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## Post-traumatic stress disorder and post-traumatic growth among the adult survivors of the Lushan earthquake: Selecting resilience as the moderator

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## ABSTRACT

On 20 April 2013, a 7.0 magnitude earthquake, the second worst natural disaster after the Wenchuan earthquake in 2008, struck Ya'an, Sichuan, China. This research studies the post-traumatic stress disorder (PTSD) and post-traumatic growth (PTG) among 2001 adult survivors who experienced the 2013 Lushan earthquake. A cross-sectional study was conducted in the severely affected area of Sichuan. A total of 2300 adult residents participated in the random sampling questionnaire survey eight months after the earthquake, and the sample population was 2001. PTSD was found to be negatively correlated with the survivors' PTG and resilience was positively related to PTG, while the negative effects of PTSD on PTG are weakened by the moderating role of resilience. The results indicate that more attention needs to be paid to strengthening the survivors' resilience as this can reduce their PTSD levels and improve their PTG. This study could support psychological relief workers helping survivors who experienced the earthquake and administrators who encounter similar situations in other countries or regions.

## 1. Introduction

On 20 April 2013, a 7.0 magnitude earthquake, the second worst natural disaster after the Wenchuan earthquake in 2008, struck the city of Ya'an, Sichuan, China. The earthquake's epicentre was located in Lushan County in Ya'an. By the end of 24 April 2013, four days later, a total of 196 people were dead, 21 were missing, and 11,470 were injured, according to the official website of the China Earthquake Administration. The survivors who lived around the Longmenshan Fault Zone were especially vulnerable as most had experienced two earthquakes.

Individuals who have survived traumatic experiences, such as war, killing, traffic accidents, or natural disasters, tend to suffer from post-traumatic stress disorder (PTSD), which was regarded as a type of mental illness in the DSM-III in 1980. The term "PTSD" was created to describe numerous Vietnam veterans' symptoms that did not match the illnesses listed in the DSM-II [1,2]. Previous studies on PTSD demonstrated that this psychiatric disorder may lead to individual symptoms related to the events within the first six months or beyond [3–5]. Kessler, Sonnega, Bromet, Hughes, and Nelson in their studies claimed that more than half of all U.S. adults (50% of women and 60% of men) are exposed to traumatic stress over the course of their lifetimes [6]. Three core classified symptoms of PTSD comprise the existence of

recognisable stress or re-experiencing symptoms that may evoke distress, the numbing of responsiveness or avoidance, and increased alertness [7]. Factors such as gender, education, social support, income, and degree of exposure to hazards are considered the disaster's exposure-related factors [8].

Recent studies have found that PTSD is commonly related to natural disaster survivors, and that the prevalence rises from 10% to 87%, among whom female survivors are more vulnerable than males [9,10]. The universality of PTSD among survivors of disasters has become a focus of research. Numerous prior studies have indicated that disasters have a long-term negative impact on survivors and that disaster-related PTSD is more general and serious than general PTSD caused by negative life events [11,12]. According to Ying and Chen's research on the survivors of the 2008 Wenchuan earthquake, the suicide rate due to the psychological causes was higher than that caused by the average life events [13]. However, several articles have suggested that traumatic events may engender positive outcomes. When patients have greater appreciation for life after suffering from tragic events, they demonstrate post-traumatic growth (PTG) [14]. It highlights five aspects: better relationships with others, greater mental capacity, appreciation for challenges, inner awakening, and positive understanding about life [15,16]. Numerous scholars have examined PTG of patients with serious illnesses; Danhauer and Zhang explored the factors affecting PTG

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in female breast cancer patients [17,18]. Yi investigated the relationship between PTG and adults who survived childhood cancer by studying their life experiences [19]. Moreover, PTG exists among those who have successfully addressed challenges and threats such as the loss of family members [15], natural disasters [20], war, and sexual violence [21]. People not only exhibit negative emotions such as anxiety and stress when confronting a disaster, but also suffer mental breakdown when dealing with the relationship between personal and extreme circumstances [22]. Moreover, PTG is principally reflected in the perceived value of the interpersonal and philosophies of physiological changes [23].

As both of the psychological states are related to trauma, PTG is considered to have a close correlation to PTSD. The positive aspect of PTSD is PTG. Resilience, known as problem-solving ability or positive adaptation, is an individual's ability to overcome adversities with positive emotions [24–26]. It may enhance the survivors' understanding about happiness, ensuring their psychological health [27,28]. Due to differences in resilience, PTG not only requires the patients' post-traumatic response and relief, but also helps them enhance themselves and become stronger. The two concepts are different development stages of positive psychology. Wang's research on middle school students who experienced the earthquake revealed a moderate impact of resilience on PTSD and PTG [29].

Whether there are different degrees of resilience between adults and adolescents as well as their slight impacts on PTSD and PTG is discussed in the current study. Hence, this paper presents two hypotheses underlining: (1) PTSD has a negative effect on the PTG of adult survivors and (2) resilience plays an essential role in moderating the correlation between PTSD and PTG of survivors.

## 2. Methods

### 2.1. Participants

A total of 2300 adult residents (aged over 18) living in the county of Lushan and other severely affected counties in Sichuan Province participated in this study. They were selected according to the following criteria: residents of the disaster areas who fully experienced the earthquake and those who were exposed to the earthquake. Both criteria were determined before interviews, which confirmed the participants as survivors. A total of 2001 copies of valid questionnaires were collected, a response rate of 87.0%. Thus, the sample population was 2001 (N = 2001).

### 2.2. Procedure

Data were gathered via a self-reported questionnaire, which was conducted from September 19, 2013, to January 14, 2014, eight months after the Lushan earthquake. The data-collection procedure was divided into three stages as shown in Fig 1: (1) the organisation of an investigation team and the training of the team members; (2) a pilot survey to test the acceptability, reliability, and validity of the original questionnaires; and (3) a massive structural random sampling and data classification executed by assistants from the Civil Affairs Bureau and the Human Resources and Social Security Bureau. The research procedure was designed and conducted in strict compliance with the basic principles of the Helsinki Declaration and was approved by the Sichuan Agricultural University ethics committee. Furthermore, the data collection was voluntary and anonymous.

### 2.3. Measurement

The self-reported questionnaire consisted of eight parts. The variables with demographic characteristics included age, gender, income level, educational level, and ethnicity. The performance of post-traumatic stress disorder, post-traumatic growth, and resilience in the

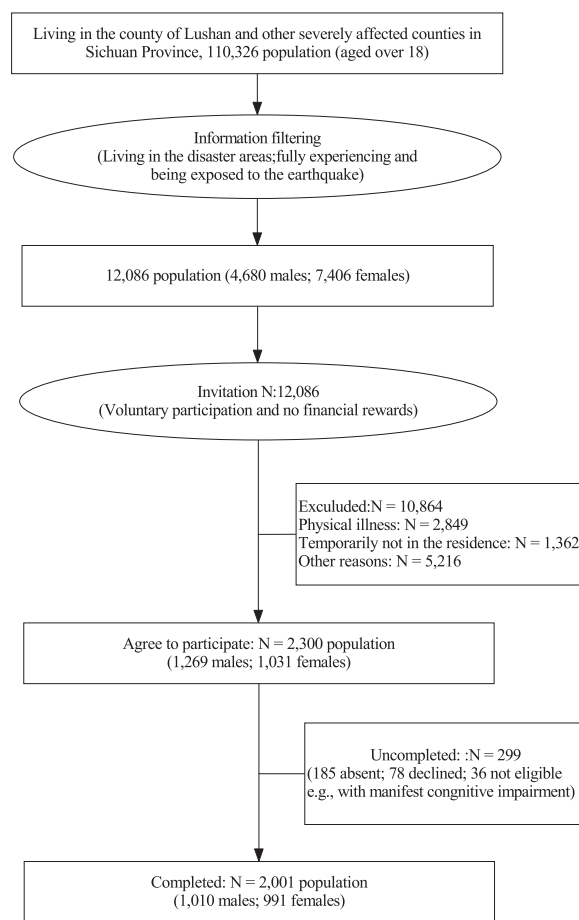


Fig. 1. Flowchart of sampling process for the adult survivors.

current research was measured via respective scales. The related scales for testing the symptoms were widely used in previous studies [30,11,31].

PTSD was continuously evaluated using the PTSD Checklist Civilian Version (PCL-C). The PCL-C was introduced to assess the level of symptomatic responses and comprises three aspects: re-experience, avoidance, and hyperarousal [32,33]. The PCL-C consists of 17 items that measure the degree of the respective symptoms via a subscale with five options (from low to high). The reliability and validity of this scale has been verified by previous studies on the survivors of the 2008 Wenchuan earthquake in particular [33,30]. In this research, the alpha coefficient for PTSD is 0.89.

The selected PTG measuring tool was C-PTGI, which consists of five aspects subdivided into 17 items. Each has options rated from 1 to 5: 1 = none, 2 = a bit, 3 moderate, 4 = considerable, and 5 = extreme, which is the same as the Likert scale [15]. It requires that the disturbed participants with problems and complaints rate their own experiences over the past month on a five-point scale. The accumulated total score ranges from 17 to 85, in which the higher the score, the greater the possibility of PTSD. In accordance with the previous studies, a score of 50 or higher is regarded as consistent with PTSD symptoms and thus is considered PTSD+ [34]. This scale is based on the number and severity of symptoms, providing a continuous grading system and another method of observing PTSD, which is used in clinical nursing. The main symptoms of PTSD were described in more detail via this tool. Cronbach's alpha for PTG is 0.89.

In this study, the Resilience Scale for Adults (RSA) was employed to measure survivors' resilience [35]. The RSA has proven to be a valid and reliable measurement in health and clinical psychology to assess the presence of the protective factors important for regaining and

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