



## Posttraumatic stress disorder and somatic symptoms among child and adolescent survivors following the Lushan earthquake in China: A six-month longitudinal study<sup>☆</sup>



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### ABSTRACT

**Objective:** To explore somatic conditions in a sample of 2299 child and adolescent survivors of an earthquake and their relationship to posttraumatic stress disorder (PTSD) symptoms.

**Methods:** The Children's Revised Impact of Event Scale, the Patient Health Questionnaire (PHQ)-13 scale, a short version of PHQ-15 scale that omits two items involving sexual pain/problems and menstrual problems, and a project-developed questionnaire were administered to participants three and six months after the earthquake.

**Results:** Among child and adolescent survivors, the prevalence rates of probable PTSD were 37.4 and 24.2% three and six months, respectively, after the earthquake. The most common somatic symptoms were trouble sleeping (58.4 and 48.4%), feeling tired or having low energy (52.0 and 46.1%), and stomach pain (45.8 and 45.4%) after three and six months, respectively. Several specific somatic symptoms evaluated three months after the earthquake including trouble sleeping, headache, and shortness of breath were predictors of the overall PTSD symptoms evaluated six months after the earthquake. Additionally, the symptom of hyperarousal evaluated after three months could predict the overall somatic symptoms evaluated after six months.

**Conclusions:** PTSD and somatic symptoms were common after the earthquake, and a longitudinal association between PTSD and somatic symptoms was detected among child and adolescent survivors. These findings have implications in China and possibly elsewhere.

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### Introduction

On the 20th of April in 2013, a 7.0 Richter-scale earthquake erupted in Sichuan province, China. The epicenter was located in the Lushan County of Yaan, which had also been affected by the Wenchuan Earthquake in 2008 (Fig. 1). Only five years separated these two catastrophic disasters. The Lushan earthquake resulted in 196 deaths, 21 lost, and at least 11,470 injured, with more than 968 seriously injured [1]. It also caused psychological changes among survivors [2]. Additionally, a large number of buildings and houses were destroyed, forcing many local inhabitants to reside in temporary settlements.

Posttraumatic stress disorder (PTSD) is the most common psychological sequelae among children and adolescents following an earthquake [3–5]. For example, three years after the Wenchuan earthquake, the prevalence of PTSD was 29.6% among 373 students from two junior

high schools in Mao County [6]. Additionally, six and twelve months after the Wenchuan earthquake, the prevalence rates were 11.2 and 13.4%, respectively, among the children in the town of Qushan in Beichuan County [7]. Furthermore, the prevalence of PTSD was 35.7% among the surviving children in the Municipality of Peristeri six to seven months after the 1999 Athens earthquake [8]. Variations in the prevalence of PTSD have been noted and attributed to differences in study measurements and assessing times, as well as different age, race and cultural background of the samples [8–10].

Previous studies conducted after a factory explosion [11], floods [12], a war [13,14], and an air plane crash [15] showed that individuals exposed to traumatic experiences often suffered from somatic symptoms [16–18]. For example, one study conducted in three US infantry brigade combat teams six months post-deployment showed that the most frequently reported physical health symptoms were sleep problems (32.8%), musculoskeletal pain (32.7%), fatigue (32.3%), and back pain (28.1%) among 1522 infantry soldiers [19]. The results of an additional study conducted in Rwanda 14 years after the genocide showed that the most common somatic symptoms were back pain (74.1%) and headache (72.5%) among survivors with PTSD [20]. The majority of the aforementioned results were derived from cross-sectional

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Fig. 1. Geographical location of the Baoxing County in relation to the epicenters of the 2008 Wenchuan earthquake (purple dot) and the 2013 Lushan earthquake (red dot), China.

studies. Furthermore, most of the previous studies were conducted among adults, and little has been reported regarding somatic conditions in child and adolescent survivors after disasters.

Individuals affected by disaster have greater odds of developing PTSD compared with those not affected by disaster [21], which is associated with possibly the highest frequency of somatic symptoms among psychiatric disorders [22,23]. The symptoms are primarily neurological and musculoskeletal, and can involve pain, respiratory, gastrointestinal, cardiovascular, and sleep disorders [24]. For example, one study conducted in diverse environments from inner-city Baltimore to rural Appalachia among 69 sexual assault survivors showed that the number of body regions with clinically significant new or worsening pain (CSNWP) and the number of somatic symptoms were positively correlated with PTSD symptom severity [25]. Musculoskeletal disorders associated with depression, PTSD, and poorer well-being were also reported as results of a study conducted in Australia among 1381 Australian veterans who served in the Gulf region during the period from August 2, 1990 to September 4, 1991 [26]. The results of an additional study conducted among 3600 conflict-affected civilians in Georgia indicated that somatic distress was highly correlated with PTSD [27]. Exploring the relationship between somatic symptoms and PTSD is a critical concern among survivors with traumatic experiences due to their demonstrated potential to impact the course of psychological distress and functional disability [22]. Most of these studies that reported an association between PTSD and somatic symptoms were conducted in adults. To our knowledge, there are limited data pertaining to the association between PTSD and somatic symptoms among children and adolescents.

Based on the aforementioned research findings, we hypothesized that child and adolescent survivors of the Lushan earthquake might develop PTSD and various somatic symptoms, and that the overall somatic symptoms and overall PTSD symptoms would be associated with each other. In addition, we hypothesized that several specific somatic symptoms would contribute to the subsequent overall PTSD symptoms. Likewise, several specific previous PTSD sub-symptoms may be predictors of subsequent overall somatic symptoms. Therefore, the aims of the

present study were to evaluate the PTSD and somatic conditions among child and adolescent survivors of the Lushan earthquake longitudinally across six months, as well as to explore the relationship between specific somatic symptoms and PTSD.

## Method

### Participants and procedure

This was a longitudinal study conducted three and six months after the earthquake. Participants were students from 21 primary and secondary schools in the County of Baoxing severely affected by the earthquake. A total of 3053 children and adolescents participated in the initial survey conducted after three months, and 75.3% ( $n = 2299$ ) of the original sample completed the second assessment after six months. In the present study, we analyzed the data from the 2299 students who completed all study assessments.

In the present study, both PTSD and somatic symptoms were evaluated among child and adolescent survivors three and six months after the earthquake using the Children's Revised Impact of Event Scale (CRIES) and the Patient Health Questionnaire (PHQ)-13 scale, which is a short version of the PHQ-15 scale without the two items involving sexual pain/problems and menstrual problems. Demographic variables including age, gender, and ethnicity were also evaluated after three and six months using a project-developed questionnaire. This study was approved by the Ethics Committee of the West China Hospital of Sichuan University, and the authors obtained permission and support from both the Education Bureau of Baoxing County and the Department of Health of Sichuan Province. Written informed consent was obtained from school principals and teachers. Before conducting this study, investigators described the experimental procedures to children and informed them that they could join the study voluntarily and had a right to withdraw. Written informed consent was obtained from each student in the questionnaire. Under the supervision of trained individuals with master's degrees in psychology, participants completed the

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