

How does parental attachment contribute to post-traumatic growth among adolescents following an earthquake? Testing a multiple mediation model

Xiao Zhou^a, Rui Zhen ^b and Xinchun Wu^c

^aDepartment of Psychology and Behavioral Sciences, Zhejiang University, Hangzhou, China; ^bInstitute of Psychological Science, Hangzhou Normal University, Hangzhou, China; ^cBeijing Key Laboratory of Applied Experimental Psychology, Faculty of Psychology, Beijing Normal University, Beijing, China

ABSTRACT

This study aimed to elucidate the mechanism underlying the effect of parental attachment on post-traumatic growth (PTG) among adolescents. Nine and a half years after the Wenchuan earthquake, 872 adolescents in China were assessed using self-reported questionnaires. The results showed that parental attachment had a direct association with PTG, two significant one-step indirect associations with PTG (through justice beliefs and cognitive reappraisal), two significant two-step indirect associations (through feelings of safety via justice beliefs and justice beliefs via cognitive reappraisal), and one significant three-step indirect association (through feelings of safety via justice beliefs by cognitive reappraisal). The results indicated that feelings of safety, justice beliefs, and cognitive reappraisal mediated the association between parental attachment and PTG. These findings highlight the importance of a family perspective and may help clinical psychologists to improve adolescents' PTG by helping them to build positive parental attachments.

¿Cómo contribuye el apego parental al crecimiento postraumático en los adolescentes después de un terremoto? Un modelo de mediación múltiple

El objetivo de este estudio fue dilucidar el mecanismo subyacente al efecto del apego parental sobre el crecimiento postraumático (CPT) en adolescentes. Nueve años y medio después del terremoto de Wenchuan, 872 adolescentes en China fueron evaluados usando cuestionarios de auto-reporte. Los resultados mostraron que el apego parental tenía una asociación directa con CPT, dos asociaciones indirectas significativas de un paso con CPT (a través de fe en la justicia y reevaluación cognitiva), dos asociaciones indirectas significativas de dos pasos (a través de sentimientos de seguridad mediante fe en la justicia y fe en la justicia a través de reevaluación cognitiva), y una asociación indirecta significativa de tres pasos (a través de sentimientos de seguridad mediante fe en la justicia por reevaluación cognitiva). Los resultados indicaron que los sentimientos de seguridad, la fe en la justicia y la reevaluación cognitiva mediaron la asociación entre el apego parental y el CPT. Estos hallazgos resaltan la importancia de una perspectiva familiar y pueden ayudar a los psicólogos clínicos a fomentar el CPT de los adolescentes ayudándolos a construir vínculos parentales positivos.

父母依恋如何导致地震后青少年的创伤后成长？一个多重中介模型

本研究旨在阐明父母依恋对青少年创伤后生长（PTG）的影响机制。汶川地震发生9年半后，在872名中国青少年使用自我报告问卷进行了评估。结果显示，父母依恋与PTG有直接关联，两个显著的一阶间接（one-step indirect）（通过公正信念和认知重新评估）关联PTG，两个显著的二阶间接关联（通过公正信念到安全感和通过认知到公正信念）和一个显著的三阶间接关联（通过安全感到公正信念到认知重评）。结果表明，安全感，公正信念和认知重评中介了父母依恋与PTG之间的关联。这些研究结果突出了家庭观点的重要性，临床心理学家可以通过帮助他们建立积极的父母依恋来促进青少年的PTG。

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关键词

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HIGHLIGHTS

- The underlying mechanism of parental attachment on post-traumatic growth (PTG) was examined.
- Feelings of safety, justice beliefs, and cognitive reappraisal were mediators between parental attachment and PTG.
- Parental attachment has indirect effects on PTG through these three mediators.

1. Introduction

Post-traumatic growth (PTG) has been defined as positive changes following traumatic events (Blackie et al., 2017; Jayawickreme & Blackie, 2014), such as feelings of strength and wisdom, placing more value on friends and family, and finding a fresh appreciation for each new day (e.g. Calhoun & Tedeschi, 2006). PTG is common among adolescents who

have experienced trauma (e.g. Andrades, García, Calonge, & Martínez-Arias, 2018; Mcdiarmid & Taku, 2016). For example, a study of adolescents affected by the Ya'an earthquake in China found a 76.2% prevalence of PTG (Chen & Wu, 2017). In another study of adolescents following the Wenchuan earthquake, also in China, 60.2% reported PTG (Zhou, Wu, & Zhen, 2018).

Although PTG is highly prevalent among adolescents, not all adolescents report it, and it remains to be clarified why only some adolescents experience PTG. According to the model of thriving through relationships (Feeney & Collins, 2015a), the likelihood of PTG may be affected by interpersonal relationships. In traumatic situations, individuals with better interpersonal relationships are more likely to express their experiences and emotions; this, in turn, increases positive cognitions, ultimately contributing to successful outcomes (Feeney & Collins, 2015a, 2015b). However, there have been no examinations of which types of interpersonal relationships are more important for adolescent PTG. Following trauma, parents are important resources for adolescents' ability to handle traumatic experiences (Tian, Wu, Wang, & Zhou, 2018). Parents can serve a critical 'protective' function for the child, increase the child's likelihood of successfully coping and adapting, and reduce the likelihood of maladjustment (e.g. Hafstad, Gilrivas, Kilmer, & Raeder, 2010). The attachment relationship between adolescents and parents is therefore important in promoting PTG among adolescents who have been through traumatic experiences (Tian et al., 2018; Yuan, Goh, Xu, & An, 2018).

According to Bowlby's definition of attachment (Bowlby, 1969), parental attachment is the affectional tie that binds adolescents to their parents. Attachment theory suggests that the quality of early attachment relationships determines the individual's internal working models of self and others (e.g. Bowlby, 1969); these models influence emotion regulation and how individuals cope with stressors (e.g. Bartholomew & Horowitz, 1991), and ultimately may result in a range of post-traumatic outcomes (e.g. Arikan, Stopa, Carnelley, & Karl, 2015; Schmidt, Blank, Bellizzi, & Park, 2012). Positive attachment relationships indicate positive internal models involving oneself and others, which may lead to better interpersonal relationships (e.g. Arikan et al., 2015). Positive interpersonal relationships can be considered individual or interpersonal resources to cope with traumatic experiences (e.g. Hobfoll, Dunahoo, & Monnier, 1995; Hobfoll, Freedy, Lane, & Geller, 1990). Therefore, it is helpful for traumatized individuals struggling with traumatic thoughts to experience encouragement and optimism (e.g. Hobfoll et al., 1995) and to discover new meanings of the self, others, and the world following trauma. This may eventually lead to PTG (e.g. Arikan et al., 2015).

The association between parental attachment and PTG may be mediated by feelings of safety and justice beliefs. Attachment theory suggests that positive attachment to others can generate positive interpersonal relationships (Bowlby, 1980; Shaver & Hazan, 1993); these provide a safe environment for individuals and increase their feelings of safety (e.g. Blaustein & Kinniburgh, 2010, 2017; Kinniburgh, Blaustein, Spinazzola, Van, & Bessel, 2005).

Individuals with a greater feeling of safety are more likely to explore the world (e.g. Nelson, 2016) and endeavour to find meaning in the world (e.g. Mikulincer & Florian, 2004); these steps may, in due course, lead to PTG.

Furthermore, attachment theory emphasizes that children may organize their cognition and behaviours towards the world by developing attachments to others, especially their parents (e.g. Ainsworth, 1991; Bowlby, 1969), and this may help them to develop a set of cognitions and behaviours designed to elicit and maintain proximity to their parents (Bowlby, 1980). In fact, following trauma, traumatized individuals receive a greater amount of support from others (e.g. Guo, He, Qu, Wang, & Liu, 2017); this can offset the loss of resources from traumatic events (e.g. Hobfoll et al., 1995, 1990) and induces individuals to form justice beliefs (e.g. Bastounis, Finkelstein, & Minibaspoussard, 2009; Deconinck, 2010). Positive parental attachments lead children to form similar cognitions to their parents (Bowlby, 1980); thus, this will result in children forming justice beliefs that are similar to their parents' justice beliefs. Furthermore, the development of justice beliefs leads individuals to believe that they live in a world where people get what they deserve and deserve what they get (e.g. Lerner, 1977). From this perspective, individuals may be willing to invest time and energy in future-oriented activities, acquire trust in others and in social institutions, and perceive meaning in life events (e.g. Maes & Kals, 2002). This may result in adjustment or growth following trauma (e.g. Fetty, 2012).

In addition to feelings of safety and justice beliefs, cognitive reappraisal may mediate the relationships between parental attachment and PTG. Cognitive reappraisal refers to attempts to remedy negative moods and generate benign or positive interpretations or perspectives of stressful situations (e.g. Gross, 1998). Under positive parental attachment, parents may encourage adolescents to disclose their emotional themes (e.g. Leibowitz, Ramos-Marcuse, & Arsenio, 2002; Zahn-Waxler, Ridgeway, Denham, Usher, & Cole, 1993) and discuss their experiences with their parents (e.g. Leibowitz et al., 2002). Adolescents who receive this type of parental advice have increased opportunities for cognitive reappraisal of their experiences. These interactions also help adolescents to divert attention from the negative aspects of traumatic reactions and to reconstruct their understanding of the post-traumatic world (e.g. Zhou, Wu, An, & Chen, 2014), which results in PTG. Therefore, parental attachment is considered to have a positive indirect relationship with PTG, via cognitive reappraisal.

The association between parental attachment and PTG seems to be mediated by feelings of safety, justice beliefs, and cognitive reappraisal. There is

also evidence that these three variables are associated with each other. Recent studies indicate that greater perceived safety may encourage individuals to openly express their emotions and experiences (e.g. Zhen, Quan, & Zhou, 2018) and discuss them with others, which helps individuals to acquire new insights and reconstruct their experiences (e.g. Pennebaker & Beall, 1986). This may increase their opportunities for cognitive reappraisal. Feelings of safety may also have an indirect effect on cognitive reappraisal, via justice beliefs. Feelings of safety may increase the sense of hope (e.g. Toyouhiro & Watanabe, 2007) and, in turn, increase expectancy of positive outcomes that generate strong feelings. These factors may therefore engender positive attitudes towards the world, leading individuals to view the world as logical, orderly, and just (e.g. Jiang, Yue, Lu, Yu, & Zhu, 2016) and resulting in justice beliefs (e.g. Dalbert, 2001). Furthermore, justice motive theory suggests that justice beliefs comprise a cognitive schema that ascribes meaning to events (e.g. Dalbert, 2001). The individual may reconstruct his or her understanding of the events to understand their meaning, which promotes his or her cognitive reappraisal of events. The evidence cited suggests that feelings of safety have a direct effect on cognitive reappraisal, but also have an indirect effect on cognitive reappraisal, via justice beliefs.

Feelings of safety, justice beliefs, and cognitive reappraisal play a mediating role in the relation between parental attachment and PTG, but the specific utility of such a role has not been evaluated. Although the unique role of these potential mediators has been discussed, their combined role in the process by which parental attachment promotes PTG has not been examined. Therefore, the mechanism underlying the effect of parental attachment on PTG remains unclear. In addition, the role of justice motive theory (e.g. Dalbert, 2001) in relieving victims' stress following trauma (e.g. Fetty, 2012; Riaz et al., 2015) has attracted an increasing amount of research attention. It is unclear whether this theory is applicable to efforts to promote PTG. This study aimed to fill this gap by examining the mediating roles of feelings of safety, justice beliefs, and cognitive reappraisal in the association between parental attachment and PTG. We hypothesized that parental attachment might have not only a direct effect on PTG, but also an indirect effect, via feelings of safety, justice beliefs, and cognitive reappraisal.

2. Methods

2.1. Participants and procedures

This study began 9.5 years after the Wenchuan earthquake that struck on 12 May 2008, and registered a magnitude of 8.0 on the Richter scale. The study

focused on Wenchuan county and Dujiangyan city in Sichuan Province. We first contacted the local education authorities and informed them of the aims and methods of the investigation. We also indicated that supplementary psychological services could be provided if required. On gaining their approval, we chose several middle schools in the two areas. Then, with the help of principals and school psychologists, we selected several classes of approximately 40 students from each school. All students in these classes were due to attend school on the assessment date, and all agreed to participate in the investigation and complete a self-reported questionnaire. A total of 872 adolescent survivors participated in the survey. Their mean age was 15.86 ($SD = 1.47$) years, with an age range of 11.0–19.0 years; 13 participants did not report their age. Of the 872 participants, 486 (55.8%) were female, 370 (42.4%) were male, and 16 (1.8%) did not report their gender.

This project was approved by the research ethics committee of Beijing Normal University, the local education authorities (in this case, county departments of education), and the participating school principals. In China, research projects that are approved by local education authorities and school administrators and that are deemed to provide a service to students do not require parental consent. Thus, this study was not required to obtain written informed consent from parents (Zhou, Wu, An, & Fu, 2014). However, written informed consent forms were obtained from school principals, classroom teachers, and each participant. Participants were free to withdraw from the survey at any time. Assessments were conducted under the supervision of trained postgraduate students in psychology and class teachers. No compensation was provided for students' participation, but counselling services were provided if needed.

2.2. Measures

2.2.1. Parental attachment

Parental attachment was assessed using a parental attachment questionnaire (Liang, Hou, & Tian, 2006). This was adapted from the Inventory of Parent and Peer Attachment (IPPA) (Armsden & Greenberg, 1987), which comprises 31 items and three dimensions: parental communication (12 items), parental alienation (five items), and parental trust (14 items). Liang et al. (2006) have translated and revised the IPPA. This modified parental attachment questionnaire has 25 items and three dimensions: communication (nine items), alienation (six items), and trust (10 items). All items were evaluated on a five-point Likert scale ranging from 1 (completely disagree) to 5 (completely

agree). The questionnaire showed good reliability (Cronbach's alpha = 0.93) in this study.

2.2.2. Feelings of safety

A feelings of safety scale (Cong & An, 2004) was used to assess adolescents following the earthquake. This scale consists of 16 items divided into two dimensions: feelings of interpersonal safety and control. All items were evaluated on a five-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). In the Cong and An (2004) study, the scale showed good reliability; in the present study, the Cronbach's alpha was 0.92.

2.2.3. Justice beliefs

The Belief in a Just World (BJW) scale (Lipkus, Dalbert, & Siegler, 1996) was used to assess adolescents' justice beliefs. This scale comprises 16 items rated on a six-point Likert scale ranging from 1 (completely disagree) to 6 (completely agree). To adapt this scale for this study population, we first translated it into Chinese and then asked a psychology professor proficient in English to translate the Chinese version into English, to ensure the semantic equivalence of the Chinese and English versions. To ensure the scale's applicability to adolescents following an earthquake, we first carried out a review of the translated BJW scale with students, then reworded the scale items that were difficult for students to understand, using more accessible words such as 'people treated me fairly after the earthquake'. The modified scale had good internal reliability (Cronbach's alpha = 0.92) in the present study.

2.2.4. Cognitive reappraisal

Cognitive reappraisal was assessed using the cognitive reappraisal subscale of a questionnaire on emotion regulation strategies (Chinese revised version) (Wang, Liu, Li, & Du, 2007). This emotion regulation strategies questionnaire consists of 10 items; six items measure cognitive reappraisal and four measure expressive suppression. All items were rated on a seven-point Likert scale ranging from 1 (completely disagree) to 7 (completely agree). This questionnaire had previously exhibited good reliability and validity (Wang et al., 2007). We found good internal reliability of the subscale and overall scale ($0.74 < \text{Cronbach's alpha} < 0.85$) in the present study. We selected and used the cognitive reappraisal subscale in accordance with the needs of this study.

2.2.5. PTG

A modified version of the Post-Traumatic Growth Inventory (PTGI) (Zhou, Wu, An, & Chen, 2014) was used to assess adolescents' PTG. This 22-item

scale comprises three subscales: perceived changes in self, a changed sense of relationships with others, and a changed philosophy of life. All 22 items were scored on a six-point scale ranging from 0 (no change) to 5 (very large degree of change). There was good internal reliability of the modified inventory (Cronbach's alpha = 0.94) in the present study.

2.3. Data analysis procedures

We first conducted an analysis of missing data for each variable and found less than 1.3% of missing data across all items. To assess whether the missing data pattern was random, Little's Missing Completely at Random test was used. The results revealed that data were missing in a non-random way [$\chi^2(210) = 282.109, p = 0.001$]. Robust maximum likelihood estimates were used to accommodate these missing data.

Descriptive analyses were conducted for all measures. Pearson correlations were calculated to examine the associations between the major variables. We then constructed structural equation models (SEMs) to examine the effects of parental attachment, feelings of safety, justice beliefs, and cognitive reappraisal on PTG. Regarding the two basic elements in the SEMs, a measurement component ('measurement model') and a structural component ('structural model'), Anderson and Gerbing (1988) recommend that the measurement model fit be evaluated first. This stepwise procedure offers the safeguard of explicitly verifying the acceptability of the measurement of constructs. We therefore first assessed the measurement model and then assessed the structural model.

We then used an SEM approach to assess the following models. First, a direct model with structural paths from parental attachment to PTG was assessed. Secondly, based on the direct model, we inserted mediators (feelings of safety, justice beliefs, and cognitive reappraisal) between parental attachment and PTG. We then added predictive paths from feelings of safety to justice beliefs and cognitive reappraisal, and from justice beliefs to cognitive reappraisal. Finally, a multiple indirect effects model was established (Figure 1). Moreover, to test the significance of the indirect effects, we conducted bias-corrected bootstrap tests with a 95% confidence interval (CI).

We used chi-squared values, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) to evaluate the model fit. A non-significant chi-square indicated good model-data fit. The general cut-offs for model acceptance were ≥ 0.90 for the CFI and TLI, and < 0.08 for the SRMR and RMSEA (Wen, Hau, & Marsh, 2004).

3. Results

3.1. Descriptive statistics and correlations among main measures

Table 1 shows the results of the descriptive statistics and correlations among the main measures. Significant and positive associations among all variables are indicated.

3.2. Examination of multiple mediating effects

We used four steps to examine the multiple mediating effects of feelings of safety, justice beliefs, and cognitive reappraisal on the association between parental attachment and PTG. The parental attachment latent variables were evaluated in accordance with the scores for parental communication, parental trust, and parental alienation. Feelings of safety latent variables were evaluated via scores for interpersonal safety and controlling beliefs. PTG latent variables were evaluated via scores on perceived changes in self, a changed sense of relationships with others, and a changed philosophy of life. The justice beliefs latent variable was evaluated using total scores on all items. The cognitive reappraisal latent variable was assessed using its item scores. We first examined the validity of the measurement model including three latent variables, in which correlations were specified among parental attachment, feelings of safety, and PTG. Factor loadings of the manifest indicators on their respective latent variables were estimated freely. The measurement model showed a good fit: $\chi^2(16) = 93.83$, CFI = 0.982, TLI = 0.969, RMSEA

(90% CI) = 0.075 (0.060–0.090), and SRMR = 0.041. The results indicated that the measurement model was sound and was appropriate for use in further SEM analyses.

Secondly, we constructed a direct effects model that demonstrated the direct association between parental attachment and PTG; this model showed a good fit: $\chi^2(7) = 18.98$, CFI = 0.996, TLI = 0.992, RMSEA (90% CI) = 0.044 (0.021–0.069), and SRMR = 0.018. Path analyses revealed that parental attachment had a significant direct and positive relation with PTG ($\beta = 0.25$, $p < 0.001$).

Thirdly, a final multiple indirect effects model was established according to the procedures described in Sub section 2.3 (Figure 1). This model showed a good fit: $\chi^2(26) = 124.07$, CFI = 0.979, TLI = 0.964, RMSEA (90% CI) = 0.066 (0.054–0.078), and SRMR = 0.036. The results showed that parental attachment had a direct association with PTG, and had two significant one-step indirect associations with PTG via justice beliefs and cognitive reappraisal. It had two significant two-step indirect associations with PTG, through feelings of safety via justice beliefs and through justice beliefs via cognitive reappraisal. It had one significant three-step indirect association with PTG, by feelings of safety via justice beliefs through cognitive reappraisal. However, the one-step indirect association from parental attachment to PTG, through feelings of safety, and the two-step indirect association from parental attachment to PTG, through feelings of safety via cognitive reappraisal, were non-significant.

Table 1. Means (*M*), standard deviations (*SD*), and correlations among the main variables.

	<i>M</i> (<i>SD</i>)	1	2	3	4
1. Parental attachment	90.41 (18.15)	1.00			
2. Safety feelings	53.73 (12.64)	0.40***	1.00		
3. Justice beliefs	64.21 (13.35)	0.41***	0.30***	1.00	
4. Cognitive reappraisal	27.71 (6.46)	0.27***	0.16***	0.33***	1.00
5. PTG	61.34 (21.90)	0.21***	0.90*	0.25***	0.34***

PTG, post-traumatic growth.

*** $p < 0.001$, * $p < 0.05$.

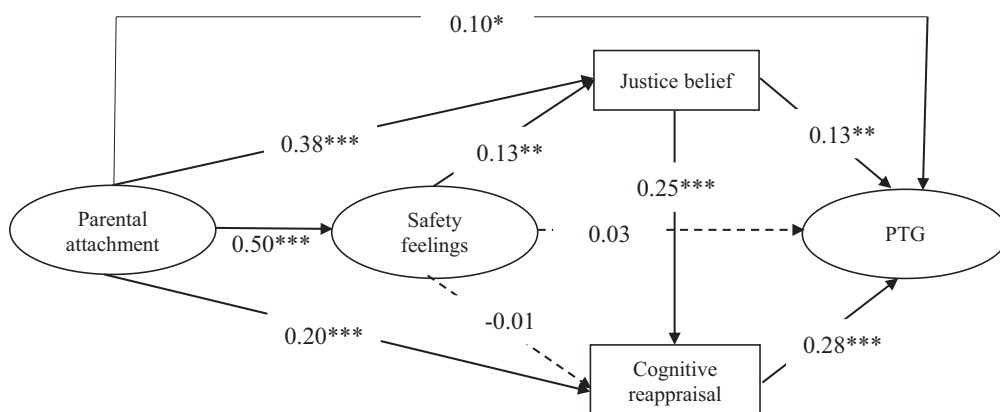


Figure 1. Model of multiple indirect effects. PTG, post-traumatic growth. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 2. Standardized regression coefficients for models and 95% confidence intervals (CIs) for the multiple indirect effects.

PTG	Bootstrap 95% CI	Standardized β
One-step mediation		
Indirect via safety feelings	−0.033 to 0.059	0.013
Indirect via justice beliefs	0.013 to 0.082	0.048
Indirect via cognitive reappraisal	0.024 to 0.089	0.057
Two-step mediation		
Indirect via safety feelings and justice beliefs	>0.000 to 0.016	0.008
Indirect via safety feelings and cognitive reappraisal	−0.014 to 0.011	−0.002
Indirect via justice beliefs and cognitive reappraisal	0.012 to 0.040	0.026
Three-step mediation		
Indirect via safety feelings, justice beliefs and cognitive reappraisal	0.001 to 0.008	0.004

PTG, post-traumatic growth.

The 95% CIs of indirect path coefficients that do not include 0 indicate a significant path. Significant paths are shown in bold.

Finally, to evaluate the significance level of the indirect association shown in Figure 1, we also conducted bias-corrected bootstrap tests with a 95% CI. A total of 5000 bootstrap samples were created from the original data set using random samples with replacements. Table 2 shows the bootstrap test results. These results indicated that the five indirect paths from parental attachment to PTG in the above model were all significant.

4. Discussion

This study examined the mechanism underlying the association between parental attachment and PTG among adolescents following the 2008 Wenchuan earthquake. The results showed that parental attachment had not only a direct and positive effect on PTG, but also an indirect effect on PTG, via feelings of safety, justice beliefs, and cognitive reappraisal. These findings suggest that these three factors may mediate the relationship between parental attachment and PTG.

Specifically, parental attachment was directly related to PTG in adolescents, a finding consistent with previous studies on adolescents (e.g. Tian et al., 2018; Yuan et al., 2018). This may be because parental attachment engenders a positive parent–adolescent relationship (e.g. Arikan et al., 2015), which, in turn, creates an open and communicative family atmosphere. This contributes to the child's constructive cognitive reprocessing of the experience, thereby facilitating coping (e.g. Hafstad et al., 2010) and resulting in PTG.

We also found that parental attachment had a one-step indirect effect on PTG, via justice beliefs. If an individual experiences threats or a stressful environment, he or she may consider the world unjust (Riaz et al., 2015), perhaps owing to a loss of resources.

Positive parental attachment furnishes adolescents with substantial support, which provides individual or interpersonal resources used to cope with traumatic experiences (e.g. Hobfoll et al., 1995, 1990). These resources offset losses during trauma for adolescents, and ultimately help them to form beliefs that the world is still just. This subsequently aids them to more easily justify their troubles and to make sense of events (e.g. Riaz et al., 2015), facilitates successful coping with stressors in life (e.g. Brown & Grover, 1998), and relieves negative psychological outcomes (e.g. depression and post-traumatic stress disorder) (e.g. Kamble & Dalbert, 2008; Lipkus et al., 1996; Riaz et al., 2015). This ultimately results in PTG (e.g. Fetschenhauer, Jacobs, & Belschak, 2005; Fetty, 2012).

We also identified another one-step indirect effect of parental attachment on PTG, via cognitive reappraisal, which was consistent with our hypotheses and with previous study findings (e.g. Tian et al., 2018). According to attachment theory (Bowlby, 1969), positive parental attachment provides adolescents with substantial parental support and love. These assets may prompt traumatized individuals to disclose personal information and express their emotions (e.g. Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009). These actions, in turn, increase opportunities to discuss traumatic experiences with their parents. Parents may also then provide adolescents with coping advice involving positive reframing (e.g. Kilmer, Gilrivas, Masten, & Osofsky, 2010), which contributes meaningfully to productive and deliberate contemplation (e.g. Hafstad et al., 2010); this may be characterized by cognitive reappraisal (e.g. Wu, Xiao, Liu, & Chen, 2014) and may lead to PTG (e.g. Zhou, Wu, Fu, & An, 2015).

We found that parental attachment has a two-step indirect effect on PTG, through justice beliefs via cognitive reappraisal. A possible explanation for this is that justice beliefs elicited by parental attachment have a substantial effect on cognitive reappraisal, which, in turn, leads to PTG. In this process, justice beliefs provide a cognitive schema for ascribing meaning to events (e.g. Dalbert, 2001), thereby promoting the reinterpretation of the cause and outcome of a traumatic event in a more positive light (e.g. Dalbert, 2001; Fetty, 2012; Lerner, 1980). These aspects further result in adolescents' cognitive reappraisal of traumatic events, which assists them to find meaning and further facilitates PTG (e.g. Zhou et al., 2015).

Inconsistent with our hypothesis, we found that the one-step (via feelings of safety) and two-step (through feelings of safety via cognitive reappraisal) indirect effects of parental attachment on PTG were non-significant. This could be attributable to the non-significant direct relationship of feelings of safety to PTG and cognitive reappraisal in this study; findings inconsistent with previous studies (Najavits, Weiss,

Shaw, & Muenz, 2010; Tavakol, Chen, Zook, & Bethea, 2015; Yablon, 2015). A possible explanation is that perceived safety induces individuals' cognitive activity and, in turn, leads to post-traumatic reactions (e.g. Quan, Zhen, Yao, & Zhou, 2017; Zhen et al., 2018). That is, the cognitive process plays an important mediating role in the effect of feelings of safety on post-traumatic reactions. When cognitive variables were inserted between feelings of safety and post-traumatic reactions, the direct effects of feelings of safety on post-traumatic reactions were disguised by the indirect effect of cognitive factors. We included justice beliefs, as a natural way of interpreting the world (e.g. Lerner, 1980). This was an important cognitive variable that mediated the association between feelings of safety and PTG, and may account for the direct effect of feelings of safety on PTG, ultimately leading to a non-significant direct association between feelings of safety and PTG or cognitive reappraisal.

We also identified the importance of cognition in the association between feelings of safety and PTG. We found that parental attachment had two-step (through feelings of safety via justice beliefs) and three-step (by feelings of safety via justice beliefs through cognitive reappraisal) indirect effects on PTG. According to attachment theory (Bowlby, 1969), if there is a positive parental attachment, parents are more likely to actively provide care for their children, provide substantial support and love, and build a safe family atmosphere, whereby the family becomes a safe harbour. Adolescents living in this type of environment perceive a greater level of safety, and this encourages them to make positive interpretations of the post-traumatic world and to consider the world as just and orderly (Jiang et al., 2016). These conditions induce individuals to invest their time and/or energy in coping with traumatic events and associated difficulties (Maes & Kals, 2002; Riaz et al., 2015), relieve negative outcomes, and promote positive changes, such as PTG (Fetty, 2012). They may also encourage adolescents to reinterpret events and increase opportunities for reappraisal of their experiences (e.g. Dalbert, 2001; Fetty, 2012; Lerner, 1980). This subsequently helps adolescents to make sense of traumatic events and find meaning in the post-traumatic world, and ultimately leads to PTG.

Several study limitations should be noted. First, we used summed scores on Armsden and Greenberg's (1987) parental attachment questionnaire to examine the role of parental attachment in PTG. However, we did not investigate the effect of parental attachment style (e.g. avoidance and insecure attachment) on PTG. In addition, we only focused on feelings of safety, justice beliefs, and cognitive reappraisal as mediators between parental attachment and PTG; other potentially relevant factors were not examined. Secondly, owing to design limitations, we did not assess the severity of trauma and other demographic variables, except for gender and age; this should be considered when

drawing conclusions from the results. Thirdly, this investigation began 9.5 years after the Wenchuan earthquake, during which time several secondary disasters occurred (e.g. landslides, debris flows) that may have affected the results; however, we did not assess these. Moreover, owing to the length of time since the Wenchuan earthquake, it was difficult to differentiate PTG from other aspects of students' cognitive and emotional growth; further studies are needed to explore these factors. In addition, we did not obtain data on other aspects of traumatization in these adolescents, and thus could not differentiate between the effects of the natural disaster and other traumatic events on PTG.

Despite these limitations, to our knowledge, this is the first study to examine the mechanism underlying the association between parental attachment and PTG. The findings not only confirm the applicability of attachment theory to the field of trauma, but also establish a new family-related perspective for the study of post-traumatic reactions. The clinical implications of these findings are that students with secure and positive parental attachment are more likely to experience feelings of safety, justice beliefs, and positive cognitions about traumatic events. They are also more likely to experience greater PTG and fewer negative outcomes. Therefore, psychological interventions should focus on students with negative or insecure parental attachments, and carry out sensitivity and attachment interventions with parents (Bakermanskransenburg, van IJzendoorn, & Juffer, 2003). This could assist parents to build positive relationships with their children, facilitating feelings of safety and justice beliefs. This type of approach could help students to reconsider traumatic experiences and experience adjustment and growth following a traumatic experience.

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ORCID

Rui Zhen  <http://orcid.org/0000-0001-5055-4683>

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