies noted major limitations, including failure to directly assess and statistically control for variables such as socioeconomic status and income, which differ substantially between one child and multiple child families and, thus, may confound findings (Fan et al. 2011a, b; Zhang et al. 2012).

Overall, studies examining higher parent level of educational attainment as a potential protective factor for development of PTSD post-natural disaster have not found significant results (Nugent et al. 2007). The exception is Zhang et al. (2012) who found that maternal education level was inversely associated with child PTSD symptoms. Further research is needed to explain, clarify, and understand this discrepancy.

Until recently, another major difference between China and most other countries was that the total population in rural areas exceeded that of urban locales (National Bureau of Statistics, 2013). Despite comparable population estimates, distinct differences are noted when observing urban versus rural areas; for instance, rural areas tend to be less dense, lack technology, have less access to public resources due to the "hukou" system, and consist of lower socioeconomic status families than urban areas (e.g., tall buildings; Fang 1993; Su and Heshmati 2013). Even with these differences, most studies conducted examining Chinese child participants have failed to identify urban or rural residence as a factor significantly impacting the experience and recovery related to natural disasters (Kun et al. 2009; Liu et al. 2010a, b, c). Fan et al. (2011a, b), however, found that residence interacted with family composition (i.e., only or multiple child) to significantly predict PTSD; namely, only children from urban areas had lower PTSD prevalence rates relative to other observed groups (Fan et al. 2011a, b).

Pre-Disaster Variables

Several pre-disaster variables are linked to the development of PTSD following exposure to a natural disaster; these include but are not limited to the experience of prior trauma and negative life events. Research suggests that children who have been exposed to past-trauma are more likely to meet criteria for PTSD than children encountering their first traumatic event; additionally, studies show a positive relationship between number of experienced traumas and/or negative life events and child reported PTSD symptoms (Mullet-Hume et al. 2008; Wu et al. 2011).

Objective and Subjective Trauma Variables

As natural disasters often result in infrastructural damage (e.g., collapsing of buildings and other industrial structures), as well as the destruction of geographical formations (e.g., uprooting of trees), it is not surprising that individuals exposed to natural disasters may experience related inopportune occurrences, including bereavement, personal injury, witnessing another's injury or death, becoming trapped or buried, being separated from family, and the loss or damage of property (Hsu et al. 2002). Although these events are not necessarily considered equal in impact (Ni et al. 2013), overall, studies have found positive associations between experiencing these events and PTSD symptomatology post-natural disaster; thus, they are each considered potential risk factors (Kun et al. 2009).

Subjective trauma variables that are explored in this paper include level of disaster exposure and perceived threat and/or fear. Research has generally shown a positive relationship between level of disaster exposure and PTSD symptom level (Lonigan et al. 1991; Neria et al. 2008). However, contrasting results were obtained in Wang et al. (2000); lower levels of disaster exposure were associated with higher frequency of PTSD. According to the authors, variables such as differential access to resources may indirectly account for this conflicting finding (Wang et al. 2000). The current study will attempt to clarify what impact disaster exposure level has on PTSD symptom level in Chinese populations.

The experience of extreme fear, many times accompanied by a feeling of helplessness, in relation to a traumatic event is a

required criterion for diagnosis of PTSD (Brewin et al. 2000); however, the degree of perceived fear or threat is subjective, as all individuals will not experience the same situation in the same manner. Studies have attempted to quantify level of perceived fear/threat; these findings suggest a positive significant relationship between perceived fear/threat and PTSD symptomatology in children post-disaster (Wang et al. 2012; Ying et al. 2013).

Post-Disaster Individual and Environmental Variables

Several post-disaster individual variables have been examined in relation to PTSD status following a natural disaster, including coping style, PTSD at multiple time points, and other psychological symptoms (e.g., anxiety, depression). Coping style has been thoroughly examined in the disaster literature; research indicates that negative coping styles such as passive or avoidant coping are associated with higher levels of PTSD symptoms; whereas, positive coping styles such as active or ameliorative coping is associated with more favorable outcomes, including fewer PTSD symptoms (Norris et al. 2002).

Research has demonstrated a positive correlation between PTSD status at one time point and a subsequent time point; such findings support the notion that individuals who meet criteria for PTSD following a trauma are also likely to meet criteria for PTSD when assessed again at a later time point (Ying et al. 2012).

Although most trauma studies focus on measurement of post-trauma psychological symptoms, often due to problems related to retrospective recall, studies have shown that individuals who report significant symptoms of anxiety and/or depression prior to a trauma are more likely to develop clinically elevated symptoms of PTSD following a natural disaster (Ying et al. 2012). Coinciding with these findings, studies that have only collected prospective data show that both anxiety and depression have strong and positive relationships with PTSD symptomatology (Wang et al. 2012). The influence of this and the other aforementioned predictors will be further examined in the current study.

Research indicates that several post-disaster environmental factors may predict psychological adjustment following trauma exposure (Trickey et al. 2012); variables that were observed in this study include living arrangements following trauma, utilization of mental health services, social support, and familial atmosphere, specifically, family violence. For many families affected by natural disasters, the lingering damage and loss is so extensive they are displaced and forced to live in shelters or temporary housing (Kun et al. 2009). Research indicates that displacement is predictive of PTSD status in children who have experienced natural disasters (Asarnow et al. 1999). Findings appear to, however, be moderated by level of damage (Kun et al. 2009); thus, both displacement and housing damage will be examined in this study.

Few studies have examined post-disaster utilization of mental health services. Research suggest use of mental health services directly following trauma can be beneficial to families and even predicts more positive outcomes in children (McMillen et al. 1997). Unfortunately, the availability of mental health services directly following a trauma is generally limited due to a multitude of factors (e.g., widespread disruption, perceived barriers, and shortage of mental health professionals; Rodriguez and Kohn 2008). This is an important variable to observe, as it has the potential to impact future disaster preparedness planning (Jacob et al. 2007; Shen et al. 2006).

Social support literature provides sound evidence that in times of distress, social support promotes and protects psychological wellbeing, leading to better overall adjustment (López and Salas 2006). Also, social support is believed to act as a buffer that heightens the tolerance of inopportune life events; numerous studies support this premise (Cryder et al. 2006; Vigil and Geary 2008).

Research on natural disasters have found that associated trauma exposure has the potential to negatively impact and disrupt the family environment; parental stress and probable parent psychopathology following natural disasters tends to influence parent–child interactions post-trauma (Costa et al. 2009; Norris et al. 2002). For example, studies investigating predictors of PTSD in children and their families exposed to natural disasters have found family violence, specifically corporal punishment, to be positively associated with PTSD (Kelley et al. 2010; Lau et al. 2010; Yu et al. 2010).

Collectively, several limitations exist in the discussed studies; first, these studies were not all conducted with Chinese samples. Although research suggests that, despite cultural differences between Western and non-Western societies (e.g., collectivism versus individualism), there are more similarities than differences in stress reactions across varying populations; examining the Chinese child population in isolation will allow researchers to speculate with a higher degree of certainty what distinctions may exist, if any. Second, past research pinpointing risk and protective factors for children experiencing natural disasters in China have been limited in success due to mixed findings across studies; these discrepancies may be due to varying study procedures, sample sizes, and apparatus.

Meta-analysis is an analytical technique designed to summarize the results of multiple studies; such an approach may prove beneficial in clarifying and gaining new knowledge, as it, by combining studies, increases the sample size and thus the power to explore effects of interest (Borenstein et al. 2011). In addition, meta-analysis allows comparison of estimated effect sizes achieved through use of varying measurement techniques or instruments and allows researchers to assign weights to studies whose results may be weighted lower due to methodological differences when compared to other studies (Borenstein et al. 2011).

The current study was the first meta-analysis to investigate risk and protective factors for PTSD, as well as factors that may indirectly impact the relationship between these risk and protective factors and PTSD (i.e., mediating and moderating variables) in children directly impacted by natural disasters in China. This study thoroughly examined and consolidated all existing research of sufficient quality investigating risk and protective factors of PTSD in children impacted by natural disasters of various types in the People's Republic of China using random-effects meta-analytic techniques. This work is vital, as it aims to not only clarify past findings but also distinguish any cultural differences that may exist by comparing findings to like studies conducted utilizing western samples (e.g., Cox et al. 2008; Trickey et al. 2012). In regards to hypotheses, this paper was exploratory in nature and thus, did not postulate specific outcomes a priori.

Method

Sample

Selection of Studies for the Meta-analysis Literature search for relevant articles involved search engines geared toward finding both English, as well as Mandarin language articles within the last decade and a half (2000 onward). A variety of psychological and medical literature databases were searched (e.g., PSYCinfo, medline). Emphasis was placed on locating articles published in peer-reviewed journals and open access sites with an acceptable standard of scrutiny (e.g., blind peer review, review by at least two reviewers). To ensure a thorough search, secondary sources such as review articles and book chapters, as well as the reference sections of selected articles were examined as a means to locate other potential studies for inclusion. Search terms for the literature databases included the word China and combinations of the following: PTSD, post-traumatic/posttraumatic stress disorder, child, children, adolescent, youth, risk, protective, predictor, and/or prediction. A predictor or risk or protective factor was operationally defined as any variable explored as a potential contributor to variability in PTSD symptomatology or diagnostic status. This initial literature search yielded a preliminary database of over 200 published articles. In addition, to proactively guard against publication biases, researchers known for conducting research investigating mental health outcomes in Chinese samples affected by natural disasters, based on names and universities that commonly appeared during the literature search, as well as through systematic internet searches, were contacted regarding the current study and asked to contribute relevant unpublished papers (e.g., manuscripts, theses, dissertations). As a result, three unpublished manuscripts or papers were provided. These, as well as the published articles were reviewed for inclusion in the meta-analysis using predetermined inclusion and exclusion criteria.

Inclusion and Exclusion Criteria To be included in the analysis, studies had to have 1) assessed acute stress or PTSD utilizing measures developed for use in child or adolescent populations (ages 6–18 years) that considered all three symptom clusters (intrusion, avoidance, and hyperarousal) and demonstrated adequate reliability and validity as shown by publication of their psychometric properties or by having good reliability and validity generalizability given data (e.g., reliability estimates, criterion validity estimates) provided by its use in a number of other studies and 2) examined children who had recently experienced a natural, not man-made, disaster in mainland China.

Articles were excluded based on the following grounds: 1) The study employed a categorical measure of acute stress or PTSD that failed to take into account the three symptom clusters; 2) the study sample lacked variability (e.g., consisted entirely of individuals who met full diagnostic criteria for PTSD) and thus, were not suitable for ascertaining the frequencies of PTSD symptomatology; 3) the study sample was selected on the basis that participants were experiencing a comorbid psychiatric disorder other than acute stress or PTSD (e.g., depression, anxiety), which would limit generalizability; 4) the article or paper did not provide sufficient data to calculate univariate effect sizes; 5) the article or paper was a review that did not present new data or only presented qualitative findings; 6) the article or paper presented a single case study; and 7) the article or paper examined a risk or protective factor that was not also examined by at least one other included study.

All eligible studies were carefully reviewed by at least two authors utilizing the aforementioned criteria to ensure decision-making consistency, with 100 % agreement. A total of 59 studies with a total sample size of 88,045 participants yielded 302 effect sizes that were included in the meta-analysis. Three of the studies assessed acute stress disorder due to employed measures or evaluation time-point; these studies were included, given the considerable overlap with assessed PTSD related symptoms and in addition, investigators felt they had the potential to remarkably contribute to the study. Table 1 provides a full list of the data extracted from each study for each risk or protective factor and Table 2 provides a detailed list of characteristics of the studies used in the meta-analysis.

Procedure

Coding of Included Studies Eligible studies were coded utilizing a detailed coding scheme. Effect-sizes for repeated measures of PTSD symptoms, both current and past, as well as

Table 1 Final list of risk and protective factors from included studies with descriptive statistics of the overall effect sizes from each study

Risk/protective factor	Article name	Assessment of risk factor	*k*	*SD*	Min.	Max.	Mean r
Age			21	0.316	−0.161	0.308	
	Fan et al. (2011a, b)	Demographic information					0.308
	Fan et al. (2010)	Demographic information					0.158
	Fu and Y.-H (2011)	Demographic information					0.000
	Jia et al. (2010)	Demographic information					0.107
	Jing et al. (2012)	Demographic information					0.074
	Li et al. (2009)	Demographic information					0.024
	Liu et al. (2010a, b, c)	Demographic information					0.139
	Liu et al. (2003)	Demographic information					0.080
	Liu et al. (2010b)	Demographic information					0.163
	Liu et al. (2011)	Demographic information					0.076
	Peng et al. (2011)	Demographic information					0.071
	Zhang et al. (2012)	Demographic information					0.050
	Scott, Chen, Zhang, Liu, Liu, & Dyregrov (2012)	Demographic information					0.240
	Wang et al. (2012)	Demographic information					0.037
	Xin et al. (2010)	Demographic information					0.043
	Ying et al. (2013)	Demographic information					0.200
	Zheng (2011)	Demographic information					0.100
	Zheng et al. (2012)	Demographic information					−0.161
	Zhou et al. (2014)	Demographic information					0.077
	Zhu et al. (2011)	Demographic information					0.327
Grade			11	0.192	−0.188	0.840	
Gender	Fu and Y.-H (2011)	Demographic information					0.017
	Liao et al. (2008)	Demographic information					0.157
	Liu et al. (2011)	Demographic information					0.353
	Xia and Ding (2011)	Demographic information					−0.000
	Xiang et al. (2010)	Demographic information					0.045
	Yu et al. (2010)	Demographic information					−0.188
	Zang et al. (2009)	Demographic information					−0.185
	Zhang et al. (2011a, b)	Demographic information					0.073
	Zhao and Zhao (2009)	Demographic information					0.840
	Zheng (2011)	Demographic information					0.093
	Zhu et al. (2013)	Demographic information					0.150
			39	0.354	0.005	0.918	
	An et al. (2013)	Demographic information					1.68
	Du et al. (2012b)	Demographic information					0.018
	Du et al. (2012b)	Demographic information					0.088
	Fan et al. (2011a, b)	Demographic information					0.173
	Fan et al. (2010)	Demographic information					0.243
	Fu and Y.-H (2011)	Demographic information					0.005
	Jia et al. (2010)	Demographic information					0.167
	Jing et al. (2009)	Demographic information					0.207
	Jing et al. (2012)	Demographic information					0.158
	Li et al. (2009)	Demographic information					0.252
	Li et al. (2011)	Demographic information					0.003
	Liao et al. (2008)	Demographic information					0.030
	Liu et al. (2003)	Demographic information					0.010
	Liu, Fan et al. (2010)	Demographic information					0.119
	Liu et al. (2011)	Demographic information					0.016
	Liu et al. (2010a, b, c)	Demographic information					0.139
	Ma et al. (2011)	Demographic information					0.164
	Peng et al. (2011)	Demographic information					−0.005
	Scott et al. (2012)	Demographic information					0.018
	Sun et al. (2012)	Demographic information					0.103
	Wang et al. (2010)	Demographic information					0.061

Table 1 (continued)

Risk/protective factor	Article name	Assessment of risk factor	*k*	*SD*	Min.	Max.	Mean r
	Wang et al. (2012)	Demographic information					0.109
	Xia and Ding (2011)	Demographic information					0.033
	Xiang et al. (2010)	Demographic information					0.082
	Xin et al. (2010)	Demographic information					0.144
	Ye et al. (2011)	Demographic information					0.104
	Ying et al. (2013)	Demographic information					0.120
	Zang et al. (2009)	Demographic information					0.196
	Zhang et al. (2012)	Demographic information					0.270
	Zhang et al. (2011a, b)	Demographic information					0.061
	Zhang et al. (2013)	Demographic information					0.038
	Zhao and Zhao (2009)	Demographic information					0.918
	Zhao et al. (2008)	Demographic information					0.493
	Zheng (2011)	Demographic information					0.120
	Zheng et al. (2012)	Demographic information					0.070
	Zhou et al. (2014)	Demographic information					0.100
	Zhu et al. (2011)	Demographic information					0.208
	Zhu et al. (2013)	Demographic information					0.081
Only child			5	0.105	−0.103	0.0605	
	Fan et al. (2011a, b)	Demographic information					0.021
	Fan et al. (2010)	Demographic information					−0.103
	Liu, Fan et al. (2010)	Demographic information					0.065
	Zhang et al. (2012)	Demographic information					−0.050
	Zheng (2011)	Demographic information					0.030
Father education			5	0.089	−0.173	0.021	
	Fan et al. (2011a, b)	Demographic information					0.021
	Fan et al. (2010)	Demographic information					−0.173
	Zhang et al. (2012)	Demographic information					−0.021
	Zhang et al. (2013)	Demographic information					−0.060
	Zheng (2011)	Demographic information					−0.050
Mother education			5	0.095	−0.169	0.068	
	Fan et al. (2011a, b)	Demographic information					0.068
	Fan et al. (2010)	Demographic information					−0.169
	Zhang et al. (2012)	Demographic information					−0.023
	Zhang et al. (2013)	Demographic information					−0.073
	Zheng (2011)	Demographic information					−0.040
Urban vs. rural			7	0.095	0.050	0.172	
	Liu et al. (2010b)	Demographic information					0.114
	Fan et al. (2011a, b)	Demographic information					0.172
	Fan et al. (2010)	Demographic information					0.169
	Xiang et al. (2010)	Demographic information					0.054
	Ye et al. (2011)	Demographic information					0.070
	Zheng (2011)	Demographic information					0.050
	Zheng et al. (2012)	Demographic information					0.050
Physical health			3	0.055	0.207	0.340	
	Peng et al. (2011)	The Rutter Parent Scale Chinese Version (Parents report, Rutter, 1967; Wong, 1988)					−207
	Zhao et al. (2008)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.260
	Zheng et al. (2012)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.340
Negative life events			5	0.077	0.151	0.490	
	Fan et al. (2011a)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.490
	Li et al. (2011)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.151
	Liu et al. (2010b)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.388

Table 1 (continued)

Risk/protective factor	Article name	Assessment of risk factor	*k*	*SD*	Min.	Max.	Mean r
	Zheng (2011)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.480
	Zheng et al. (2012)	Adolescent Self-Rating Life Events Checklist (ASLEC; Liu et al., 1997)					0.480
Prior trauma			3	0.055	0.052	0.170	
	Ying et al. (2013)	Study Questionnaire					0.170
	Zhang et al. (2012)	Study Questionnaire					0.052
	Yu et al. (2010)	Study Questionnaire					0.128
Bereavement (Family Member) Family Member Injured		12		0.009	.0.559		
	Du et al. (2012a, b)	Study Questionnaire					0.036
	Fan et al. (2011a, b)	Study Questionnaire					0.232
	Fan et al. (2010)	Study Questionnaire					0.432
	Jia et al. (2010)	Earthquake exposure scale (Roussos et al. 2005)					0.462
	Li et al. (2010d)	Study Questionnaire					0.313
	Liu, Fan et al. (2010)	Study Questionnaire					0.189
	Liu et al. (2011)	Study Questionnaire					0.559
	Xin et al. (2010)	Study Questionnaire					0.038
	Zhang et al. (2011b)	Study Questionnaire					0.041
	Zhao et al. (2001)	Study Questionnaire					0.009
	Zheng (2011)	Study Questionnaire					0.170
	Zheng et al. (2012)	Adolescent Self-rating Life Events Checklist (ASLEC; Liu, et al., 1997)					0.150
			8	0.221	0.027	0.234	
	Du et al. (2012a)	Study Questionnaire					0.036
	Fan et al. (2011b)	Study Questionnaire					0.234
	Jia et al. (2010)	Earthquake exposure scale (Roussos et al. 2005)					0.123
	Jing et al. (2012)	Study Questionnaire					0.027
	Li et al. (2010d)	Study Questionnaire					0.111
	Sun et al. (2012)	Study Questionnaire					0.097
	Zhang et al. (2012)	Study Questionnaire					0.034
	Zhao et al. (2001)	Study Questionnaire					0.104
Other injured/killed			7	0.190	0.072	0.339	
	Jia et al. (2010)	Study Questionnaire					0.339
	Jing et al. (2009)	Study Questionnaire					0.159
	Li et al. (2009)	Study Questionnaire					0.075
	Li et al. (2010d)	Study Questionnaire					0.128
	Ma et al. (2011)	Study Questionnaire					0.072
	Zhang et al. (2011b)	Study Questionnaire					0.078
	Zhu et al. (2011)	Study Questionnaire					0.226
Witnessed other injury/death			13	0.219	0.014	0.557	
	Jia et al. (2010)	Earthquake exposure scale (Roussos et al. 2005)					0.342
	Jing et al. (2012)	Study Questionnaire					0.073
	Li et al. (2010d)	Study Questionnaire					0.557
	Liu, Fan et al. (2010)	Study Questionnaire					0.141
	Liu et al. (2011)	Study Questionnaire					0.280
	Ma et al. (2011)	Study Questionnaire					0.138
	Peng et al. (2011)	Study Interview					0.018
	Wang et al. (2012)	Study Questionnaire					0.087
	Xin et al. (2010)	Study Questionnaire					0.014
	Ying et al. (2013)	Study Questionnaire					0.220
	Zhang et al. (2011b)	Study Questionnaire					0.051
	Zhu et al. (2011)	Study Questionnaire					0.197
	Zhu et al. (2013)	Study Questionnaire					0.127

Table 1 (continued)

Risk/protective factor	Article name	Assessment of risk factor	*k*	*SD*	Min.	Max.	Mean r
Separated from family			2		0.009	0.072	
	Li et al. (2010d)	Study Questionnaire					0.072
	Peng et al. (2011)	Study Interview					0.009
Personal injury			14	0.277	0.004	0.370	
	Jia et al. (2010)	Earthquake exposure scale (Roussos et al. 2005)					0.351
	Jing et al. (2009)	Study Questionnaire					0.056
	Jing et al. (2012)	Study Questionnaire					0.187
	Li et al. (2009)	Study Questionnaire					0.050
	Li et al. (2010d)	Study Questionnaire					0.160
	Liu et al. (2011)	Study Questionnaire					0.155
	Ma et al. (2011)	Study Questionnaire					0.370
	Xiang et al. (2010)	Study Questionnaire					0.039
	Xin et al. (2010)	Study Questionnaire					0.017
	Ye et al. (2011)	Study Questionnaire					0.241
	Zhang et al. (2012)	Study Questionnaire					0.004
	Zhang et al. (2011b)	Study Questionnaire					0.045
	Zhao et al. (2001)	Study Questionnaire					0.187
	Zhu et al. (2011)	Study Questionnaire					0.184
Hospitalization/surgery/ amputation		4		0.037	0.441		
	Jing et al. (2012)	Study Questionnaire					−0.052
	Li et al. (2009)	Study Questionnaire					0.037
	Liu et al. (2010a)	Study Questionnaire					0.441
	Zhu et al. (2011)	Study Questionnaire					−0.144
Trapped/buried			7	0.241	0.052	0.567	
	Jing et al. (2012)	Study Questionnaire					0.052
	Li et al. (2009)	Study Questionnaire					0.567
	Li et al. (2010d)	Study Interview					0.111
	Liu et al. (2011)	Study Interview					0.070
	Liu et al. (2010a)	Study Questionnaire					0.501
	Zhu et al. (2011)	Study Questionnaire					0.180
	Zhu et al. (2013)	Study Questionnaire					0.307
House damage			14	0.195	0.010	0.235	
	Fan et al. (2011b)	Study Questionnaire					0.052
	Fan et al. (2011a)	Study Questionnaire					0.090
	Fan et al. (2010)	Study Questionnaire					0.213
	Jia et al. (2010)	Earthquake exposure scale (Roussos et al. 2005)					0.157
	Liu, Fan et al. (2010)	Study Questionnaire					0.027
	Ma et al. (2011)	Study Questionnaire					0.182
	Sun et al. (2012)	Study Questionnaire					0.080
	Wang et al. (2012)	Study Questionnaire					0.235
	Ye et al. (2011)	Study Questionnaire					0.140
	Ying et al. (2013)	Study Questionnaire					0.180
	Zhang et al. (2012)	Study Questionnaire					0.020
	Zhao et al. (2001)	Study Questionnaire					0.058
	Zheng (2011) Dissertation	Study Questionnaire					0.100
	Zheng et al. (2012)	Study Questionnaire					0.010
Loss of property			9	0.110	0.028	0.250	
	Fan et al. (2011b)	Study Questionnaire					0.074
	Liu, Fan et al. (2010)	Study Questionnaire					0.060
	Sun et al. (2012)	Study Questionnaire					0.073
	Xiang et al. (2010)	Study Questionnaire					0.028
	Zhang et al. (2011b))	Study Questionnaire					0.130
	Zhao et al. (2001)	Study Questionnaire					0.068
	Zhao et al. (2008)	Study Questionnaire					0.250

Table 1 (continued)

Risk/protective factor	Article name	Assessment of risk factor	*k*	*SD*	Min.	Max.	Mean r
	Zheng (2011) Dissertation	Study Questionnaire					0.120
	Zheng et al. (2012)	Study Questionnaire					0.050
Trauma severity			19	0.167	0.004	0.328	
Perceived Threat/Fear							
Positive Coping	Du et al. (2012a)	Study Questionnaire					0.004
	Fan et al. (2011b)	Study Questionnaire					0.189
	Fan et al. (2011a)	Study Questionnaire					0.190
	Fan et al. (2010)	Study Questionnaire					0.328
	Fu and Y.-H (2011)	Study Questionnaire					0.221
	Li et al. (2010d)	Area affected by flood					0.016
	Li et al. (2011)	Proximity to epicenter					−0.205
	Liu et al. (2003)	Study Interview					0.307
	Peng et al. (2011)	Area affected by flood					0.137
	Sun et al. (2012)	Study Questionnaire					0.131
	Wang et al. (2010)	Study Questionnaire					0.101
	Wang et al. (2012)	Children's Revised Impact of Event Scale (CRIES-13).					0.161
	Zhang et al. (2010)	Distance from epicenter, level of impact					0.215
	Zhang et al. (2012)	Study Questionnaire					0.075
	Zhang et al. (2011b)	Study Questionnaire					0.062
	Zheng (2011)	Study Questionnaire					0.180
	Zheng et al. (2012)	Study Questionnaire					0.120
	Zhou et al. (under review)	Study Questionnaire					0.080
	Zhu et al. (2013)	Study Questionnaire					0.182
			6	0.214	0.129	0.371	
	Jia et al. (2010)	Earthquake exposure scale (Roussos et al. 2005)					0.304
	Jing et al. (2012)	Study Questionnaire					0.128
	Liu et al. (2011)	Study Questionnaire					0.193
	Wang et al. (2012)	Study Questionnaire					0.328
	Xin et al. (2010)	Study Questionnaire					0.305
	Zhao et al. (2001)	Study Questionnaire					0.355
			5	0.077	−0.114	−0.340	
	Jiang et al. (2013)	Simplified Coping Style Questionnaire (Xie, 1999)					−0.327
	Liu et al. (2010b)	Children Simple Coping Style Questionnaire (Xie, 1998)					−0.187
	Zhang et al. (2010)	Coping Scale, CS (Xiao & Xu, 1996)					−0.114
	Zheng (2011)	Simplified Coping Style Questionnaire (Xie, 1998)					−0.140
	Zheng et al. (2012)	Simplified Coping Style Questionnaire (Xie, 1998)					−0.140
Negative coping			5	0.071	0.224	0.548	
	Jiang et al. (2013)	Simplified Coping Style Questionnaire (Xie, 1998)					0.499
	Liu et al. (2010b)	Children Simple Coping Style Questionnaire (Xie, 1998)					0.265
	Zhang et al. (2010)	Coping Scale, CS (Xiao & Xu, 1996)					0.316
	Zheng (2011)	Simplified Coping Style Questionnaire (Xie, 1998)					0.240
	Zheng et al. (2012)	Simplified Coping Style Questionnaire (Xie, 1998)					0.220
PTSD T1			7	0.100	−0.096	0.621	
	Du et al. (2012a)	Children's Revised Impact of Event Scale (Perrin, Meiser-Stedman, & Smith, 2005)					−0.115
	Fan et al. (2011a)	PTSD Self-rating Scale (Liu, Ma, & Liu, 1998)			0.540		
	Liu et al. (2011)	Trauma Symptom Checklist for Children-Alternate Version (Briere, 1996)					−0.097

Table 1 (continued)

Risk/protective factor	Article name	Assessment of risk factor	*k*	*SD*	Min.	Max.	Mean r
	Ye et al. (2011)	PTSD Checklist-Civilian Chinese Version (Wu et al. 2008)					−0.109
	Ying et al. (2012)	Child PTSD Symptom Scale (Foa, Johnson, Feeny, & Treadwell, 2001)					0.621
	Zhang et al. (2011a)	Children's Revised Impact of Event Scale (Perrin, Meiser-Stedman, & Smith, 2005)					−0.096
	Zheng (2011)	PTSD Self-rating Scale (Liu, Ma, & Liu, 1998)					−0.466
Anxiety			2	0.032	0.414	0.510	
	Fan et al. (2011b)	The Screen for Child Anxiety Related Emotional Disorders (Birmaher, Khetarpal, & Brent, 1997)					0.470
	Tao et al. (2009)	The Screen for Child Anxiety Related Emotional Disorders (Birmaher, Khetarpal, & Brent, 1997)					0.392
Depression			7	0.122	0.247	0.780	
	Fan et al. (2011b)	The Depression Self-rating Scale for Children (Birleson, 1981)					0.640
	Jing et al. (2009)	The Depression Self-rating Scale for Children (Birleson, 1981)					0.708
	Li et al. (2011)	Children's Depression Inventory Chinese Version, CDI (Yu & Li 2000)					0.247
	Tao et al. (2009)	The Depression Self-rating Scale for Children (Birleson, 1981)					0.294
	Ying et al. (2013)	Center for Epidemiologic Studies Depression Scale for Children (Cheung & Bagley, 1998)					0.780
	Ying et al. (2012)	Center for Epidemiologic Studies Depression Scale for Children (Cheung & Bagley, 1998)					0.715
	Zhang et al. (2012)	Beck Depression Inventory Chinese Version, BDI (Shek, 1990)					0.499
Utilization of mental health services			2	0.204	0.49	0.358	
	Jia et al. (2010)	Study Interview					0.358
	Zhang et al. (2011b)	Study Questionnaire					0.049
Displacement			2	0.000	0.046	0.070	
	Jing et al. (2012)	Study Questionnaire					0.046
	Ying et al. (2013)**	Study Questionnaire					0.070
Social support			8	0.100	−0.224	−0.008	
	Fan et al. (2011a)	Social Support Questionnaire (Wang, 1999)					−0.150
	Fan et al. (2010)	Social Support Rating Scale for Children and Adolescent, SSRS-CA (Xiao, 1999)					−0.053
	Liu et al. (2009)	Perceived Social Support Scale, PSSS (Jiang, 2001)					−0.208
	Ma et al. (2011)	Social Support Rating Scale, SSRS (Xiao, 1999; Tan et al. 2011)					−0.163
	Ye et al. (2011)	Perceived Social Support Scale, PSSS (Jiang, 2001)					−0.008
	Zang et al. (2009)	Subjective Perception of Social Support Scale, SPSS (Furman & Buhrmester, 1985; Zhou et al. 2014)					−0.224
	Zheng (2011)	Social Support Rating Scale, SSRS (Xiao, 1999)					−0.140
	Zheng et al. (2011)	Social Support Rating Scale, SSRS (Xiao, 1999)					−0.170
Family violence			2	0.045	0.022	0.528	
	Li et al. (2010d)	Study Questionnaire					0.528
	Lau et al. (2010)	Study Questionnaire					0.022

k=the number of effect sizes

longitudinal studies that presented multiple assessment time-points, were included. Simple mean was computed for studies contributing more than one effect-size for the same factor.

Meta-analysis was not carried out on any risk or protective factor in which only a single effect size was reported. Continuous measures were utilized over categorical measures,

Table 2 Characteristics of included studies

Article	Disaster type	Sample size	Acute stress/PTSD measure	Age range	Mean age	%Male
An et al. 2013,	Mud-rock flow	554	PCL-C	8–18	N/A	47.1 %
Chen et al. 2012a, b	Earthquake	268	PCL-C	8–18	12.58 (2.19)	45.9 %
Du et al. 2012a	Earthquake	522	CRIES	8–12	11.6	47.5 %
Du et al. 2012b	Earthquake	553	CRIES-13	10–16	11.61 (1.48)	48.1 %
Fan et al. 2010	Earthquake	1925	PTSD-SS	11–18	14.6 (1.3)	86 %
Fan et al. 2011a	Earthquake	1074	PTSD-SS	11–17	N/A	42.4 %
Fan et al. 2011b	Earthquake	2081	PTSD-SS	14–17	14.6 (1.3, male) 14.5(1.3, female)	45.9 %
Fu 2011	Earthquake	2132(Control) 1988(intervention)	UCLA-PTSD Index for DSM-IV	6–16	11.7 (2.18) 11.1(1.89)	50 % 48 %
Han et al. 2012	Earthquake	188	MHS (modified version)	11–15	13.76 (0.8)	45.2 %
Hu and Zhao 2010	Earthquake	456	SCL-90	14–18	16.98 (4.67)	42.1 %
Jia et al. 2010	Earthquake	596	UCLA PTSD Reaction Index	8–16	11.4 (2.2)	49.8 %
Jiang et al. 2013	Mud-rock flow	592	PCL-C	8–18	13.1	47.5 %
Jing et al. 2009	Earthquake	278	UCLA PTSD Index for DSM-IV	14–16	15.6	49.6 %
Jing et al. 2012	Earthquake	1498	CRIES-13	11–16	13.66 (2.83)	51.8 %
Lau et al. 2010	Earthquake	3324	CRIES	N/A	N/A	54.3 %
Li et al. 2009	Earthquake	99	CPSS	8–18	12.56 (3.26)	42.4 %
Li et al. 2011	Earthquake	341	CRIES	12–16	13.40 (0.77)	44.58 %
Li et al. 2010d	Flood	4327	DSM-IV diagnostic interview	7–15	N/A	52.3 %
Li et al. 2010a	Earthquake	962	The screen for child anxiety related emotional disorders	6–16	11.7	N/A
Li et al. 2010b	Earthquake	370	MHS	11–17	N/A	51.6 %
Li et al. 2010c	Earthquake	370	MHS	8–18	13.8	51.6 %
Liao et al. 2008	Earthquake	3239	CRIES-13	10–19	14.5	54.2 %
Liu et al. 2003	Flood	6555	Research interview based on DSM-IV Criteria for PTSD	7–15	N/A	N/A
Liu et al. 2009	Earthquake	1958	PCL-C	N/A	N/A	47.2 %
Liu et al. 2011	Earthquake	330	TSCC-A	8–11	10.36 (0.98)	N/A
Liu, Fan et al. 2010	Earthquake	2004	PTSD-SS	11–17	14.6	45.9 %
Liu et al. 2010a	Earthquake	105	ASDS	5–18	11.77 (3.79)	47.6 %
Ma et al. 2011	Earthquake	3208	CRIES, K-SADS-PL	12–18	13.8 (1.1)	47.9 %
Peng et al. 2011	Flood	7038	DSM-IV diagnostic interview	7–15	N/A	53 %
Situ et al. 2009	Earthquake	1268	SDQ (Self-reported version)	11–17	14.2 (1.02)	49.5 %
Sun et al. 2012	Earthquake	984	PTSD-SS	16–18	16.5	43.0 %
Tan et al. 2011	Earthquake	147	Study Questionnaire	7–10	N/A	54.4 %
Tao et al. 2009	Earthquake	1925	PTSD-SS	11–18	14.6	46.0 %
Wang 2010	Earthquake	761	Study Questionnaire	1–3	N/A	52.7 %
Wang et al. 2010	Earthquake	1472	IES-R	N/A	15.7	46.6 %
Wang et al. 2012	Earthquake	1841	CRIES-13	11–20	14.2 (1.2)	48.7 %
Xiang et al. 2010	Earthquake	1960	PCL-C	11–18	N/A	47 %
Xia and Ding 2011	Earthquake	617	IES-R	N/A	N/A	46.68 %
Xin et al. 2010	Earthquake	587	LASC	15–20	17.28 (0.79)	48 %
Yang et al. 2010	Earthquake	252	PTGI	10–17	13.98 (1.13)	52.78 %
Ye et al. 2011	Earthquake	1958	PCL-C	N/A	N/A	47.2 %
Ying et al. 2012	Earthquake	200	CPSS	13.6–16.4	N/A	38 %
Ying et al. 2013	Earthquake	3052	CPSS	8–19	13.31 (2.27)	46.5 %
Yu et al. 2010	Earthquake	3324	CRIES	N/A	N/A	54.3 %
Zang et al. 2009	Earthquake	338	CPSS	N/A	15.6 (1.76)	41.4 %
Zhang et al. 2011b	Earthquake	1976	PCL-C	12–20	15.34 (1.4)	45.7 %
Zhang et al. 2012	Earthquake	737	PCL-C	15–18	16.86 (0.58)	43.2 %
Zhang et al. 2010	Earthquake	188 (HEA) 235 (LEA)	MHS	11–15 (HEA) 12–16 (LEA)	13.21 (0.62, HEA) 13.11 (0.60, LEA)	45.2 % (HEA) 43.8 % (LEA)

Table 2 (continued)

Article	Disaster type	Sample size	Acute stress/PTSD measure	Age range	Mean age	%Male
Zhang et al. 2011a	Earthquake	585	CRIES	10–17	14.0	49.6 %
Zhang et al. 2013	Earthquake	1123	The UCLA PTSD Reaction Index for DSM-IV, Revision 1	11–17	14.0	48.1 %
Zhao et al. 2001	Earthquake	2001	Study Questionnaire	14–18	15.9	55.7 %
Zhao and Zhao 2009	Earthquake	413	DSM-IV diagnostic self-rating scale	N/A	15.7	42.13 %
Zheng (2011)	Earthquake	1573	PTSD-SS	N/A	14.91 (1.32)	45.8 %
Zheng et al. 2011	Earthquake	1439	PTSD-SS	N/A	15.96 (1.35, male), 15.93 (1.29, female)	45.2 %
Zheng et al. 2012	Earthquake	2250	PTSD-SS	12–15	14.5 (1.33)	45.9 %
Zhu et al. 2011	Earthquake	7341	CRIES	8–16	12 (1.8)	50.3 %
Zhou et al. (2014)	Earthquake	304	UCLA PTSD Index, ASDS	9–17	12.06 (2.45)	44.4 %
Zhao et al. 2008	Earthquake	394	PTSD-SS	13–18	15.7	41.9 %
Zhu et al. 2013	Mud-rock flow	592	PCL-C	8–18	13.1	47.5 %

[1] *ASDS* Acute Stress Disorder Scale, *CPSS* Child PTSD Symptom Scale, *CRIES* Children's Revised Impact of Event Scale, *IES-R* Impact of Event Scale-Revised, *K-SADS-PL* Schedule for Affective Disorders and Schizophrenia for School-Age Children (Kiddie-SADS-Present and Lifetime Version), *LASC* Los Angeles Symptom Checklist (King LA,1995), *MHS* Mental Health Scale (Psychology Association of China, 2000), *PCL-C* PTSD Checklist-Civilian Chinese Version, *PTGI* Posttraumatic Growth Inventory, *PTSD-SS* Post-traumatic stress disorder self-rating scale, *SDQ* Strengths and Difficulties Questionnaire (Goodman,2001), *TSCC-A* Trauma Symptom Checklist for Children-Alternate Version. [2] *HEA* high exposure area, *LEA* low exposure area

when both presented in a study due to the statistical advantages of continuous measures in correlational research.

Calculating of Effect Sizes Pearson's correlation coefficient, r, was chosen as the effect size for this study, as r is a common metric utilized in many studies, is easily interpreted, and can be easily computed from other provide indices of effect size (e.g., odds ratio, chi-square; Field 2001). Comprehensive Meta-analysis (CMA; Borenstein et al. 2000), a statistical software program designed specifically to carry out meta-analyses, was used to compute effect-sizes and covert effect-sizes not reported as r.

For categorical data, correlation coefficients were computed such that a positive correlation coefficient reflected a higher mean in the high PTSD symptom level group than the comparison group, and a negative correlation coefficient represented a lower mean in the high PTSD symptom level group than the comparison group. For continuous data, correlation coefficients were computed such that a positive correlation coefficient reflected more severe PTSD symptoms, and a negative correlation coefficient reflected less severe PTSD symptoms. Higher values of r indicate a stronger positive association with PTSD symptom level. Table 1 provides the effect sizes included in the meta-analysis for each risk or protective factor.

Statistical Approach Meta-analyses were conducted using CMA. A separate meta-analysis was conducted for each risk or protective factor. Random-effect meta-analysis was performed for each predictor variable. This method was selected over the fixed-effect model based on findings from a study conducted by Field (2003), which demonstrated that fixed-effects model of meta-analysis may yield unreliable results (i.e., inflated estimates of population effect-sizes), specifically when examined effect sizes violate homogeneity rules, and result in increased Type I error probability. The Hedges' method was applied using Fisher-transformed correlation coefficients with results reported upon transformation back to the Pearson product–moment correlation coefficient (Field 2001). Utilization of this method allowed each effect size to be weighted by a value reflecting both the within and between study variance (Cooper, Hedges, & Valentine, 2009).

In addition, moderator analyses were conducted in CMA to assess potential indirect effects of study related factors; examined variables were selected based on review of the literature, as well as construct level analysis (Wong et al. 2008) and included: Type of disaster, first evaluative time-point, and disaster severity as assessed by proximity to most severely impacted areas (e.g., epicenter). Potential continuous moderators were analyzed using unstandardized regression slopes via a meta-analytic analogue of regression, while categorical moderators were analyzed by between-group heterogeneity statistics using a meta-analytic analogue of ANOVA. In accordance with recommendations made by Borenstein et al. (2011) and Chen et al. (2012a, b), only significant risk and protective factors with at least eight effect sizes were included in the moderation analyses. Examined predictors were: Age, gender, bereavement, family member injured, witnessed other's injury or death, personal injury, house damage, loss of property, subjective trauma severity (within study) and social support.

Results

Examination of Risk and Protective Factors Seventy of the examined predictors yielded significant small to medium effect sizes, with Pearson's correlation coefficients less than 0.3; these included: Age (older more vulnerable), gender (females more vulnerable), father level of education (higher education of paternal figure less vulnerable), urban versus rural residence prior to trauma exposure (rural residents more vulnerable), experience of prior trauma, bereavement, having a family member that was injured, knowing someone other than a family member (e.g., friend, classmate) who was injured or killed, witnessing someone get injured or killed, suffering personal injury during the trauma, becoming trapped or buried, house

Table 3 Individual meta-analysis of individual risk and protective factors

Risk/protective factor	k	γ^2	Q	P_{est}	95 confidence interval of P_{est}		Z	P
					Lower	Upper		
Demographic variables								
Age	21	0.008	498.110***	0.104	0.061	0.146	4.778	0.000***
Grade	11	0.073	731.400***	0.101	−0.061	0.259	1.221	0.222
Gender	38	0.027	2199.839***	0.141	0.088	0.194	5.159	0.000***
Only child	5	0.002	11.312*	0.005	−0.051	0.060	0.164	0.869
Father education	5	0.001	8.019	−0.049	−0.095	−0.003	−2.084	0.037*
Mother education	5	0.003	12.995*	−0.043	−0.101	0.016	−1.428	0.153
Urban vs. rural	7	0.001	12.290	0.079	0.051	0.108	5.456	0.000***
Pre-trauma factors								
Physical health	3	0.145	569.11***	0.135	−0.289	0.514	0.615	0.539
Negative life events	5	0.010	56.100***	0.413	0.335	0.485	9.452	0.000***
Prior trauma	3	0.002	7.186*	0.127	0.067	0.186	4.141	0.000***
Objective trauma characteristics								
Bereavement (Family Member)	12	0.010	126.221***	0.181	0.116	0.245	5.400	0.000***
Family member injured	8	0.002	27.854***	0.076	0.034	0.118	3.545	0.000***
Other injured/killed (e.g., friend)	7	0.008	37.766***	0.155	0.074	0.235	3.722	0.000***
Witnessed other injury/death	13	0.009	169.740***	0.146	0.089	0.203	4.943	0.000***
Separated from family	2	0.001	1.504	0.022	−0.028	0.072	0.859	0.391
Personal injury	14	0.007	96.342***	0.134	0.080	0.187	4.843	0.000***
Hospitalization/surgery/amputation	4	0.057	27.530***	0.085	−0.169	0.328	0.652	0.514
Trapped/buried	7	0.045	81.592	0.266	0.101	0.416	3.128	0.002**
House damage	14	0.006	99.837***	0.105	0.061	0.149	4.645	0.000***
Loss of property (excluding home)	9	0.002	27.856**	0.088	0.055	0.121	5.191	0.000***
Subjective trauma characteristics								
Trauma severity	19	0.019	1106.753***	0.135	0.072	0.198	4.155	0.000***
Perceived threat/fear	6	0.016	38.509***	0.263	0.149	0.371	4.418	0.000***
Post-trauma individual factors								
Positive coping	5	0.004	23.047***	−0.181	−0.239	−0.121	−5.885	0.000***
Negative coping	5	0.011	58.136***	0.309	0.221	0.392	6.579	0.000***
PTSD (Time 1)	7	0.051	406.690***	0.307	0.147	0.451	3.674	0.000***
Anxiety	2	0.004	9.298***	0.432	0.353	0.505	9.576	0.000***
Depression	7	0.120	762.596***	0.584	0.388	0.730	5.057	0.000***
Post-trauma environmental factors								
Displacement	2	0.000	1.170	0.055	0.032	0.077	4.744	0.000***
Utilization of mental health services	2	0.046	7.684**	0.190	−0.124	0.469	1.190	0.234
Social support	9	0.010	218.045***	−0.137	−0.207	−0.065	−3.696	0.000***
Family violence (e.g., corporal punishment)	2	0.159	165.042***	0.294	−0.246	0.695	1.072	0.284

***=p<.001, ** p<.01, * p<.05, k number of studies, γ^2 tau square, Q test of heterogeneity, P_{est} point of estimate, p p-value

damage, loss of property, trauma severity (those with a higher or more severe degree of exposure more vulnerable), perceived threat or fear during the natural disaster (those who experienced a higher degree of fear or threat experienced more PTSD symptoms), positive coping (less use of positive coping related to increased PTSD symptomatology), displacement (those displaced as a result of the disaster more vulnerable), and social support (perception of inadequate social support associated with more PTSD symptoms).

Five of the examined predictors yielded medium to large effect sizes, with Pearson's correlation coefficients greater than or equal to 0.3; these included: Negative life events, negative coping, the presence of anxiety post-trauma, the presence of depression post-trauma, and the presence of PTSD at a previous time point post-trauma. Those with high levels of anxiety and/or depression were also likely to have high levels of PTSD symptomatology.

As expected, given results from previous studies (Brewin et al. 2000; Cox et al. 2008) that utilized meta-analyses on this topic, although, not with Chinese participants, significant heterogeneity was observed amongst the majority of examined effect-sizes (based on the test of homogeneity for each explored risk or protective factor), indicating that the majority of the effect sizes were not uniform and varied significantly across studies. This variability may be random or systematic in nature, but, overall, suggest that risk and protective factors vary in the degree to which they predict; this should be kept in mind when interpreting results. The only significant predictors to exhibit relatively homogeneous effect-sizes were father education, urban versus rural residence, separation from family, trapped or buried, and displacement. Moderation analyses were conducted to, in part, explore whether sample or study characteristics accounted for the variable effect sizes (see below). Results of the Meta-analyses for individual risk and protective factors are presented in Table 3.

Moderation Analyses Moderation analyses of the categorical study related variables revealed a significant moderation effect of type of disaster (i.e., earthquake, flood, other) on gender and PTSD. In addition, a significant moderation effect was found for age range (i.e., younger/<12, older/<12 years, both) with regard to PTSD and gender, bereavement, witnessed other's injury or death, subjective trauma severity, and social support. Analysis of the continuous variables indicated that first evaluative time point (i.e., within 1 month, <6 months, within 6–12 months, within 12–18 months, and >18 months) appeared to moderate the relationship between PTSD and age, gender, bereavement, witnessed other's injury or death, house damage, subjective trauma severity, and social support. Finally, disaster severity, as assessed by the distance to the most severely impacted areas (e.g., epicenter; i.e., most severe, severe, moderate, mild) exhibited a moderation effect between PTSD and gender, house damage, and subjective trauma severity. See Table 4.

Discussion

The current study examined multiple potential risk and protective factors of PTSD in youth exposed to natural disasters in Mainland China via meta-analysis of 59 studies, with a combined total of 88,045 participants and 302 effect sizes. Separate meta-analyses of individual predictors revealed small to medium effect sizes for the following risk factors: older age, female gender, rural locale, previous trauma, having a family member or knowing someone other than a family member who was injured or killed during the natural disaster, witnessing another's death or injury, sustaining a personal injury oneself, becoming trapped or buried in disaster related debris, house damage, loss of personal property, high subjective trauma severity, greater perceived fear/threat related to the trauma, and displacement. In regards to protective factors, small to medium effect sizes were found for father higher level of education, greater use of positive coping, and higher levels of perceived social support. Additionally, the following risk factors demonstrated medium to large effect sizes: Endorsement of negative life events, greater use of negative coping, the presence of anxiety post-trauma, the presence of depression post-trauma, and PTSD at a prior evaluative time point following the natural disaster.

Due to high levels of heterogeneity across effect sizes, as well as theoretical and construct level reasoning, moderation analyses were conducted examining the potential indirect effects of study related characteristics, including disaster type, age range, first evaluative time point, and across study disaster severity (based on proximity to most severely affected regions) on the relationship between PTSD and significant risk and protective factors. Results suggest that the relationship between older age and PTSD incidence post-disaster appeared to be moderated by study determined evaluative time point, with more differences being seen across age level the further out the first evaluation time point was from the experienced disaster (e.g., 12 months versus 3 months post-disaster). Although females experienced a higher degree of PTSD symptoms than males, moderation analyses indicated that multiple variables perhaps influenced the magnitude of this relationship; specifically, effect size differences among females and males were most notable when the experienced disaster was an earthquake, when studies utilized an older age range of participants, when the first evaluative time point was earlier versus later, and in studies that included participants from the most ravaged, devastated areas. Both bereavement and the witnessing of another's injury or death were significant risk factors for PTSD; effect sizes were, however, larger in studies that included a wider age range of participants

Table 4 Moderation analyses of individual risk and protective factors

Risk/protective factor	Moderator	*k*	P_{est}/b	95 confidence interval of P_{est}/b		Q/Z	*p*
				Lower	Upper		
Age	Disaster Type	21				1.055	0.304
	Earthquake		0.106	0.050	0.161		
	Flood		0.075	0.059	0.092		
	Other		–	–	–		
	Age Range	21				2.858	0.239
	Younger		0.076	−0.118	0.265		
	Older		0.053	−0.009	0.115		
	Both		0.132	0.065	0.199		
	First Evaluative Time Point	21	0.00658	0.00079	0.01237	2.227	0.026*
	Disaster Severity	21	−0.00965	−0.02893	0.00962	−0.981	0.326
Gender	Disaster Type	39				25.651	0.000***
	Earthquake		0.170	0.110	0.229		
	Flood		0.007	−0.019	0.033		
	Other		0.092	0.019	0.165		
	Age Range	39					
	Younger		0.040	−0.023	0.103	7.222	0.027*
	Older		0.192	0.100	0.280		
	Both		0.101	0.048	0.153		
	First Evaluative Time Point	39	−0.04821	−0.05295	−0.04346	−19.907	0.000***
	Disaster Severity	39	−0.02034	−0.03839	−0.00229	−2.209	0.027*
Bereavement	Disaster Type	12				2.514	0.113
	Earthquake		0.171	0.105	0.237		
	Flood		0.313	0.150	0.459		
	Other		–	–	–		
	Age Range	39				6.904	0.032*
	Younger		0.280	−0.280	0.698		
	Older		0.112	0.049	0.175		
	Both		0.343	0.181	0.487		
	First Evaluative Time Point	39	−0.01921	−0.03105	−0.00737	−0.3.179	0.001**
	Disaster Severity	–	–	–	–	–	–
Family member injured	Disaster Type	8				0.049	0.824
	Earthquake		0.076	0.033	0.119		
	Flood		0.111	−0.195	0.397		
	Other		–	–	–		
	Age Range	8				2.647	0.266
	Younger		0.036	0.005	0.067		
	Older		0.094	0.021	0.166		
	Both		0.119	−0.063	0.294		
	First Evaluative Time Point	8	0.00883	−0.00131	0.01898	1.707	0.088
	Disaster Severity	–	–	–	–	–	–
Witnessed other injury/death	Disaster Type	13				0.413	0.814
	Earthquake		0.141	0.087	0.195		
	Flood		0.300	−0.281	0.719		
	Other		0.127	0.057	0.196		
	Age Range	13				13.282	0.001**
	Younger		0.280	0.098	0.444		
	Older		0.060	0.031	0.089		

Table 4 (continued)

Risk/protective factor	Moderator	*k*	P_{est}/b	95 confidence interval of P_{est}/b		Q/Z	*p*
				Lower	Upper		
	Both		0.196	0.109	0.279		
	First Evaluative Time Point	13	−0.02588	−0.03643	−0.01533	−0.4806	0.000***
	Disaster Severity	13	−0.02276	−0.14629	0.10077	−0.361	0.718
Personal injury	Disaster Type	14				0.033	0.857
	Earthquake		0.133	0.078	0.187		
	Flood		0.160	−0.131	0.426		
	Other		–	–	–		
	Age Range	14				1.378	0.502
	Younger		0.155	−0.030	0.331		
	Older		0.118	0.050	0.185		
	Both		0.186	0.094	0.275		
	First Evaluative Time Point	14	0.02087	−0.01865	0.06039	1.035	0.301
	Disaster Severity	–	–	–	–	–	–
House damage	Disaster Type	14				–	–
	Earthquake		0.105	0.061	0.149		
	Flood		–	–	–		
	Other		–	–	–		
	Age Range	14				0.513	0.474
	Younger		–	–	–		
	Older		0.095	0.044	0.145		
	Both		0.139	0.029	0.244		
	First Evaluative Time Point	14	0.03827	0.02176	0.05478	4.543	0.000***
	Disaster Severity	14	0.14823	0.09991	0.19655	6.01292	0.000***
Loss of property	Disaster Type	9				–	–
	Earthquake		0.088	0.055	0.121		
	Flood		–	–	–		
	Other		–	–	–		
	Age Range	9				1.225	0.268
	Younger		–	–	–		
	Older		0.093	0.055	0.131		
	Both		0.060	0.016	0.104		
	First Evaluative Time Point	9	0.00521	−0.01008	0.02496	0.517	0.605
	Disaster Severity	–	–	–	–	–	–
Trauma severity	Disaster Type	19				1.101	0.577
	Earthquake		0.129	0.069	0.189		
	Flood		0.148	0.019	0.273		
	Other		0.182	0.103	0.259		
	Age Range	19				48.669	0.000***
	Younger		0.004	0.000	0.007		
	Older		0.114	0.070	0.157		
	Both		0.193	0.119	0.265		
	First Evaluative Time Point	19	−0.06988	−0.07566	−0.06410	−23.682	0.000***
	Disaster Severity	19	0.15627	0.11514	0.19740	7.446	0.000***
Social support	Disaster Type	9				–	–
	Earthquake		−0.145	−0.214	−0.076		
	Flood		–	–	–		
	Other		–	–	–		

Table 4 (continued)

Risk/protective factor	Moderator	*k*	P_{est}/b	95 confidence interval of P_{est}/b		Q/Z	*p*
				Lower	Upper		
	Age Range	9				4.993	0.025*
	Younger		–	–	–		
	Older		−0.158	−0.236	−0.077		
	Both		−0.053	−0.097	−0.008		
	First Evaluative Time Point	9	−0.10518	−0.12072	−0.08963	−13.261	0.000***
	Disaster Severity	–	–	–	–	–	–

***=$p<.001$, ** $p<.01$, * $p<.05$, *k* number of studies, P_{est} point of estimate, *b* moderator estimate (slope), *Q* test of heterogeneity, *Z z* value, *p p*-value, (–) indicates that values could not me computed because of lack of observation or variability

and conducted first evaluations of PTSD symptomatology or incidence earlier. Additionally, meta-analysis findings provided evidence that house damage resulting from a natural disaster is predictive of PTSD, though this relationship appears to be influenced by first evaluative time point and disaster severity, as greater effect sizes were reported in studies that began assessment at a later time point and observed participants from less severely impacted areas (i.e., severe or moderate versus most severe). The current study found that high trauma severity level was a risk factor for PTSD; this relationship was, however shown to be moderated by first evaluative time point and disaster severity via proximity to worse impacted areas (study characteristic), as reported effect sizes were larger for studies in which initial assessment was closer to the actual date of the natural disaster and in studies that examined child participants with severe or moderate levels of disaster severity exposure versus most severe levels. Finally, analyses revealed that the relationship between social support and PTSD was moderated by study age range and first evaluative time point; larger effect sizes were reported for studies with a wider age range of child participants and that first examined PTSD symptoms on dates closer to the experienced trauma.

As expected, more similarities than differences were found when comparing the results of the current study to other meta-analyses conducted utilizing Western, instead of solely Chinese samples. In alignment with findings from Cox et al. (2008) and Trickey et al. (2012), significant effect sizes were found for gender, negative life events or exposure to prior trauma, other psychological problems (e.g., anxiety, depression), bereavement, personal injury, perceived fear/threat, social support, and poor family functioning. However, contrary to these previous meta-analyses (Trickey et al. found age was not a significant risk factor; Cox, et al. found that younger age was a significant risk factor), but corresponding with many of the studies conducted using Chinese samples (Fan et al. 2011a, b; Liu et al. 2010a, b, c; Peng et al. 2011), older age was a significant risk factor for PTSD. This finding may be partially accounted for by the primary use of older participants in the current study, whereas, the referenced meta-analyses had a greater range of ages across studies, or may perhaps reflect cultural differences in indirect variables beyond the scope of this study. With respect to potential cultural variations that may explain this discrepancy, Dong et al. (1994) found that older Chinese children endorsed a more heightened level of fear than younger children (this trend was not seen in the Western sample explored) and cited developmental differences as a probable explanation for this finding; specifically, older Chinese children may have more perceived pressures in their environment due to societal expectations and demands, which makes them more prone to emotional stress. Also, research carried out by Wang and Leichtman (2000) revealed that Chinese children, when compared to American children exhibited greater orientation toward emotional expression and situational details in their verbal narratives; age appeared to mediate these variables. Finally, when investigating trauma severity level as a potential risk factor, as expected, results of the current study suggest that higher or more severe levels of trauma exposure are predictive of PTSD status following a natural disaster. However, when observing the highly related study characteristic of disaster severity, which was measured based on locale of participants in relation to disaster and not primarily questionnaires assessing events that occurred during the disaster, findings indicate that participants deemed to be from severely and moderately exposed areas were more likely to develop heightened levels of PTSD symptomatology after experiencing disaster caused house damage and high levels of trauma severity than those individuals deemed to be from very severely exposed areas; this finding is in alignment with Wang et al. (2000) who postulated that unequal distribution of government provided resources during recovery efforts may account for these phenomenon, but contradicts the results of Lonigan et al. (1991) and Vogel and Vernberg (1993), who found a linear, positive relationship between disaster exposure and PTSD. These studies examined all Western samples, which may be the distinguishing factor.

There are multiple limitations of the current study; first, the studies included in this meta-analysis were highly heterogeneous due to varying sampling and study procedures, the wide array of measurement instruments employed, and the differing construct conceptualizations. Second, interpretation of results may be limited for several variables explored due to the low number of yielded studies that observed these variables; this reflects the relative novelty of this area of research in China, as well as the absence of an uniformed approach to investigating risk and protective factors of PTSD in child populations following a natural disaster. Along the same lines, this study failed to assess many of the protective factors shown to promote resiliency in Western youth (e.g., self esteem, social competence, problem solving; Bernard 1991), due to the scarcity of works that observed these variables in Chinese populations. Future research should incorporate study of these variables into their design †o assess whether these factors act in the same protective manner. Third, majority of the variables explored in this paper were assessed via questionnaires, versus performance or behavioral measures, and were also limited by informant. Although questionnaires can yield valuable information in scientific research, they are limited to the content included and thus, may be insufficient to measure targeted constructs; additionally, questionnaires may be prone to certain response biases or within subject variables that pose threat to internal validity (Podsakoff et al. 2003). Future meta-analyses should look to include studies not limited to questionnaires or surveys. Finally, this study focused exclusively on PTSD as the dependent variable; inclusion of other outcome variables may augment or enhance the understanding of natural disasters and their impact on children in China and should be strongly considered in subsequent work.

Despite the aforementioned shortcomings, the current study has several implications for the theoretical understanding of post-disaster psychological recovery and resilience. First, by combining and analyzing the studies collectively, this study was able to detect which risk and protective factors appeared the strongest predictors of PTSD in youth according to effect sizes across studies. This is valuable information, as it can aid mental health professionals in identifying children and adolescence more vulnerable to PTSD following a natural disaster and has the potential to impact recovery efforts at the organizational or even national level. Second, this study reiterates how similar the experience of natural disasters may be across geographical regions, as results from this study exhibited more similarities than differences when compared to like studies conducted with Western samples. It also highlights the minute differences such as PTSD related to age and disaster severity, which may or may not be due to cultural differences, that should be explored more thoroughly in future projects. Although a plethora of research has investigated and identified values and attitudes that are salient for specific cultures (Wang and Leichtman 2000), little work has been conducted to understand how they may impact one's reactions to inopportune events. This is undeniably an important area to explore in the future.

References

An, R. J., Jiang, X., Wang, C., & Li, K. (2013). Analysis of the relationship between post-traumatic stress disorder and family environment in Zhouqu children. *Journal of Psychiatry, 26*(1), 40–42.

Asarnow, D. P. J., Glynn, S., Pynoos, R. S., Nahum, J., Gurthrie, D., Cantwell, D. P., & Franklin, B. (1999). When the earth stops shaking: earthquake sequelae among children diagnosed for pre-earthquake psychopathology. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*(8), 1016–1023.

Bernard, B. (1991). *Fostering resiliency in kids: Protective factors in the family, school, and community.* Portland: Western Regional Center for Drug-Free Schools and Communities.

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*(1), 73–88.

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*(4), 545–553.

Bokszczanin, A. (2007). PTSD symptoms in children and adolescents 28 months after a flood: age and gender differences. *Journal of Traumatic Stress, 20*(3), 347–351.

Borenstein, M., Rothstein, D., & Cohen, J. (2000). *Comprehensive meta-analysis: A computer program for research synthesis [Computer software]*. Englewood: Biostat.

Borenstein, M., Hedges, L. V., Higgins, J. P., Rothstein, H. R. (2011). *Introduction to Meta-analysis*. Wiley.

Brewin, C. R., Andrews, B., & Rose, S. (2000). Fear, helplessness, and horror in posttraumatic stress disorder: investigating DSM-IV criterion A2 in victims of violent crime. *Journal of Traumatic Stress, 13*(3), 499–509.

Briere, J. (1996). Trauma symptom checklist for children. Odessa, FL: Psychological Assessment Resources, 00253-8.

Chen, K. W., Berger, C. C., Manheimer, E., Forde, D., Magidson, J., Dachman, L., & Lejuez, C. W. (2012a). Meditative therapies for reducing anxiety: a systematic review and meta-analysis of randomized controlled trials. *Depression and Anxiety, 29*(7), 545–562.

Chen, Z., Zhang, Y., Liu, Z., Liu, Y., & Dyregrov, A. (2012b). Structure of the Children's Revised Impact of Event Scale (CRIES) with children and adolescents exposed to debris flood. *PLoS ONE, 7*(8), e41741.

Cheung, C. K., & Bagley, C. (1998). Validating an American scale in Hong Kong: the center for epidemiological studies depression scale (CES-D). *The Journal of psychology, 132*(2), 169–186.

Cooper, H., Hedges, L. V., & Valentine, J. C. (Eds.). (2009). The handbook of research synthesis and meta-analysis. New York, NY, US: Russell Sage Foundation

Costa, N. M., Weems, C. F., & Pina, A. A. (2009). Hurricane Katrina and youth anxiety: the role of perceived attachment beliefs and parenting behaviors. *Journal of Anxiety Disorders, 23*(7), 935–941.

Cox, C. M., Kenardy, J. A., & Hendrikz, J. K. (2008). A meta-analysis of risk factors that predict psychopathology following accidental trauma. *Journal for Specialists in Pediatric Nursing, 13*(2), 98–110.

Cryder, C. H., Kilmer, R. P., Tedeschi, R. G., & Calhoun, L. G. (2006). An exploratory study of posttraumatic growth in children following a natural disaster. *American Journal of Orthopsychiatry, 76*(1), 65–69.

Cutter, S. L., Emrich, C. T., Mitchell, J. T., Boruff, B. J., Gall, M., Schmidtlein, M. C., & Melton, G. (2006). The long road home: Race, class, and recovery from Hurricane Katrina. *Environment Science and Policy for Sustainable Development, 48*(2), 8–20.

Danckwerts, A., & Leathem, J. (2003) Questioning the link between PTSD and cognitive dysfunction. *Neuropsychology Review, 13*(4), 221–235.

Dong, Q., Yang, B., & Ollendick, T. H. (1994). Fears in Chinese children and adolescents and their relations to anxiety and depression. *Journal of Child Psychology and Psychiatry, 35*(2), 351–363.

Du, N., Yan, J., Zhu, C. Z., & Huang, Y. (2012a). Comparative study on the symptoms of PTSD and depression of the children exposed to the Wenchuan earthquake 2 and 3 years after it. *Chinese Journal of Behavioral Medicine and Brain Science, 21*(5), 447–449.

Du, N., Zhu, C. Z., Yan, J., Huang, Y. (2012). Research on the mental health of pupils 24 months after 5.12 earthquake. *West China Medical Journal, 27*(2), 254–258. Retrieved from http://www.cnki.com.cn/Article/CJFDTotal-HXYX201202038.htm.

Fan, F., Liu, W. M., Zheng, Y. H., Cui, M. M. (2010). Mental health problems and correlates among adolescents 6 months after exposed to the Wenchuan earthquake. *Chinese Journal of Clinical Psychology, 18*(1), 56–59. Retrieved from http://www.cnki.com.cn/Article/CJFDTOTAL-ZLCY201001020.htm.

Fan, F., Geng, F. L., Zhang, L., & Zhu, Q. (2011a). Posttraumatic stress symptoms, negative life events and social supports: a longitudinal study of survival adolescents following the 2008 Wenchuan earthquake. *Acta Psychologica Sinica, 43*(12), 1398–1407.

Fan, F., Zhang, Y., Yang, Y., Mo, L., & Liu, X. (2011b). Symptoms of posttraumatic stress disorder, depression, and anxiety among adolescents following the 2008 Wenchuan Earthquake in China. *Journal of Traumatic Stress, 24*(1), 44–53.

Fang, Y. (1993). China throws itself into international competition: Agriculture faces a new challenge. In C. Howe, Y. Y. Kueh, & R. Ash (Eds.), *China's economic reform: A study with documents* (pp. 278–284). London: Routledge Curzon.

Field, A. P. (2001). Meta-analysis of correlation coefficients: a Monte Carlo comparison of fixed-and random-effects methods. *Psychological Methods, 6*(2), 161.

Field, A. P. (2003). The problems in using fixed-effects models of meta-analysis on real-world data. *Understanding Statistics Statistical Issues in Psychology, Education, and the Social Sciences, 2*(2), 105–124.

Foa, E. B., Johnson, K., Feeny, N. C., & Treadwell, K. R. T. (2001). The Child PTSD Symptom Scale (CPSS): Preliminary psychometrics of a measure for children with PTSD. *Journal of Clinical Child Psychology, 30*(3), 376–384.

Fu, C. Y. H. (2011). *Evaluating the Healing Power of Art and Play: A Cross-cultural Investigation of Psychosocial Resilience in Child and Adolescent Survivors of the 2008 Sichuan, China Earthquake* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (Publication No. 3492511).

Furman, W., & Buhrmester, D. (1985). Children's perceptions of the personal relationships in their social networks. *Developmental psychology, 21*(6), 1016.

Green, B. L., Korol, M., Grace, M. C., Vary, M. G., Leonerd, A., Gleser, C., & Smiton-Cohen, S. (1991). Children and disaster: age, gender and parental effects on PTSD symptoms. *Journal of the American Academy of Child and Adolescent Psychiatry, 30*(6), 945–951.

Groome, D., & Soureti, A. (2004). Post-traumatic stress disorder and anxiety symptoms in children exposed to the 1999 Greek earthquake. *British Journal of Psychology, 95*(3), 387–397.

Han, L., Zhang, Y., & Zheng, Y. (2012). Responses over time of child and adolescent survivors to the 2008 Wenchuan, China earthquake. *Social Behavior and Personality: An International Journal, 40*(7), 1147–1152.

Hesketh, T., Lu, L., & Xing, Z. W. (2005). The effect of China's one-child family policy after 25 years. *The New England Journal of Medicine, 353*(11), 1171–1176.

Hsu, C., Chong, M. Y., Yang, P., & Yen, C. F. (2002). Posttraumatic stress disorder among adolescent earthquake victims in Taiwan. *Journal of the American Academy of Child & Adolescent Psychiatry, 41*(7), 875–881.

Hu, L., & Zhao, Y. F. (2010). Investigation on the mental health of middle school students after seven months of wenchuan earthquake. *Modern Preventive Medicine, 37*(14), 2676–2678. Retrieved from http://www.cnki.com.cn/Article/CJFDTotal-XDYF201014033.htm.

Jacob, K. S., Sharan, P., Mirza, I., Garrido-Cumbrera, M., Seedat, S., Mari, J. J., & Saxena, S. (2007). Mental health systems in countries: where are we now? *The Lancet, 370*(9592), 1061–1077.

Jia, Z., Tian, W., He, X., Liu, W., Jin, C., & Ding, H. (2010). Mental health and quality of life survey among child survivors of the 2008 Sichuan earthquake. *Quality of Life Research, 19*(9), 1381–1391.

Jiang, Q. J. (2001). Perceived social support scale. *Chinese Journal of Behavioral Medical Science, 10*(10), 41–43.

Jiang, X., Zhu, J. H., Zhang, L., & Zhu, X. J. (2013). The relationship between PTSD and coping style in children after Zhouqu mud-rock flow. *Chinese Journal of Nervous and Mental Diseases, 39*(8), 489–492.

Jing, L. S., Huang, Y., Situ, M. J., Zhang, Y., Fang, H., Wang, D., & Qiu, C. J. (2009). A study of the post-traumatic stress and depressive reactions of adolescents in the severe disaster areas after the Wenchuan earthquake. *Chinese Journal of Behaviroal Medicine and Brain Science, 18*(3), 193–195.

Jing, L. S., Zhu, C. Z., Wang, D., Situ, M. J. Fang, H., Zhang, Y., Huang, Y. (2012). Research on Post-traumatic Stress Disorder of Students in a Secondary School in Dujiangyan after Wenchuan Earthquake. *West China Medical Journal, 27*(3), 339–342. Retrieved from http://www.cnki.com.cn/Article/CJFDTOTAL-HXYX201203010.htm.

Kelley, M. L., Self-Brown, S., Le, B., Bosson, J. V., Hernandez, B. C., & Gordon, A. T. (2010). Predicting posttraumatic stress symptoms in children following Hurricane Katrina: a prospective analysis of the effect of parental distress and parenting practices. *Journal of Traumatic Stress, 23*(5), 582–590.

Kun, P., Chen, X., Han, S., Gong, X., Chen, M., Zhang, W., & Yao, L. (2009) Prevalence of post-traumatic stress disorder in Sichuan Province, China after the 2008 Wenchuan earthquake. *Public Health, 123*(11), 703–707.

Lau, J. T., Yu, X., Zhang, J., Mak, W. W., Choi, K. C., Lui, W. W., & Chan, E. Y. (2010). Psychological distress among adolescents in Chengdu, Sichuan at 1 month after the 2008 Sichuan earthquake. *Journal of Urban Health, 87*(3), 504–523.

Li, X. R., Guo, L. T., Liu, K. Z., Xin, B., Huang, M. J., Li, Y. Y., & Sun, J. H. (2009). A follow-up study of posttraumatic stress disorder in children and adolescents admitted to the hospital after disablement in Wenchuan earthquake. *Chinese Journal of Epidemiology, 30*(10), 1092–1093.

Li, G. Y., Ma, H. X., Qi, D., Li, W. J., Wang, P., & Dang, Y. Q. (2010a). Control study of behavioral and emotional problem between local children and victimized children migrated out of disaster area one year after earthquake. *Chinese Journal of Behavioral Medicine and Brain Science, 19*(11), 1016–1018.

Li, E. X., Wo, J. Z., Xiang, Y. H. (2010). The characteristics and relation on psychosomatic health and coping styles for adolescent in 512 earthquake. *Science of Social Psychology, 25(*4), 69–74. Retrieved from http://www.cqvip.com/QK/82346X/201004/34144608.html.

Li, E. X., Xiang, Y. H., Wo, J. Z. (2010). The characteristics of primary and secondary school students' psychosomatic health in the malloseismic area of 512 earthquake—Wenchuan and its coping styles. *Education Research Monthly*, (6), 19–22. Retrieved from http://d.g.wanfangdata.com.cn/Periodical_jxjyky201006006.aspx.

Li, X., Huang, X., Tan, H., Liu, A., Zhou, J., & Yang, T. (2010d). A study on the relationship between posttraumatic stress disorder in flood victim parents and children in Hunan, China. *Australian and New Zealand Journal of Psychiatry, 44*(6), 543–550.

Li, S. W., Yu, H. Y., Qian, M. Y., Gao, J., Wang, Y. Y., Deng, J. (2011). A comparative study on level of depression and PTSD severity between the earthquake severely-exposed and mildly-exposed middle school students. *Chinese Journal of Clinical Psychology, 19*(1), 77–80. Retrieved from http://d.g.wanfangdata.com.cn/Periodical_zglcxlxzz201101024.aspx.

Liao, Q., Zhang, J., Fu, D., Tu, X., Jiang, L., Wang, L., & Li, C. (2008). Investigation on mental health among high school students in Chengdu one month after Wenchuan earthquake. *Journal of Preventive Medicine Information, 24*(12), 930–932.

Liu, A., Tan, H., Zhou, J., Li, S., Yang, T., Wang, J., & Tang, S. (2003). Epidemiological study on PTSD among 7–15 years old children in flood district. *China Journal of Public Health, 19*(4), 447–449.

Liu, A., Tan, H., Zhou, J., Li, S., Yang, T. Wang, J., Wen, S. (2006). An epidemiologic study of posttraumatic stress disorder in flood victims in Hunan China, *Canadian Journal of Psychiatry, 51*, 350–354. Retrieved from https://ww1.cpa-apc.org/Publications/Archives/CJP/2006/may/liu-OR.asp.

Liu, X. X., Xiong, G. Y., Ma, D. C., Dong, Y. Q., Ye, Y. L., Zhang, X., & Yuan, P. (2009). Relationship between post-traumatic stress disorder and perceived social support among middle school students in Wenchuan earthquake-stricken. *Chinese Journal of Epidemiology, 30*(10), 1017–1020.

Liu, K., Liang, X., Guo, L., Li, Y., Li, X., Xin, B., & Li, Y. (2010a). The acute stress disorder in the paediatric surgical children and adolescents injured in the Wenchuan earthquake of China. *Stress and Health, 26*(1), 75–81.

Liu, W. M., Fan, F., Zheng, Y. H., & Cui, M. M. (2010b). Postramatic stress symptoms and related factors among adolescents in Dujiangyan district 6 months after the earthquake. *Chinese Mental Health Journal, 24*(9), 647–651.

Liu, X. C., Ma, D. D., Liu, L. Q., Zhao, G. F., Li, C. Q., Yang, J., & Shun, L. M. (1998). Development of the post-traumatic stress disorder self-rating scale and its reliability and validity. *Chinese Journal of Behavioral Medical Science, 7*, 93–96.

Liu, X. C., Oda, S., Peng, X., & Asai, K. (1997). Life events and anxiety in Chinese medical students. *Social psychiatry and psychiatric epidemiology, 32*(2), 63–67.

Liu, Z., Yang, Y., Ye, Y., Zeng, Z., Xiang, Y., Yuan, P. (2010). One-year follow-up study of post-traumatic stress disorder among adolescents following the Wen-Chuan earthquake in China. *Bioscience Trends, 4*(3), 96–102. Retrieved from http://www.biosciencetrends.com/wholeissue.php.

Liu, M., Wang, L., Shi, Z., Zhang, Z., Zhang, K., & Shen, J. (2011). Mental health problems among children one-year after Sichuan earthquake in China: a follow-up study. *PLoS ONE, 6*(2), e14706.

Lonigan, C. J., Shannon, M. P., Finch, A. J., Daughtery, T. K., & Taylor, C. M. (1991). Children's reactions to a natural disaster: symptom severity and degree of exposure. *Advances in Behaviour Research & Therapy, 13*(3), 135–154.

López, E. J., & Salas, L. (2006). Assessing social support in Mexican American high school students: a validity study. *Journal of Hispanic Higher Education, 5*, 97–106.

Ma, X., Liu, X., Hu, X., Qiu, C., Wang, Y., Huang, Y., & Li, T. (2011). Risk indicators for post-traumatic stress disorder in adolescents exposed to the 5.12 Wenchuan earthquake in China. *Psychiatry Research, 189*(3), 385–391.

McMillen, J. C., Smith, E. M., & Fisher, R. H. (1997). Perceived benefit and mental health after three types of disaster. *Journal of Consulting and Clinical Psychology, 65*, 733–739.

Mullet-Hume, E., Anshel, D., Guevara, V., & Cloitre, M. (2008). Cumulative trauma and posttraumatic stress disorder among children exposed to the 9/11 world trade center attack. *American Journal of Orthopsychiatry, 78*, 103–108.

National Bureau of Statistics of China (NBSC) (Ed).China Population Statistics Yearbook 2006–2012. Beijing, China: National Bureau of Statistics of China.

Neria, Y., Nandi, A., & Galea (2008) SPost-traumatic stress disorder following disasters: a systematic review. *Psychological medicine, 38*(04), 467–480.

Ni, J., Reinhardt, J. D., Zhnag, X., Xiao, M., Li, L., Jin, H., & Li, J. (2013). Dysfunction and post-traumatic stress disorder in fracture victims 50 months after the Sichuan earthquake. *PLoS ONE, 8*(10), e77535.

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 Interpersonal and Biological Processes, 65*(3), 207–239.

Nugent, N. R., Ostrowski, S., Christopher, N. C., & Delhanty, D. L. (2007). Parental posttraumatic stress symptoms as a moderator of child's acute biological response and subsequent posttraumatic stress symptoms in pediatric injury patients. *Journal of Pediatric Psychology, 32*, 309–318.

Peng, M., Liu, A., Zhou, J., Wen, S., Li, S., Yang, T., & Tan, H. (2011). Association between posttraumatic stress disorder and preflood behavioral characteristics among children aged 7–15 years in Hunan, China. *Medical Principles and Practice, 20*(4), 336–340.

Perrin, S., Meiser-Stedman, R., & Smith, P. (2005). The Children's Revised Impact of Event Scale (CRIES): Validity as a screening instrument for PTSD. *Behavioural and Cognitive Psychotherapy, 33*(04), 487–498.

Piyasil, V., Ketuman, P., Plubrukarn, R., Jotipanut, V., Tanprasert, S., Aoqjinda, S., Thaeeromanophap, S. (2007). Post traumatic stress disorder in children after tsunami disaster in Thailand: 2 years follow-up. *Journal of the Medical Association of Thailand, 90*, 2370–2376. Retrieved from http://www.medassocthai.org/journal.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879–903.

Rodriguez, J. J., & Kohn, R. (2008). Use of mental health services among disaster survivors. *Current Opinion in Psychiatry, 21*(4), 370–378.

Roussos, A., Goenjian, A. K., Steinberg, A. M., 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(3):530–537

Rutter, M. (1967). A children's behaviour questionnaire for completion by teachers: preliminary findings. *Child Psychology & Psychiatry & Allied Disciplines* 8:(1)1–11

Scheeringa, M. S., Zeanah, C. H., & Cohen, J. A. (2011). PTSD in children and adolescents: toward an empirically based algorithm. *Journal of Depression and Anxiety, 28*(9), 770–782.

Scott, J. G., Zhenggen, C., Yuqing, Z., Zhengkui, L.,Yin, L., Atle, D. (2012). Structure of the Children's Revised Impact of Event Scale (CRIES) with Children and Adolescents Exposed to Debris Flood. PLoS ONE, 7(8), e41741. doi:10.1371/journal.pone.0041741

Shek, D. T. (1990). Reliability and factorial structure of the Chinese version of the Beck Depression Inventory. *Journal of clinical psychology, 46*(1), 35–43.

Shen, Y. C., Zhang, M. Y., Huang, Y. Q., He, Y. L., Liu, Z. R., Cheng, H., Tsang, A., & Kessler, R. C. (2006). Twelve-month prevalence, severity, and unmet need for treatment of mental disorders in metropolitan China. *Psychological Medicine, 36*, 257–267.

Situ, M., Zhang, Y., Fang, H., Jing, L., Wang, D., Chen, T., Huang, Y. (2009). Mental health survey of children and adolescents after 5.12 Wenchuan earthquake. *West China Medical Journal, 24*(1), 24–28.

Retrieved from http://www.cnki.com.cn/Article/CJFDTOTAL-HXYX200901008.htm.

Su, B., & Heshmati, A. (2013). Anaysis of the determinants of income and income gap between urban and rural China. (IZA DP No. 7162). Discussion Paper Series, Forschungsinstitut zur Zukunft der Arbeit. Retrieved from http://ftp.iza.org/dp7162.pdf.

Sun, S., Fan, F., Zheng, Y., Zhu, Q., Chen, S., Zhang, L., Tan, Y. (2012). Mediating effect of resilience between parenting styles and PTSD symptoms in adolescents. *Chinese Journal of Clinical Psychology, 20*(4), 502–505. Retrieved from http://d.wanfangdata.com.cn/periodical_zglcxlxzz201204019.aspx.

Tan, Y., Gan, Z., Liu, C., Zhang, G., & Cai, R. (2011). The psychological status of students in lower grades and psychological intervention after Wenchuan earthquake. *Sichuan Medical Journal, 32*(5), 627–629.

Tao, J., Fan, F., Yang, X., & Zheng, Y. (2009). Analysis of comorbidities of PTSD and anxiety, depression among juvenile victims in Dujiangyan six months after Wenchuan earthquake. *Chinese Journal of Behavioral Medicine and Brain Science, 18*(11), 991–993.

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 adolesents. *Clinicial Psychology Review, 32*, 122–138.

Vigil, J. M., & Geary, D. C. (2008). A preliminary investigation of family coping styles and psychological well-being among adolescent survivors of Hurricane Katrina. *Journal of Family Psychology, 22*, 176–180.

Vogel, J. M., & Vernberg, E. M. (1993). Part 1: Children's psychological responses to disasters. *Journal of Clinical Child Psychology, 22*(4), 464–484.

Wang, Q. (2010). 761 cases study in Deyang: social and emotional status of 12–36 months old children and related factors after the earthquake. *Sichuan Medical Journal, 31*(9), 1376–1377.

Wang, Q., & Leichtman, M. D. (2000). Same beginnings, different stories: a comparison of American and Chinese children's narratives. *Child Development, 71*, 1329–1346.

Wang, X., Gao, L., Shinfuku, N., Zhang, H., Zhao, C., & Shen, Y. (2000). Longitudinal study of earthquake-related PTSD in a randomly selected community sample in North China. *American Journal of Psychiatry, 157*(8), 1260–1266.

Wang, Y. Y., Gao, J., Lin, M. Y., Qian, M. Y., Li, S. W., Deng, J., & He, Q. (2010). Posttraumatic symptoms in senior middle school students from Wenchuan earthquake disaster areas of different severity. *Chinese Mental Health Journal, 24*(6), 467–468.

Wang, W., Fu, W., Wu, J., Ma, X., Sun, X., Huang, Y., & Gao, C. (2012). Prevalence of PTSD and depression among junior middle school students in a rural town far from the epicenter of the Wenchuan earthquake in China. *PLoS ONE, 7*(7), e41665.

Wong, C. K. (1988). The Rutter parent scale A2 and teacher scale B2 in Chinese II. Clinical validity among Chinese children. *Acta Psychiatrica Scandinavica, 78*(1), 11–17.

Wong, C. S., Law, K. S., & Huang, G. H. (2008). On the importance of conducting construct-level analysis for multidimensional constructs in theory development and testing. *Journal of Management*

Wu, K. K., Chan, S. K., & Yiu, V. F. (2008). Psychometric properties and confirmatory factor analysis of the posttraumatic stress disorder checklist for Chinese survivors of road traffic accidents. Hong Kong *Journal of Psychiatry, 18*(4), 144.

Wu, D., Yin, H., Xu, S., & Zhao, Y. (2011). Risk factors for posttraumatic stress reactions among Chinese students following exposure to a snowstorm disaster. *Biomedical Central Public Health, 11*(1), 96–103.

Xia, L. X., & Ding, C. (2011). The relationship between interpersonal traits and posttraumatic stress disorder symptoms: Analyses from Wenchuan earthquake adolescent survivors in China. *Journal of Traumatic Stress, 24*(4), 487–490.

Xiang, Y.-J., Xiong, G.-Y., Dong, Y.-Q., Ma, D.-C., Liu, Z.-Y., Liu, X.-X., & Yuan, P. (2010). Prevalence of post-traumatic stress disorder symptoms among middle school students after Wenchuan earthquake. *Chinese Mental Health Journal, 24*(1), 17–20.

Xiao, S. (1999). Social support rating scale. Mental Health Scale (Suppl).

Xiao, J. H., & Xu, X. F. (1996). The study on reliability and validity of 'The Coping Scale'. *Chinese Mental Health Journal, 10*(4), 164–166.

Xie, Y. N. (1998). 简易应对方式量表信度和效度的初步研究[A preliminary study of the reliability and validity of the simplified coping style questionnaire]. *Chinese Journal of Clinical Psychology, 6*, 114–115.

Xie, Y. N. (1999). Simplified coping style questionnaire. *Chinese Mental Health Journal, 13*(Suppl.), 122–124.

Xin, J., Zhu, Z., Wang, L., Zhang, Y., Xu, S., Wang, W. (2010). Prevalence of PTSD of adolescents and its associated factors in Mianzhu, Sichuan. *Chinese Journal of Clinical Psychology, 18*(1), 63–65. Retrieved from http://d.wanfangdata.com.cn/Periodical_zglcxlxzz201001021.aspx.

Yang, F., Lin, M. Y., Qian, M. Y. (2010). A study of the relationship between posttraumatic growth and social support in children and adolescents following Wenchuan earthquake. *Chinese Journal of Clinical Psychology, 18*(5), 614–617. Retrieved from http://d.wanfangdata.com.cn/Periodical_zglcxlxzz201005022.aspx.

Ye, Y., Liu, Y., Chen, M., Zhang, J., Yang, C., Liu, X., Yuan, P. (2011). Trajectory and the related factors of PTSD in secondary school students after earthquake. *Chinese Journal of School Health, 32*(2), 166–167. Retrieved from http://www.cqvip.com/QK/96360A/201102/36835481.html.

Ying, L. H., Wu, X. C., & Lin, C. D. (2012). Longitudinal linkages between depressive and posttraumatic stress symptoms in adolescent survivors following the Wenchuan earthquake in China: a three-wave, cross-lagged study. *School Psychology International, 33*(4), 416–432.

Ying, L. H., Wu, X. C., Lin, C. D., & Chen, C. S. (2013). Prevalence and predictors of posttraumatic stress disorder and depressive symptoms among child survivors 1 year following the Wenchuan earthquake in China. *European Child & Adolescent Psychiatry, 22*(9), 567–575.

Yu, D., & Li, X. (2000). Preliminary use of the children's depression inventory in China. *Chinese Mental Health Journal, 14*(4), 225–227

Yu, X. N., Lau, J. T. F., Zhang, J., Mak, W. W., Choi, K. C., Lui, W. W., & Chan, E. Y. Y. (2010). Posttraumatic growth and reduced suicidal ideation among adolescents at month 1 after the Sichuan earthquake. *Journal of Affective Disorders, 123*(1), 327–331.

Yule, W., Bolton, D., Udwin, O., Boyle, S., O'Ryan, D., & Nurrish, J. (2000). The long-term psychological effects of a disaster experienced in adolescence: I: The incidence and course of PTSD. *Journal of Child Psychology and Psychiatry, 41*(04), 503–511.

Zang, W. W., Zhang, Y. D., Wu, X. C. (2009). PTSD status of the relocating students and its relationship with social support after the Wenchuan earthquake. *Journal of South China Normal University (Social Science Edition),* (4), 59–63. Retrieved from http://www.cqvip.com/QK/82786X/200904/31410082.html.

Zhang, Y., Kong, F., Wang, L., Chen, H., Gao, X., Tan, X., & Liu, Y. (2010). Mental health and coping styles of children and adolescent survivors one year after the 2008 Chinese earthquake. *Children and Youth Services Review, 32*(10), 1403–1409.

Zhang, N., Zhang, Y., Wu, K., Zhu, Z., & Dyregrov, A. (2011a). Factor structure of the children's revised impact of event scale among children and adolescents who survived the 2008 Sichuan earthquake in China. *Scandinavian Journal of Psychology, 52*(3), 236–241.

Zhang, W., Jiang, X., Ho, K. W., & Wu, D. (2011b). The presence of posttraumatic stress disorder symptoms in adolescents three months after an 8. 0 magnitude earthquake in southwest China. *Journal of Clinical Nursing, 20*, 3057–3069.

Zhang, Z., Ran, M.-S., Li, Y.-H., Ou, G.-J., Gong, R.-R., Li, R.-H., & Fang, D.-Z. (2012). Prevalence of post-traumatic stress disorder among adolescents after the Wenchuan earthquake in China. *Psychological Medicine, 42*(8), 1687–1693.

Zhang, J. F., Shi, Z. B., & Zhu, Z. H. (2013). Relationship between posttraumatic stress symptoms and post-traumatic growth in adolescents. *Chinese Journal of Behavioral Medicine and Brain Science, 22*(8), 739–742.

Zhao, Y. F., & Zhao, S. L. (2009). Effects of pre-earthquake life stress events and injury severity on post-traumatic disorder symptoms of middle school students. *Advances in Psychological Science, 17*(3), 511–515. Retrieved from http://www.cqvip.com/QK/80511A/200903/30256187.html.

Zhao, C. Z., Li, J. F., Wang, M. S., Fan, Q. L., Zhang, F., Zhang, H. B., & Wang, X. D. (2001). Prevalence and correlated factors of PTSD in adolescents 17 months after earthquake. *Chinese Mental Health Journal, 15*(3), 145–147.

Zhao, S. L., Zhang, B., & Zhao, Y. F. (2008). Effect of life stress events on post-traumatic stress response of middle school students. *Chinese Journal of School Health, 29*(12), 1098–1099.

Zheng, Y. H. (2011). Predictors and developmental course of posttaumatic stress symptoms among adolescents after earthquake—A two-year longitudinal study] (Unpublished master's thesis). South China Normal University, Guangzhou, China.

Zheng, Y. H., Fan, F, Yu, C. F., Luo, T., C. (2011). Relationship between gratitude and symptoms of post-traumatic stress disorder among adolescents: Mediation of social support and resilience. *Psychological Development and Education, 27*(5), 522–528. Retrieved from http://www.cnki.com.cn/Article/CJFDTOTAL-XLFZ201105012.htm.

Zheng, Y. H., Fan, F., Liu, X. C., & Mo, L. (2012). Life events, coping, and posttraumatic stress symptoms among Chinese adolescents exposed to 2008 Wenchuan earthquake, China. *PLoS ONE, 7*(1), e29404.

Zhou, P. L., Zhang, Y. Q., Fox, J. E., Reeder, J., McMahon, A., Fournier, K. R., Liu, Z. K. (2014). Is ASD a predictor of PTSD? The relationship between Acute Stress Disorder and PTSD among children after Lushan earthquake. Manuscript submitted for publication.

Zhu, C. Z., Situ, M. J., Zhang, Y., Fang, H., Jing, L. S., Wang, D., & Huang, Y. (2011). Influence factors of post-traumatic stress disorder (PTSD) and depression symptoms in children and adolescents after Wenchuan earthquake in China. *Chinese Journal of Preventive Medicine, 45*(6), 531–536.

Zhu, X. J., Jiang, X., Zhang, L., & Zhu, J. H. (2013). Postramatic stress disorders and related factors among high school and primary school students after the mud-rock flow. *Chinese Journal of Behavioral Medicine and Brain Science, 22*(1), 65–66.