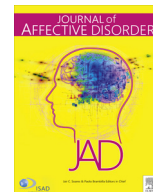




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## Research paper

# The relationship between rumination, posttraumatic stress disorder, and posttraumatic growth among Chinese adolescents after earthquake: A longitudinal study



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## ABSTRACT

**Background:** Posttraumatic stress disorder (PTSD) and posttraumatic growth (PTG) can coexist in individuals following traumatic experiences, and cognitive pathways to PTSD and PTG can be different. Nevertheless, to date, no study using the longitudinal-design has examined the cognitive process of PTSD and PTG, nor has the specific causal relation between cognitive factors and PTSD/PTG been clarified in the aftermath of disaster. Therefore, the aim of this study was to extend previous study from a longitudinal perspective, and further examine the possible cognitive mechanism of PTSD and PTG in a long-time frame after earthquake.

**Methods:** 310 middle school students in Lushan County were assessed using the Event-Related Rumination Inventory, the Post-Traumatic Growth Inventory and the Child PTSD Symptom Scale at 6 months (T1), 12 months (T2) and 18 months (T3) after the Ya'an earthquake.

**Results:** Intrusive rumination at T2 partly mediated the relationship of intrusive rumination at T1 to PTSD but not PTG at T3. Deliberate rumination at T2 did not mediate the relationship of intrusive rumination at T1 and PTG/PTSD at T3 but completely mediated the relation of intrusive rumination at T2 and PTSD/PTG at T3.

**Limitations:** All variables were measured by self-report scales.

**Conclusions:** Intrusive rumination at T1 had an effect on PTSD but not PTG at T3 through intrusive rumination at T2, and it could affect PTSD and PTG at T3 through deliberate rumination at T2. These results suggest that PTSD and PTG are influenced by different mechanisms and that intrusive rumination leads to PTSD, whereas deliberate rumination elicits PTG in a long time after trauma.

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## 1. Introduction

It has been suggested that posttraumatic stress disorder (PTSD) is the most common negative outcome after traumatic events (Bal, 2008; Campbell et al., 2007; Wang et al., 2012). Nevertheless, some positive outcomes, such as posttraumatic growth (PTG), have also been reported (Jin et al., 2014; Ying et al., 2014). PTG refers to positive changes, such as the feeling of strength and wisdom, placing increased value on friends and family, and finding a fresh appreciation for each new day, which results from experiencing a traumatic event (Tedeschi and Calhoun, 1995, 1996). More importantly, PTG and PTSD can coexist in individuals following traumatic experiences (Tedeschi and Calhoun, 1996; Zhou et al., 2015a), and thus, an important issue is to examine whether PTSD

and PTG share influencing factors. Previous studies suggested that rumination may play an important role in the developmental process of PTSD and PTG (Calhoun and Tedeschi, 2006; Janoff-Bulman, 2006), and found different ruminations may have different effects on PTSD and PTG (Wu et al., 2015; Zhou et al., 2015b), but these studies are cross-sectional design and have a critical limitation on making the conclusion about causal relation. Therefore, the aim of this study was to extend previous study from a longitudinal perspective, and further examine the effects of different ruminations on PTSD and PTG in a long-time frame after Ya'an earthquake which occurred in Sichuan province of China on April 20th 2013.

Traumatic event can challenge people's stable cognitive system involving understanding the world by according to the model of PTG from Calhoun and Tedeschi (2006). They suggested that, in this model, to reconstruct the understanding on the world after trauma, people may reexamine their personal belief systems and think repetitively on the traumatic event. The repetitive thoughts

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on causes and consequences of negative events or mood are called “rumination”, which may include two forms as intrusive and deliberate rumination. The former involves a negative focus on trauma-related clues or negative mood, whereas the latter involves a deliberate reexamination of and contemplation about the trauma.

Furthermore, there is a positive relationship between intrusive rumination and deliberate rumination. Calhoun and Tedeschi (2006) PTG model suggested that intrusive rumination can provide traumatic survivors with traumatic clues and opportunities for further deliberate rumination. In addition, intrusive rumination may also elicit psychological stress (Nolen-Hoeksema et al., 2008), which in turn creates enough cognitive dissonance for positive recurrent thought on traumatic clues. Therefore, intrusive rumination is supposed to be an impetus for deliberate rumination.

While there is a positive relationship between intrusive rumination and deliberate rumination, it is worthwhile to note that intrusive and deliberate rumination are two different functional forms, which may play different roles in posttraumatic psychological reactions (Zhou et al., 2015b). From the shattered world assumption (Janoff-Bulman, 2010), before traumatic event, people have stable basic perceptions of personal worth, trust in others, and justice or predictability in the world. Nevertheless, traumatic event will severely challenge these stable perceptions and lead to a cognitive discrepancy of survivors before and after the trauma, which can further elicit their intrusive rumination on traumatic events. Engaging in intrusive rumination, people always focuses on the negative effects of the traumatic event and negative emotion (Janoff-Bulman, 2010), which is more likely to be related to various types of posttraumatic distress (Affleck and Tennen, 1996; Dunn et al., 2011). In addition, by engaging in intrusive rumination, people are also exposed to traumatic cues, thereby encouraging further cognitive processing of traumatic events, which results in PTG (Park and Fenster, 2004; Taku et al., 2009; Yanez et al., 2011). Thus, it is likely that intrusive rumination can be considered to play a “two-sided” role in posttraumatic psychological reactions, and may be a predictor of PTSD and PTG.

Engaging in deliberate rumination, based on Calhoun and Tedeschi (2006) PTG model, people may pay attention to the positive aspects of the world, the self and others after highly stressful events, which is more likely to be related to eventual PTG (Affleck and Tennen, 1996; Cann et al., 2010; Dunn et al., 2011; Taku et al., 2008). Likewise, deliberate rumination on traumatic events also can change pathological thinking styles and reduce trauma-related fear, which in turn ameliorates PTSD symptoms (Ehlers and Steil, 1995; Paunovic and Öst, 2001). Thus, deliberate rumination has been proposed as a protective factor against PTSD and a predictive factor for PTG.

For most people, intrusive ruminations tends to occur soon after the traumatic event (Lindstrom et al., 2013), may persist for a long time (Taku et al., 2008). Wu et al. (2015) also found that intrusive rumination soon after Wenchuan earthquake have a positive effect on continued intrusive rumination, and it also results in deliberate rumination. It is likely that baseline intrusive rumination can predict latter intrusive and deliberate rumination, and in turn results in posttraumatic psychological reactions. However, because of the limitations of cross-sectional design, previous studies do not indicate causality or a temporal sequence. Furthermore, previous studies found that the predictors for PTSD and PTG are different, then it can be concluded that the pathways to PTSD and PTG are different (Wu et al., 2015; Zhou et al., 2015b). Although this conclusion may be helpful for us to understand the difference on predictors for PTSD and PTG, it is difficultly to find the difference on the developmental process of PTSD and PTG because there lack of longitudinal and developmental perspective.

Given this background, the present study examines the role of

intrusive and deliberate rumination in the developmental process of PTSD and PTG from a longitudinal perspective. And, based on the shattered world assumption (Janoff-Bulman, 2006) and the PTG model (Calhoun and Tedeschi, 2006), we will address the following hypotheses: deliberate rumination would mediate the relationships of intrusive rumination to both PTSD and PTG; and this mediating effect of deliberate rumination would be stable with time change.

## 2. Method

### 2.1. Participants and procedures

According to our study aim, after the Ya'an earthquake, we firstly focused on Lushan county in Sichuan province, which was most affected by the Ya'an earthquake. Then we informed some schools of our study aims and ways of investigation, and that we could provide some psychological services if they needed. With the approval of several primary and secondary schools, we randomly selected several classes, in which all the students attended school at the date of measurement were recruited to the participate. In the present study, 310 adolescent survivors were selected. The mean age of the adolescents at the time of the first measuring wave was 14.88 (SD=1.96) years, and the range was 12.0–19.0 years. Of the 310 participants, 154 (49.7%) were female and 156 (50.3%) were male. All the participants experienced this earthquake, and 8.7% of the participants were trapped and 9.0% were injured in the earthquake. The houses of 74.8% participants were severely or totally destroyed in the earthquake. 7.7% of participants saw themselves their friends getting trapped, and 26.8% of participants saw themselves their friends getting injured.

This study was approved by the Research Ethics Committee of Beijing Normal University and was conducted according to the principals of the participating schools. In the selected classes, everyone who attended school on the date of the survey was recruited to participate. There were no exclusion criteria. Compensation was not provided. The purpose of the study and the voluntary nature of the students' participation were highlighted before the survey, and written informed consent was obtained from school principals and classroom teachers. In China, research projects that are approved by local education authorities and the school administrators and that are deemed to provide a service to the students do not require parental consent. Three assessments were conducted at different time points under the supervision of trained individuals with Master's degree in psychology. The participants were initially asked to provide demographic information that included sex and age. They were asked to complete the remaining measures that assessed traumatic exposure, intrusive rumination, deliberate rumination, PTG and PTSD. After the questionnaire packets were completed, the participants were told that school psychologists or teachers were possible to provide some psychological/counseling services if they might need.

All of the 310 participants completed the first assessment 6 months after the earthquake (T1). At the second assessment, which was 12 months after the earthquake (T2), 260(83.9%) of the original 310 participants completed the survey. At the third assessment, which was 18 months after the earthquake (T3), 249 (80.3%) of the original participants completed the survey. In each follow-up survey, some students dropped out or graduated from schools, thus there was a drop-out rate. To investigate the potential impact of attrition, we tested the differences in traumatic exposures, rumination, PTSD, and PTG in the first assessment between the longitudinal sample and the subjects who did not follow up for unknown reasons (i.e., other than dropout and graduation). Attrition analysis results indicate that there were no

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