Emerging Posttraumatic Growth: A Prospective Study With Pre- and Posttrauma Psychological Predictors

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Posttraumatic growth (PTG) is viewed as a positive psychological change resulting from a struggle with trauma. A number of trauma-related factors have been proven effective in predicting PTG; however, the effects of pretrauma psychological factors on PTG have not been adequately evaluated (e.g., using a prospective design). This prospective study examined the effects of pretrauma psychological factors (e.g., coping styles, prior trauma) on PTG. In total, 810 Taiwanese undergraduate students were recruited for a baseline survey (Time 1), among whom 592 completed a survey 2 months later (Time 2). Data from 110 participants who had experienced trauma between Time 1 and Time 2 were used for analysis. Among the pretrauma factors examined at baseline, only rumination and distractive style were positively correlated with PTG. The posttrauma factors based on Calhoun and Tedeschi’s model (i.e., core belief challenge, deliberate rumination, and social support) were also positively correlated with PTG. A hierarchical regression analysis showed that pretrauma coping styles had an incremental effect on PTG beyond posttrauma predictors. Deliberate rumination significantly mediated the relationship between pretrauma rumination and PTG. These findings highlight the role of pretrauma psychological factors in PTG and present further support for Calhoun and Tedeschi’s model of PTG.

Keywords: posttraumatic growth, posttraumatic stress disorder, prospective design, pretrauma factor, coping style

In the last decade, research in the field of trauma studies has shifted their focus from trauma-related pathologies such as posttraumatic stress disorder (PTSD) to positive adaptation-related outcomes after adversity, such as growth, benefits, and other positive changes. Posttraumatic growth (PTG) is viewed as a positive psychological change resulting from a struggle with a highly challenging crisis (Calhoun & Tedeschi, 2001). PTG has been observed among individuals who had suffered various types of trauma, such as cancer (e.g., Nenova, DuHamel, Zemon, Rini, & Redd, 2013), natural disaster (e.g., Xu & Liao, 2011), or physical or sexual assault (e.g., Kleim & Ehlers, 2009). Most trauma survivors presenting PTSD symptoms have reported widespread positive changes as a consequence of trauma, such as a positive reassessment of their personal strength, improvements in relationships, or a shift in life philosophy (e.g., Kleim & Ehlers, 2009; McCaslin et al., 2009).

Calhoun and Tedeschi proposed a model of PTG comprising several interacting components (Calhoun & Tedeschi, 1998; Tedeschi & Calhoun, 2004), chief among which is the severe challenge to an individual’s assumptive world, defined as a “basic conceptual system, developed over time, that governs one’s expectations regarding oneself and the world” (Janoff-Bulman, 1992). Challenge to one’s core beliefs has been shown to strongly predict PTG (Cann et al., 2010; Lindstrom, Cann, Calhoun, & Tedeschi, 2013). Further, severe cognitive challenges lead to subsequent cognitive processing of the trauma, manifesting as two kinds of rumination: (a) automatic/intrusive rumination—an initial process of intrusive, unwanted thoughts invading the person’s mind; and (b) deliberate rumination—a subsequent process of reflection and purposeful re-examination of the trauma and related issues. It has been theorized that PTG occurs among individuals who move away from automatic rumination and toward more deliberate rumination, as evidenced by the discovery that PTG is more strongly correlated with deliberate rumination than intrusive rumination (Lindstrom et al., 2013; Stockton, Hunt, & Joseph, 2011). The model presented by Calhoun and Tedeschi also highlights the central role of social support in PTG. The presence of supportive others is presumed to be beneficial for the validation of the narratives provided by trauma survivors and for offering alternative perspectives that could be integrated into assumptive worlds. Meta-analysis has indicated that social support was moderately associated with PTG (Prati & Pietrantoni, 2009).

It has been posited that PTG might be facilitated (or impeded) by particular personality characteristics and the style in which one manages trauma-related distress (Tedeschi & Calhoun, 2004), both can be viewed as pretrauma psychological predictors. Extraversion and openness to experience are assumed to play a role in making positive use of the aftermath of trauma, whereas neuroticism is assumed to hinder growth. Much evidence indicates that extraver-
sion and openness are positively related to PTG (e.g., Garnefski, Kraaij, Schroever, & Somsen, 2008; Shakespeare-Finch, Gow, & Smith, 2005), but the relation between neuroticism and PTG has been mixed. A recent meta-analysis concluded that neuroticism is unrelated to PTG (Helgeson, Reynolds, & Tomich, 2006), whereas several studies have demonstrated an inverse relationship between them (e.g., Evers et al., 2001; Garnefski et al., 2008). Because almost all of these studies used a cross-sectional design, the causal directionality of neuroticism-PTG relationship is hard to establish.

Regarding the style in which one manages distress engendered by trauma, several positive coping styles (e.g., positive appraisal, religious coping) have been consistently associated with PTG (e.g., see the meta-analysis of Helgeson et al., 2006; Prati & Pietrantoni, 2009). Positive coping might promote more constructive cognitive processing that is necessary for growth (Tedeschi & Calhoun, 2004). In contrast, the relations between negative coping styles (e.g., avoidant coping, denial) and PTG have been mixed. Some studies have shown that avoidant coping is correlated with less growth (e.g., Frazier, Tashiro, Berman, Steger, & Long, 2004), whereas others have found the opposite or no effect (e.g., Park, Aldwin, Fenster, & Snyder, 2008; Solomon & Dekel, 2007).

Two main styles of responding to distress proposed by Nolen-Hoeksema’s (1991) response styles theory—rumination and distraction—might affect the occurrence of PTG. Ruminative style (or depressive rumination), a mode of dwelling on one’s symptoms of distress and their possible causes and consequences, has been shown to predict depressive disorders (e.g., Just & Alloy, 1997; Nolen-Hoeksema, 2000) and to be associated with increased levels of distress, negative thinking, and degraded problem-solving skills (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Ruminative style can be seen as a form of negative coping that impedes PTG. Nevertheless, because posttrauma deliberate rumination seems necessary for PTG to occur (Tedeschi & Calhoun, 2004) and may be linked to pretrauma ruminative style, little is known about the relationship between pretrauma rumination and PTG. In contrast, distraction style, a mode of purposefully turning one’s attention away from one’s distress to pleasant or neutral activities (e.g., working on a hobby), has been shown to shorten depressed mood (e.g., Nolen-Hoeksema & Morrow, 1993) and to reduce depression and anxiety symptoms over time (e.g., Roelofs et al., 2009). Distractive coping proposed by Nolen-Hoeksema can be regarded as a form of positive coping that promotes PTG, as it represents the composite of disengagement, positive reappraisal, and active coping.

PTG often co-occurs with PTSD symptoms (e.g., see the meta-analysis of Shakespeare-Finch & Lurie-Beck, 2014) and both may share the same posttraumatic processes (i.e., shatter fundamental assumptions); therefore, it would be valuable to explore whether pretrauma risk factors for PTSD also affect PTG. Prior trauma and psychological maladjustment (e.g., history of depression) have been shown to exhibit small-to-medium effect sizes for PTSD (Ozer, Best, Lipsy, & Weiss, 2003). Both factors may interfere with one’s positive adaptation to trauma. Moreover, examining the effects of prior positive beliefs on PTG would be worthwhile, given the similar nature of the two constructs. However, as rigid positive schemas are likely to be strongly violated by trauma and, in turn, heighten the risk of PTSD (Foa & Rothbaum, 1998), the relationship between positive beliefs and PTG remains unclear.

Despite the number of studies examining whether demographic characteristics (e.g., gender, age; Manne et al., 2004; Widows, Jacobsen, Booth-Jones, & FIELDS, 2005), peritraumatic factors (e.g., peritraumatic distress; Klein & Ehlers, 2009; Kunst, 2010), or posttrauma factors (e.g., coping style; Klein & Ehlers, 2009; Widows et al., 2005) affect PTG, only a few prospective studies have specifically examined the relations between pretrauma psychological factors (e.g., psychological distress) and PTG (e.g., Frazier et al., 2009; Moore et al., 2011; Sawyer, Ayers, Young, Bradley, & Smith, 2012). Furthermore, according to Calhoun and Tedeschi (1998), the process of PTG involves the interplay of pre- and posttrauma psychosocial factors. In the few studies on this subject, researchers have found that positive cancer-related rumination mediated the relationship between positive attentional bias and PTG (Chan, Ho, Tedeschi, & Leung, 2011), and adaptive coping mediated the relationship between personality traits (e.g., openness) and PTG (Shakespeare-Finch et al., 2005). However, because of the cross-sectional design of these studies, the causal directionality of the observed associations is unclear. This gap needs to be addressed to further our understanding of the pathway to the attainment of PTG.

This study sought to resolve the following questions: (a) Can PTG be predicted by pretrauma psychological factors, including neuroticism, coping styles (rumination and distraction), prior trauma, psychological adjustment, and positive beliefs? (b) Do pretrauma psychological factors contribute to PTG after controlling for posttrauma factors related to PTG, including core belief challenge, deliberate rumination, and social support? and (c) What links exist among pretrauma psychological factors, posttrauma factors, and PTG?

**Method**

**Participants and Procedures**

Initially, 810 undergraduate students from seven universities in various regions of Taiwan (mean age = 21.1 ± 3.3 years; 60% female) completed the baseline survey (Time 1; T1), of whom 592 (73%) completed the follow-up survey 2 months later (Time 2; T2). No differences were noted between those who completed surveys at T1 and T2 and those who did not complete the T2 survey in age, gender, prior trauma, and depressive symptoms. Among the participants at T2, 112 had experienced a potentially traumatic event (met Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition [DSM–IV] PTSD stressor Criterion A1) between T1 and T2, and two of them were excluded from the analyses because of missing PTG rating.

The final sample comprised 110 undergraduate students who had experienced a potentially traumatic event between T1 and T2. The mean age was 20.02 ± 1.33 years; approximately two-thirds (63.6%) were female. The most commonly reported traumas between T1 and T2 included natural disaster (n = 34, 30.9%); loved ones suddenly experiencing a life-threatening event (n = 21, 19.1%); and unexpected sudden death of a close friend or loved one (n = 18, 16.4%). The time elapsed since the trauma ranged from 1 day to 10.6 weeks (M = 22.2 ± 16.9 days). Fifty-nine (53.6%) reported experiencing intense fear, helplessness, or horror during the trauma (i.e., DSM–IV PTSD stressor Criterion A2). The Institutional Review Board of Department of Psychology, National
Taiwan University approved all study procedures before the data collection.

Measures

Assessment at Time 1.

Neuroticism. Neuroticism was assessed using the 12-item Neuroticism subscale of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1989), a shortened version of the NEO Personality Inventory (NEO-PI; Costa & McCrae, 1985). Items are rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The original and Taiwanese Neuroticism subscale both demonstrate good psychometric properties (Chen & Piedmont, 1999; Costa & McCrae, 1992). The Cronbach’s α coefficient in this study was .81.

Coping style. Rumination and distraction response styles were assessed using the Chinese Response Styles Questionnaire-Short Form (CRSQ-SF; Yu, Chen, & Chang, 2008), a 20-item self-report inventory that assesses the extent to which one responds to sad feelings with rumination and distraction. The CRSQ-SF was adapted from the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991), which consists of Ruminative Responses and Distracting Responses subscales, with 10 items each. Items are rated on a 4-point Likert scale (1 = almost never, 4 = almost always). The Rumination subscale assesses how often people engage in various ruminative thoughts or behaviors when feeling down or depressed. Items included responses to sad moods that are self-focused (e.g., I think “why can’t I handle things better?”) or focused on the possible consequences and causes of one’s distress (e.g., I think “what am I doing to deserve this?”). The Distraction subscale assesses how often people engage in active, distracting responses to depression that are not risky (e.g., I go to a favorite place to get my mind off my feelings; I do something fun with a friend). The original and Chinese RSQ both exhibit sound psychometric properties (Nolen-Hoeksema & Morrow, 1991; Yu, 2004). Based on the principle component analysis of the CRSQ items, 20 items with high principal component efficiency were selected to construct the CRSQ-SF (Yu et al., 2008). The Cronbach’s α coefficients for the CRSQ-SF Ruminaton and Distraction subscales in this study were .71 and .87, respectively.

Prior trauma. Prior trauma was assessed using the Chinese version of the Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000; Su & Chen, 2013), a behaviorally specific comprehensive multiple-item traumatic event questionnaire. Respondents indicate whether they had experienced each of 23 traumatic stressors that meet DSM–IV PTSD stressor Criterion A1 (e.g., nature disaster, motor vehicle accidents, or childhood physical abuse; dichotomously scored). When traumatic experiences are endorsed, respondents are further asked if the event evoked intense fear, helplessness, or horror (stressor Criterion A2; dichotomously scored) to be qualified as DSM–IV Criterion A trauma. The TLEQ exhibits adequate to excellent temporal stability (Kubany et al., 2000), and is highly useful for identifying potential traumatic events and possible PTSD cases (Peirce, Burke, Stoller, Neufeld, & Brooner, 2009). In this study, we summed the number of Criterion A traumas endorsed to create an index of prior trauma (M = 2.55 ± 2.12, values ranging from 0 to 9).

Prior depression. Prior depression was assessed using three dichotomous items designed by Rost, Burnam, and Smith (1993): (a) “In the past year have you had 2 weeks or more during which you felt sad, blue, or depressed; or when you lost all interest or pleasure in things that you usually cared about or enjoyed?”; (b) “Have you had 2 years or more in your life when you felt depressed or sad most days, even if you felt okay sometimes?”; and (c) “Have you felt depressed or sad much of the time in the past year?”). Items are summed to create a screen index, ranging from 0 to 2. The sensitivity fall between 83% and 94% and specificity was over 90% relative to a diagnostic instrument (Rost et al., 1993).

PTSD symptom. PTSD symptoms were assessed using the 17-item PTSD symptoms scale of the Chinese version of the Posttraumatic Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997; Su & Chen, 2006). Items are rated on a 4-point Likert scale (0 = not at all or only once, 3 = five or more times per week/almost always), PTSD symptom severity is indexed by summing scores of the 17 symptom items, with a total ranging from 0 to 51. The PDS exhibits sound psychometric properties and good diagnostic agreement with the Structured Clinical Interview for DSM–IV, as well as adequate sensitivity and specificity (.89 and .75, respectively, Foa et al., 1997). The Chinese PDS also demonstrates good reliability and validity (Su & Chen, 2006). The participants in this study completed the PDS in response to the worst trauma endorsed in the TLEQ or stressful events (for those who had never experienced trauma). The Cronbach’s α coefficient in this study was .92.

Positive beliefs. Positive beliefs were assessed using the Chinese version of the World Assumptions Scale (WAS; Janoff-Bulman, 1989; Su & Chen, 2013), a 32-item self-report inventory that assesses the fundamental assumptions of oneself and the world. The WAS originated from Janoff-Bulman’s (1989, 1992) shattered assumptions theory that proposes three primary categories of schemas: Benevolence of the World, Meaningfulness of the World, and Worthiness of self. The measure is closely linked to this theory and consists of eight subscales with four items each: Benevolence of people, Benevolence of the world, Justice, Control, Randomness, Self-Worth, Luck, and Self-control. Items are rated on a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree). The original and Chinese WAS both display adequate psychometric properties (Elklit, Shevlin, Solomon, & Dekel, 2007; Janoff-Bulman, 1989; Su & Chen, 2013). Only the WAS total was used in this study. The Cronbach’s α coefficient was .88 for the WAS total and .60 to .88 for the subscales in this study.

Assessment at Time 2.

Posttraumatic growth. Posttraumatic growth was assessed using the question adapted from the survey question that Davis, Nolen-Hoeksema, and Larson (1998) designed to assess benefit finding in response to loss. Participants were first instructed to write the positive implication of their trauma with the following question: “Sometimes people who had experienced a trauma event may produce some positive changes in this experience. The nature of such changes might differ among individuals. Have you found anything positive from this experience?”, and then to subjectively assess the extent to which they had experienced overall positive change as a result of the trauma on a 4-point Likert scale (1 = none; 2 = mild, 3 = moderate, and 4 = considerable). This score was used to index trauma-related growth, with the higher score indicating greater growth. To investigate the subjective nature of PTG, we categorized the responses in terms of the specific mean-
ing reported by the participants. After reviewing a number of transcripts, a coding scheme was constructed that includes six categories: appreciation of life (e.g., “Life is changing, so we should seize the day”), gained perspective (e.g., “Don’t take things so seriously. I’m learning to take it easy.”), growth in self-care (e.g., “I am paying more attention to my health”), personal strength (e.g., “I’m able to handle the same situations in the future”), relating to others (e.g., “I feel a greater sense of closeness with family members”), and other (e.g., “Disaster is unavoidable”).

Recent trauma. The traumas occurred between T1 and T2 were also assessed using the Chinese TLEQ (Kubany et al., 2000; Su & Chen, 2013). The T2 version used for surveying recent traumas eliminated five event categories representing childhood trauma (e.g., sexual abuse before age 13, childhood physical abuse), which could not happen between T1 and T2 because participants were all older than 18 years old. Respondents indicated whether they had experienced any of these traumas between T1 and T2.

Core belief challenge. Core belief challenge was assessed using the 7-item Belief Violation Questionnaire (BVQ) developed by the first author and used in an earlier study (Su, 2011). Following Crystal Park’s (2008) design to assess belief violation and the shattered assumption theory (Janoff-Bulman, 1992), seven questions were constructed following the stem, “When you think about how you felt before and then following this traumatic event, how much does the occurrence of this trauma violate your sense that: (a) people are good and trustworthy, (b) the world is a good and safe place, (c) the world is controllable, (d) the world is fair and just, (e) I am in control of my life, (f) I am worthy, and (g) people’s behavior is comprehensible and predictable. Items are rated on a 4-point Likert scale (1 = not at all, 4 = very much) and summed to indicate overall challenge to one’s core beliefs. The BVQ exhibited high internal consistency (α = .86) and acceptable 3-month test–retest reliability (r = .60). Concurrent validity was demonstrated through moderate correlations with peritraumatic dissociation (r = .33, assessed by the State Dissociation Questionnaire; Murray, Ehlers, & Mayou, 2002), and PTSD-related dysfunctional cognitions (r = .43, assessed by the Posttraumatic Cognitions Inventory; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999). Predictive validity was shown via moderate correlation with PTSD (r = .31, assessed by the PDS) and depressive symptoms (r = .34, assessed by the Beck Depression Inventory; Beck, Steer, & Brown, 1996) at 3-month follow-up (Su, 2011). The Cronbach’s α coefficient in this study was .84.

Deliberate ruminations. Deliberate rumination after trauma was assessed using the 8-item Trauma-Related Rumination subscale of the Chinese version of the Response to Intrusion Questionnaire (RIQ). The RIQ was developed to assess aspects of trauma survivors’ responses to intrusive memories in a series of studies (Clohessy & Ehlers, 1999; Murray et al., 2002; Steil & Ehlers, 2000). Respondents are asked to rate the extent to which they had preoccupied with trauma and its consequences (e.g., “I think about why the event happened to me”) on a Likert 4-point scale (0 = never, 3 = always). The Trauma-Related Rumination subscale exhibits good reliability and predictive validity (Clohessy & Ehlers, 1999). The Cronbach’s α coefficient in this study was .84.

Perceived social support. Two items were constructed to assess perceived social support after trauma: “I get the support and help I need from my friends following the trauma” and “I get the support and help I need from my family following the trauma.” Items are rated on a 5-point Likert scale (1 = totally not, 5 = extremely). Responses to the items were summed to indicate overall perceived social support. The inter-item correlation was .50 (p < .001), indicating a large effect size (Cohen, 1992). The Cronbach’s α coefficient was .63, which might be acceptably tolerated because the α is strongly affected by the length of scale (Cortina, 1993).

Results

Themes of Posttraumatic Growth

With respect to posttraumatic growth (i.e., positive changes resulting from trauma), 29.1% (n = 32) of the participants reported mild positive changes; 34.5% (n = 38) moderate positive changes; 4.5% (n = 5) considerable positive changes; and 31.8% (n = 35) no positive change at all. Analysis of the changes described by those who reported at least mild positive changes (n = 75) showed that the most common theme was relating to others (26.8%), followed by growth in self-care (21.1%), and appreciation of life (16.9%).

Bivariate Correlations Among Study Variables

Table 1 presents the mean, SDs, and Pearson correlation coefficients for the study variables. Because of the number of correlations examined, the α level was set at .01 to correct for inflated risk of Type I error. Among the pretrauma variables examined, ruminative style (r = .35, p < .001) and distraction style (r = .24, p = .010) were both prospectively, positively associated with PTG, while neuroticism, prior trauma, prior depression and PTSD symptoms, and positive beliefs were not associated with PTG. In keeping with Calhoun and Tedeschi’s model of PTG, core belief challenge (r = .39, p < .001), deliberate rumination (r = .43, p < .001), and perceived social support (r = .27 p = .005) were all significantly positively correlated with PTG. As for a link between posttrauma and pretrauma predictors, deliberate rumination after trauma was significantly correlated with pretrauma ruminative style (r = .35, p < .001) and prior PTSD symptoms (r = .28, p = .003). Perceived social support was negatively correlated with neuroticism (r = −.25, p = .009).

The time elapsed since trauma varied in our sample; therefore, partial correlations were calculated to examine the correlation between all of the proposed factors and PTG, while controlling for the time since trauma. Similar partial correlation patterns were identified, suggesting that the present findings were unaffected by time since trauma.

Hierarchical Regression: Incremental Effect of Pretrauma Psychological Factors

We used hierarchical regression analysis to test whether pretrauma psychological factors have an incremental effect on PTG beyond posttrauma factors. Gender and age were entered into the model as covariates in Step 1. Posttrauma factors related to PTG, including core belief challenge, deliberate rumination, and perceived social support, were entered in Step 2. Posttrauma ruma-
tion and distraction response styles were entered in Step 3. Squared semipartial correlation coefficient ($sr^2$) was calculated as effect size that quantifies the proportion of variance of Y that is uniquely predicted by a particular variable (Kelley & Maxwell, 2010). $sr^2$ has been analogous to $\eta^2$, an effect size measure of analysis of variance (ANOVA; Fritz, Morris, & Richler, 2012) whose values for small, medium, and large effects are .01, .06, and .14, respectively (Cohen, 1988). As shown in Table 2, the final model accounted for 36.4% of explained variance, $F(7, 102) = 8.35, p < .001$. Core belief challenge ($\beta = 0.26, p = .006, sr^2 = .050$), deliberate rumination ($\beta = 0.23, p = .019, sr^2 = .033$), perceived social support ($\beta = 0.22, p = .008, sr^2 = .046$), and pretrauma ruminative style ($\beta = 0.19, p = .034, sr^2 = .029$) were shown to be significant predictors of PTG. The effect sizes were small-to-moderate in magnitude. The addition of pretrauma rumination and distraction increased the explained variance by an additional 6.8%, $F(2, 102) = 5.43, p = .006$.

### Mediation Analysis: Relations Among Pre- and Posttrauma Predictors and PTG

Mediation analysis was conducted to examine whether pretrauma psychological factors affect PTG via posttrauma cognitive processes. The correlational results indicated that among the pretrauma variables, only rumination and distraction styles were significantly related to PTG. To elucidate the mediational process underlying these relations, we followed Baron and Kenny’s (1986) conceptualization of mediation to identify the potential mediator, including: (a) independent variable (IV) significantly predicts outcome, (b) IV significantly predicts the potential mediator, and (c) the potential mediator significantly predicts outcome after controlling for IV. In terms of these criteria and the conceptual relationships among the variables, we tested the mediation hypothesis with deliberate rumination after trauma as a mediator for the effect of pretrauma rumination on PTG.

### Table 1
**Means, SD, and Zero-Order Correlations for All Study Variables (N = 110)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
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<th>10</th>
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<td>1. T1 neuroticism</td>
<td>35.34</td>
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<td>2. T1 rumination style</td>
<td>24.22</td>
<td>4.66</td>
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<td>3. T1 distraction style</td>
<td>26.74</td>
<td>5.62</td>
<td>—</td>
<td>—</td>
<td>.42***</td>
<td>.26**</td>
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<td>4. T1 prior trauma</td>
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<td>.14</td>
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<td>5. T1 prior depression</td>
<td>0.77</td>
<td>0.87</td>
<td>.50***</td>
<td>.36***</td>
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<td>.14</td>
<td>.26**</td>
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<td>6. T1 PTSD symptoms</td>
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<td>7. T1 positive beliefs</td>
<td>125.63</td>
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<td>10. T2 perceived social support</td>
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<td>—</td>
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<td>.12</td>
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<td>11. T2 posttraumatic growth</td>
<td>2.12</td>
<td>0.92</td>
<td>.01</td>
<td>.35***</td>
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<td>.09</td>
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<td>.43***</td>
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**Note.** T1 = Time 1; T2 = Time 2; PTSD = posttraumatic stress disorder. 
†p = .010. **p < .01. ***p < .001.

### Table 2
**Hierarchical Regression Analysis Predicting Posttraumatic Growth (N = 110)**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>b</th>
<th>SE</th>
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<th>sr²</th>
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<th>$\Delta R^2$</th>
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<td>Gender</td>
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<td>0.11</td>
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<td>.013</td>
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</tr>
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<td>.296**</td>
<td>.283***</td>
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<td>0.02</td>
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<td>.067</td>
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<td>−0.03</td>
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<tr>
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<td>.050</td>
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<td>0.02</td>
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**Note.** $b =$ unstandardized beta weight; $\beta =$ standardized beta weight; $sr^2 =$ squared semi-partial correlation coefficient. 
*p < .05. **p < .01. ***p < .001.
As shown in Figure 1, pretrauma rumination had a significant effect on PTG (Path a; \( p < .001 \)), pretrauma rumination had a significant effect on deliberate rumination (Path a; \( p < .001 \)), and deliberate rumination had a significant effect on PTG (Path b; \( p < .001 \)). When controlling for the effect of deliberate rumination, the effect of pretrauma rumination on PTG was significant (Path \( c' \); \( p = .013 \)), suggesting that deliberate rumination partly mediated the relationship between pretrauma rumination and PTG. To more rigorously test the mediation hypothesis, the Sobel test (Sobel, 1982) and the bootstrapping procedure (Preacher & Hayes, 2004) were used to test the indirect effect of pretrauma rumination on PTG via deliberate rumination. Both tests revealed significant indirect effects (Sobel \( Z = 2.70, p = .007 \); bootstrap index = 0.02, \( SE = 0.01, 95\% CI [0.008, 0.047] \)), statistical significance is achieved if zero is not in the confidence interval). The proportion mediated, \( 1 - (c'/c) = ab/(ab + c') \), was 0.35 (MacKinnon, Fairchild, & Fritz, 2007), indicating that 35% of the total effect of the pretrauma rumination on PTG was accounted for by deliberate rumination.

**Discussion**

Using a prospective design, the present study examined the effects of pretrauma psychological factors on PTG, including neuroticism, coping styles (rumination and distraction), prior trauma, psychological maladjustment, and positive beliefs. Among these factors, only pretrauma rumination and distraction styles were significantly positively associated with PTG, corresponding to previous findings that coping styles are strongly predictive of PTG (e.g., Prati & Pietrantoni, 2009; Schmidt, Blank, Bellizzi, & Park, 2012).

It is interesting that distraction and rumination were both positively associated with PTG because response styles theory (Nolen-Hoeksema, 1991) posits that ruminative style prolongs and intensifies depressive episodes whereas distraction style shortens and diminishes depressive episodes. Based on the theory, one would expect rumination and distraction to exert opposite effects on mental health outcomes. One possible reason for the positive relationship between ruminative style and PTG is that preexisting rumination promotes deliberate rumination after trauma, a process necessary for the occurrence of PTG (Tedeschi & Calhoun, 2004).

This was confirmed by the current finding that deliberate rumination mediated the relationship between pretrauma rumination and PTG. In terms of the link between distraction and PTG, survivors who engage in distraction are perhaps more likely to be aware of positive emotions despite adversity and to be able to process trauma-related information more effectively. These processes may facilitate survivors to take a positive view of trauma.

This study used hierarchical regression analysis to explore whether pretrauma psychological factors contribute to PTG after controlling for posttrauma predictors. The results showed that pretrauma coping styles significantly accounted for 6.8% of the variance when controlling for demographic variables and posttrauma cognitive processes. This suggests that coping strategies before trauma may play a crucial role in PTG. The significance of these findings is also highlighted by the fact that pretrauma rumination affected PTG through deliberate rumination (i.e., cognitive processing), a central component in the development of PTG (Tedeschi & Calhoun, 2004). In the final regression model, the combined variables together predicted 36.4% of the explained variance in PTG, among which core belief challenge, deliberate rumination, perceived social support, and pretrauma rumination significantly predicted PTG. The influence of pretrauma distraction, although not significant, still approached significance (\( \beta = 0.17, p = .064, sr^2 = .022 \)). These findings are consistent with previous research (Cann et al., 2010; Lindstrom et al., 2013; Stockton et al., 2011), providing additional support for Calhoun and Tedeschi’s model of PTG and suggesting that PTG may occur through the interplay of pre- and posttrauma psychosocial factors.

In this study, however, PTG and posttrauma predictors were assessed concurrently (as in most prior studies), which did not allow for causal inferences regarding the relationship between posttrauma predictors and PTG.

The ruminative style surveyed in this study followed Nolen-Hoeksema’s (1991) original conception of depressive rumination, which was later expanded into “Brooding” and “Reflection” using exploratory factor analysis (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). The relationship between both ruminative styles to PTG remains unclear. Nolen-Hoeksema and Davis (2004) showed that finding benefits in loss was positively related to reflective pondering but unrelated to brooding. In contrast, Stockton et al. (2011) found that PTG was negatively related to brooding but unrelated to reflective pondering. Further research will be needed to clarify this issue.

Somewhat contrary to our expectations, neuroticism, prior trauma, and prior psychological maladjustment were not found to be related to PTG. The meta-analytic finding that PTG is unrelated to neuroticism (Helgeson et al., 2006) has been replicated in this study with a prospective design (\( r = .01 \)). The lack of a relationship between PTG and other pretrauma factors differs from the earlier reports that prior trauma and prior maladjustment were predictive of PTSD symptoms (Ozer et al., 2003). These results echo Park’s (1998) contention that positive and negative aspects of adjustment may be independent, as well as more recent findings that the pathways to PTSD and PTG are distinct, with the negative
aftermath of trauma being predictive of PTSD and positive aftermath of trauma being predictive of PTG (Chan et al., 2011; Schuettler & Boals, 2011). Another possible reason is the complex nature of the relationship between PTG and PTSD, as demonstrated by the meta-analysis indicating a curvilinear association between PTG and PTSD (Shakespeare-Finch & Lurie-Beck, 2014). This may be because of the fact that both conditions share the same etiological process, that is, the shattering of fundamental assumption (Janoff-Bulman, 1992; Tedeschi & Calhoun, 2004).

Therefore, pretrauma risk factors for PTSD (e.g., prior trauma) do not necessarily produce the opposite effect on PTG.

A number of caveats must be acknowledged. First, our sample comprised only undergraduate students. Nearly all youths in Taiwan attend college or university; therefore, our participants can be considered representative of the young adults in Taiwan. Nonetheless, the findings may not be generalizable to younger or elderly populations. Second, most of the recent traumas reported by the participants were indirect traumas (e.g., traumatic bereavement). Although these events qualify as Criteria A stressors in DSM–IV, the shattering of the individual’s assumptive worlds might not be as strong as the traumas that are experienced directly (e.g., sexual assault). PTG induced by indirect trauma is probably somewhat less distinct. Third, PTG outcome was assessed by a 4-point Likert-scale item. Despite a somewhat restricted range, we succeeded in replicating earlier findings (e.g., Lindstrom et al., 2013). Nonetheless, our findings would be strengthened by using standardized measures of PTG (e.g., Posttraumatic Growth Inventory; Tedeschi & Calhoun, 1996). This limitation also holds true for the assessment of perceived social support. The two-item measure developed in this study might be psychometrically inferior to standardized measures of social support (e.g., Multidimensional Scale of Perceived Social Support; Zimet, Dahlem, Zimet, & Farley, 1988).

Fourth, the average length of time since trauma was approximately three weeks, a period that might be insufficient for actual PTG to occur. It is possible that the current findings may be different over a longer period of time (e.g., Lechner, Carver, Antoni, Weaver, & Phillips, 2006). Finally, as mentioned earlier, concurrent assessment of posttrauma predictors (e.g., deliberate rumination) and PTG limited our ability to infer causality. A prospective study of posttrauma predictors and PTG would be required to address this issue.

In conclusion, the present study found that pretrauma rumination and distractions were both associated with subsequent PTG. However, other pretrauma psychological factors were unrelated to PTG. Pretrauma coping styles may, therefore, play a role in the occurrence of PTG. Our discovery that core belief challenge, deliberate rumination, and perceived social support were all associated with PTG helps validate the model presented by Tedeschi and Calhoun. The finding of mediation analysis that pretrauma rumination affects PTG through deliberate rumination is noteworthy, indicating that PTG may involve the interplay of pre- and posttrauma psychosocial factors. Altogether, the present findings shed a light on the mechanism underlying trauma-related growth.

References


