

## Perceiving Benefits After Adversity: The Relationship Between Self-Reported Posttraumatic Growth and Creativity

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Anecdotal and scientific evidence has documented the existence of a relationship between the experience of adversity and creativity. Accounts of the challenges endured by creative individuals suggest that they may have been able to channel their negative experiences as sources of inspiration and motivation for their work. Increased creativity may therefore constitute a manifestation of *posttraumatic growth*, defined as retrospective perceptions of positive psychological changes that take place following experiences of highly challenging life circumstances. To investigate this hypothesis, the present study tested whether scores on a measure of posttraumatic growth and depreciation related to scores on self-reported measures of creativity in the aftermath of adversity. Results of a path analysis showed that adversity-induced distress predicted self-reported creative growth and breadth in a sample of online participants. Cognitive processing (intrusive/deliberative rumination) as well as domains of posttraumatic growth/depreciation—in particular, self-reported changes in interpersonal relationships and in the perception of new possibilities for one's life—mediated the link between self-reported distress and creativity outcomes. This study is the first focused investigation showing that self-reported posttraumatic growth may be manifested through perceptions of increased creativity.

*Keywords:* creativity, adversity, trauma, posttraumatic growth, rumination

*Posttraumatic growth* (PTG) has been defined as the retrospective perceptions of positive psychological changes that take place following experiences of highly challenging life circumstances (Tedeschi & Calhoun, 2004). Research on positive changes in the aftermath of adversity has highlighted the tendency for people to report growth in five domains: interpersonal relationships, the perception of new possibilities for one's life, personal strength, spirituality, and appreciation for life (Tedeschi & Calhoun, 1996, 2004). In addition, the unique life experiences often reported by highly creative individuals suggest that adversity may have played a critical role in fostering their creativity, and that increased creativity could therefore constitute a manifestation of PTG.

Anecdotal reports suggest that the experience of adversity is a recurrent theme in the lives of eminent creative individuals, and examples of great creative achievements following traumatic or very difficult experiences come to mind easily. To give one example, Mexican painter Frida Kahlo survived polio, a severe traffic accident, and three miscarriages, experiences which may have exerted an important influence on her art (Herrera, 1983). These reports suggest an intimate connection between the experience of adversity and creative thinking, and point to the possibility, *inter alia*, that these individuals may have been able to channel their negative experiences into sources of inspiration and motivation for their work (which may, in turn, have contributed to the healing process).

In keeping with this, scientists interested in the determinants of creative thinking and achievement have begun to study the adversity–creativity link empirically (Simonton, 1994), although much remains to be learned about the specific mechanisms explaining this association. In parallel to this growing area of research, clinical psychologists have, over the past few decades, developed a large body of literature documenting and examining ways in which adverse experiences may promote psychological growth. One label for this phenomenon, as mentioned earlier, is PTG (Tedeschi & Calhoun, 2004), the term used in the present paper. This construct has also been termed *stress-related growth* (Park, Cohen, & Murch, 1996), *benefit finding* (Tennen & Affleck, 2002), and *growth through adversity* (Joseph & Linley, 2005). The present study aimed to bridge these two areas of research by investigating whether perceptions of increased creativity constitute a way in which PTG may be expressed. As the first focused

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empirical investigation of the relationship between self-reported PTG and creativity, the present study can help shed light on whether and how creative processes emerge and can be used adaptively in the aftermath of adversity.

### The Link Between Adversity and Creativity

Beyond anecdotal reports, empirical studies have provided preliminary support for the existence of a link between adversity (in the form of adverse life events, psychological disorders, and physical illness) and subsequent creativity. These studies have, for the most part, focused on the lives of eminent creators, and therefore little is known about the relationship between adversity and everyday creativity.

#### Life Events

Simonton (1994), for example, reviewed the body of scientific literature pointing to the existence of an “orphanhood effect.” Studies demonstrating this effect have shown that accomplished individuals tend to have experienced early parental loss at higher rates than the normal population, and at equal rates to individuals receiving psychiatric treatment for depressive and/or suicidal symptoms. For example, the lives of celebrated writers Charlotte, Emily, and Anne Brontë were marked by the loss of their mother and older sisters in early childhood (Barker, 1995). The orphanhood effect appears to be particularly strong in writers, for which rates as high as 55% have been found (Simonton, 1994). Csikszentmihalyi (1996) also noted the recurrent theme of the missing father in his interviews with creative individuals. Csikszentmihalyi hypothesized that, although early parental loss can lead to negative outcomes, it can also lead a child to take on adult responsibilities early and grow beyond what would normally be expected. In addition, Aldwin and Sutton (1998) proposed that individuals exposed to adversity early in life may have suffered from social isolation, and as a result, developed the ability to “step outside of social conventions” (p. 53) and to see the world differently. In keeping with this, Kim, Vincent, and Goncalo (2012) showed that the experience of social rejection fostered creative thinking in individuals holding independent (as opposed to interdependent) self-concepts by heightening the feeling of being different from others.

#### Psychological Disorders

In addition to life events, adversity may also come in the form of psychological disorders, as these constitute very difficult circumstances to which individuals need to adapt. In addition, if an individual experiences the onset of a psychological disorder as sudden and acute, the disorder may be perceived as a highly traumatic event that profoundly and radically changes his or her life. Findings suggest that the lifetime rates of psychological disorders in individuals in the creative arts exceed the rates of individuals in other fields (including scientific fields; for reviews see Jamison, 1993; Kaufman, 2009; Ludwig, 1995; Simonton, 1994). The most common disorders found in creative individuals are affective in nature (depression or bipolar disorder; Andreasen, 1987; Jamison, 1989; Johnson et al., 2012). These results overall suggest that psychological disorders may be more associated with

particular creative domains (usually artistic domains) than with creativity per se. The highly domain-specific nature of the mental illness–creativity link is further supported by the finding that, even within the domain of creative writing, poets present more psychopathology than other kinds of writers (Kaufman, 2001).

Several explanations have been proposed for the link between psychological disorders and creativity. First, self-selection may lead individuals prone to psychological disorders to gravitate toward creative careers as a result of their abilities or particular ways of thinking (Jamison, 1995). Alternatively, they may engage in creative endeavors as a way to heal and grow from their experiences (the hypothesis examined by the present study). Third, creative work may cause, maintain, or exacerbate psychological symptoms, as has been suggested for poets (Kaufman & Sexton, 2006). Finally, a third variable may explain the relationship between psychological disorders and creativity.

#### Physical Illness

Past research has also suggested that physical illness may meaningfully transform both creative individuals and their work. Zausner (1998) conducted a qualitative study of the biographies of 21 visual artists having suffered from a physical illness (including Botticelli, Michelangelo, Dürer, Monet, Munch, and others), and concluded that the experience of illness may have the power to break habits, provoke disequilibrium, and lead to the emergence and pursuit of new possibilities for one’s art. Commenting on her own experience with ovarian cancer, Zausner (2007, p. 3) reflected that “an illness that feels like an impassible barrier can become a doorway to a new and more creative existence.” In addition to Zausner’s findings, Reynolds (2004) conducted a qualitative study of 24 female textile artists coping with a variety of chronic illnesses (e.g., multiple sclerosis, rheumatoid arthritis, chronic fatigue syndrome, cancer, etc.). Participants in this sample reported that their experiences of illness contributed to inspiring their creative practices by sharpening their perceptions, by increasing their emotional sensitivity, and by confronting them with deep issues surrounding life.

#### Perceptions of Increased Creativity as a Manifestation of PTG

The studies discussed above provide preliminary support for the hypothesis of the present study, which is that perceptions of increased creativity following the experience of adversity constitute a manifestation of PTG. These studies, however, mostly focused on the lives of eminent creators, and the present study attempted to expand the scientific understanding of this phenomenon by examining a sample of noneminent creators. In addition, the present study used a correlational design to investigate the relationship between self-reported PTG and creativity following the experience of adversity. As with most existing studies on PTG, the term “growth” therefore refers to retrospective perceptions of change, as opposed to objective manifestations of such change. As a result, reports of PTG may only constitute subjective beliefs that do not correspond to changes in psychological and/or behavioral markers. In addition, if change indeed occurred, it may not actually

be causally related to the adverse event(s) it followed (see also Ford, Tennen, & Albert, 2008; Park & Helgeson, 2006)<sup>1</sup>.

### Theories of Posttraumatic Growth

In light of the variety of psychological processes that may explain how perceptions of positive change occur following stressful events, three main theories have been developed, each offering a unique perspective on the nature of PTG, including on whether this construct truly represents growth. Indeed, these theories underlie an important debate around the genuine or illusory nature of PTG. First, *cognitive adaptation theory* proposed that individuals faced with threatening events cope by developing and maintaining self-enhancing positive illusions that do not, in fact, relate to real positive changes (Taylor, 1983). In contrast, *organismic valuing theory* proposed that humans have an innate tendency to integrate experiences (including traumatic or difficult experiences) into one's unified sense of self, a process through which genuine growth occurs (Joseph & Linley, 2005). Third, *assumptive world theory* (which is closely related to organismic valuing theory) proposed that adverse events have the power to shatter individuals' assumptions about themselves and about the world. In other words, adverse experiences force individuals to question the core beliefs they had been taking for granted (for instance, the benevolence, predictability, and controllability of the world; Cann, Calhoun, Tedeschi, Kilmer, et al., 2010; Janoff-Bulman, 1992, 2006; Tedeschi & Calhoun, 2004). These assumptions must then be rebuilt. Growth following adversity occurs through cognitive processing, allowing individuals to make sense of their experience, and to modify their assumptive world by integrating new information.

### Cognitive Processing

The role of cognitive processing has received an increasing amount of attention from researchers, as it seems to be the key ingredient determining whether an individual might grow and/or deteriorate following adversity. According to assumptive world theory (Calhoun, Cann, & Tedeschi, 2010; Tedeschi & Calhoun, 2004), individuals engage in two forms of rumination (i.e., repetitive thinking) following experiences of adversity. Intrusive rumination refers to the occurrence of unwanted, or unsolicited, thoughts related to the event. Deliberate rumination refers to voluntary and purposeful thinking about the occurrence and implications of the event. Intrusive rumination is thought of as a precursor to deliberate rumination, prompting individuals to carefully explore their experiences. Intrusive rumination tends to predict higher levels of distress (Taku, Calhoun, Cann, & Tedeschi, 2008; Taku, Cann, Tedeschi, & Calhoun, 2009); deliberate rumination tends to predict growth (Calhoun et al., 2010; Cann et al., 2011). Long-term growth may therefore follow or coincide with the experience of distress. Thus, the model explains why individuals engaging in cognitive processing may concurrently, or at close time points, experience posttraumatic growth and depreciation.

In addition, recent research has established a link between rumination and creative thinking, as long as the rumination does not focus on one's negative emotional states. When participants engaged in rumination that focused on their negative emotional states (i.e., dysphoric rumination), it was found to predict poorer problem-solving and to be associated with self-criticism, self-

blame, as well as reduced self-confidence and willingness to engage in problem-solving (Lyubomirsky, Tucker, Caldwell, & Berg, 1999). In addition, dysphoric rumination appears to be characterized by decreased cognitive flexibility (Davis & Nolen-Hoeksema, 2000), which is an important predictor of creative thinking, as it involves the ability to seek out and apply alternative strategies to solve problems, as well as the capacity to find relationships between concepts generally thought to be unrelated (Isen, Johnson, Mertz, & Robinson, 1985; Murray, Sujan, Hirt, & Sujan, 1990).

In contrast, research on the relationship between nondysphoric rumination (i.e., repetitive thinking that does not focus on one's negative emotional states) has revealed that such deliberate rumination may actually be helpful for creative thinking. Verhaeghen, Joorman, and Khan (2005), for example, found that rumination fully accounted for the relationship between depression and creativity in a sample of undergraduate students by increasing both fluency and seriousness about one's creative activities. In a content-analysis study of the works of eminent writers, Forgeard (2008) found that writers known to have suffered from depression were more likely to use words describing cognitive mechanisms (e.g., "think," "know") than other groups, suggesting that they may have been able to use ruminative processes to their advantage by using them as tools for creativity. Finally, in a sample of adult participants, Cohen and Ferrari (2010) found that rumination predicted creative ideation in participants who also reported being high in indecision. Evidence from this literature therefore supports the hypothesis that deliberate rumination may foster PTG outcomes, including creativity. Indeed, researchers in this field have already noted the possibility that creativity may constitute one way in which PTG is expressed (Aldwin & Sutton, 1998; Bloom, 1998; Forgeard, Mecklenburg, Lacasse, & Jayawickreme, in press).

### Mechanisms Explaining the Hypothesized Link Between Self-Reported PTG and Creativity

In addition to past research on the relationship between adversity and creativity, as well as on cognitive processing and creativity, other possible mechanisms may explain why PTG could be manifested by perceptions of increased creativity. First, it is possible that the experience of adversity provides important material, ideas, and motivation for the realization of creative projects. For example, artists may describe their emotional experiences through their work, entrepreneurs may develop products or services designed to solve or counteract the difficulties they have encountered, or scientists may seek to understand the causes of the circumstances they have experienced. Such creative callings motivated by past adverse experiences may therefore constitute a form of "survivor mission" (Eskreis-Winkler, Duckworth, & Shulman, 2012).

Second, particular domains of PTG may explain how this construct could relate to perceptions of increased creativity. As mentioned above, the positive and negative changes described by individuals in the aftermath of trauma generally fall into one of

<sup>1</sup> These limitations, which apply to a majority of past studies investigating the relationship between PTG and outcomes other than creativity, are presented here so the reader can keep them in mind when interpreting results. They are further examined in the Discussion section.

five domains: interpersonal relationships, the perception of new possibilities for one’s life, personal strength, spirituality, and appreciation for life (Tedeschi & Calhoun, 1996, 2004). Two of these domains could explain an association between self-reported PTG and creativity. Indeed, research on the personality predictors of PTG has found that the trait of openness to experience predicted the identification of new possibilities for one’s life, and perceptions of increased personal strength (Tedeschi & Calhoun, 1996). In addition, the personality trait of openness to experience—which refers to active imagination, aesthetic and intellectual curiosity, as well as a willingness to try new things and experiences—is one of the most well-known predictors of creative thinking (Feist, 1998; King, Walker, & Broyles, 1996; McCrae, 1987). The perception of new possibilities seems intuitively linked to creativity, since identifying new possibilities for one’s life requires creative thinking. In addition, an increased sense of personal strength may promote feelings of initiative beneficial to creativity, or, alternatively, creative involvement may confer a sense of mastery and strength to individuals (Zausner, 1998). The present study therefore hypothesized that perceptions of increased creativity would be related to these two domains of PTG (see below).

**Hypotheses of the Present Study**

To date, only one study has examined the relationship between PTG and creativity. Using the Values in Action Inventory of Strength (VIA-IS; Peterson, Park, & Seligman, 2005), Peterson, Park, Pole, D’Andrea, and Seligman (2008) found that the character strength of creativity correlated significantly ( $r = .21$ ) with PTG. In addition, there was a significant linear association be-

tween the number of traumatic events experienced and participants’ scores on the VIA-IS creativity scale. However, since creativity was only one of many character strengths included as outcomes in this study, the precise nature of the association between PTG and creativity was not investigated further or explained. Nevertheless, Peterson and colleagues’ finding provided preliminary support for the main hypothesis of the present study.

This study used path analysis to look at the relationship between the experience of adversity, rumination, self-reported posttraumatic growth (PTG), and posttraumatic depreciation (PTD), as well as self-reported creativity, in a sample of online participants. The path model tested was based on the theoretical relationships between variables outlined in the introduction, and illustrated in Figure 1. In particular, the model focused on the effect of the most traumatic/difficult event experienced by participants at any point in their lives. This main independent variable was selected in light of assumptive world theory (Tedeschi & Calhoun, 2004), which proposes that PTG occurs when an event is powerful enough to shatter a person’s core beliefs about the world (e.g., assumptions about the safety, predictability, and controllability of the world; Janoff-Bulman, 1992, 2006). Thus, the model posits that “seismic” events bring about perceptions of change. What results from this theoretical position is that PTG follows discrete but powerful experiences, rather than prolonged exposure to stressors/traumas (although such discrete experiences may happen in the context of a more chronic exposure to stress), which, taken individually, may not be strong enough to shatter one’s core beliefs. In keeping with this, instruments designed to assess PTG typically ask participants

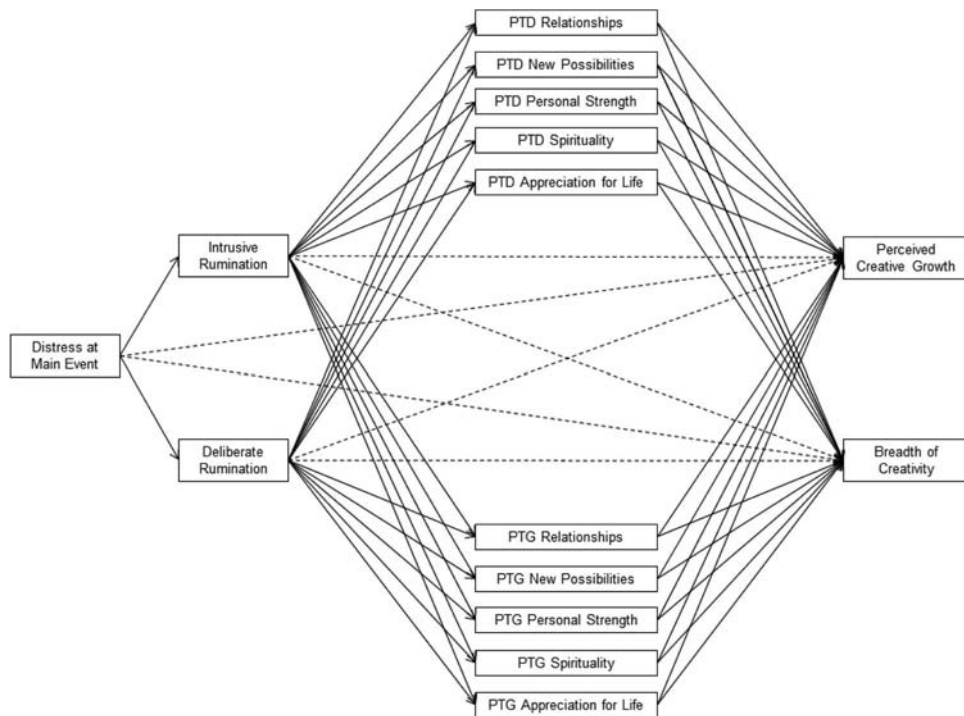


Figure 1. Main path model tested. Dotted lines represent the six direct paths constrained to zero in the nested mediation model.

to refer to one major event in order to assess perceptions of change (e.g., Tedeschi & Calhoun, 1996).

The main statistical analyses tested the following hypotheses:

*Hypothesis 1:* The amount of distress experienced by participants at the time of the main traumatic/difficult event in their lives predicts both the amount of intrusive and deliberate rumination they engaged in after the event; intrusive and deliberate rumination are correlated.

*Hypothesis 2:* Intrusive rumination predicts PTSD domains (including self-reported negative changes in relationships, perception of new possibilities, personal strength, spirituality, and appreciation for life).

*Hypothesis 3:* Deliberate rumination predicts PTG domains (including self-reported positive changes in relationships, perception of new possibilities, personal strength, spirituality, and appreciation for life).

*Hypothesis 4:* It was also predicted that intrusive rumination would not predict PTG, and deliberate rumination would not predict PTSD, although these paths were still included and tested in our model based on some contradictory findings in the literature showing, for example, that recent intrusive rumination may predict reduced levels of PTG (Cann, Calhoun, Tedeschi, & Solomon, 2010).

*Hypothesis 5:* Self-reported positive changes in the perception of new possibilities for one's life and in personal strength are positively correlated to self-reported creativity; self-reported negative changes in the perception of new possibilities and in personal strength are negatively correlated to self-reported creativity.

*Hypothesis 6:* Self-reported creativity is correlated to creative achievement.

## Method

### Participants

Three hundred and seventy-three participants were recruited online using two websites, Amazon Mechanical Turk ( $n = 137$ ) and authentic happiness.org ( $n = 236$ ). Participants were 39.63 years old on average ( $SD = 13.64$ ), and mostly female (78%). Most participants in our sample were Caucasian (75%), followed by Asian (7.80%), of mixed ethnicity (6.40%), Latino (4.40%), African American (3.40%) and other (3%). Participants also indicated their country of origin: 76.70% of our sample originated from North America, 8.10% from Europe, 6% from Australia or New Zealand, 4.40% from Asia, 2% from Africa, and 3% from other parts of the world. The modal level of education attained (34% of participants) was a bachelor's degree (1% of participants did not finish high school; 6% had a high school diploma; 23% completed some college education; 6% had an Associate's degree; 27% had a graduate degree). Participants were told that this was a study on "life events, personality, and behavior" (creativity was not included in the study description), and there were no inclusion or exclusion criteria. Participants recruited on MTurk received a

nominal fee (50 cents) for completing the survey; participants from authentic happiness.org were volunteers.

### Materials and Procedures

Participants filled out a 20-min survey administered online using Qualtrics (qualtrics.com). This survey included seven questionnaires (in addition to the demographic questions listed above). The variables extracted from each questionnaire are described below.

**Life Events Checklist.** Participants completed the Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004), a questionnaire designed to identify traumatic events participants may have experienced in the past. Participants were presented with different kinds of traumatic events, and indicated whether they had *personally experienced* or *witnessed* such events, or whether they had *learned* about such events happening to someone close to them. In addition to the 16 categories of events usually included in this checklist, one additional category, "psychological disorders," was added, as this form of difficult experience may also be associated with self-reported creativity (as explained above).

In addition, since participants often reported having experienced more than one traumatic event, participants were asked to indicate which one event (whether personally experienced, witnessed, or learned about) had the greatest impact on their lives, and how old (in years) they were at the time of this "main event." Participants who did not experience any of the events proposed were asked to describe in a few words the most difficult event they had ever experienced in their lives. All participants were asked to consider this main event as reference for the rest of the questionnaires. All participants also indicated on a 5-point Likert-type scale (1 = *not at all*, 5 = *extremely*) how distressing the event was to them when it first happened.

Events were categorized into nine meaningful categories to facilitate analysis and interpretation of results: natural disasters, accidents (including fire, explosions, transportation accidents, other serious accidents, or exposure to toxic substances); physical assault (including unarmed and armed assault); sexual assault (including sexual assault and other unwanted sexual experiences); combat (including combat and captivity); illness/suffering (including physical illnesses or injuries, psychological disorders, and severe human suffering); death of other (including sudden violent deaths, or death of someone close); harm to someone else; and other (this category grouped the difficult events reported by participants who had not experienced any of the traumatic events proposed by the LEC).

Thus, five variables resulted from the administration of the LEC and were used in statistical analyses:

- Lifetime number of events: The total number of traumatic/difficult events each participant reported having experienced in his or her lifetime.
- Main event kind: The type of event corresponding to the main event indicated by each participant.
- Type of main event involvement: Whether each participant personally experienced, witnessed, or learned about the main event he or she reported.
- Age at main event: The age (in years) at which each participant experienced the main event he or she reported.

- Distress at main event: The level of distress (on a 5-point scale) experienced during the main event reported.

**Posttraumatic Growth Inventory.** Participants completed the paired-format Posttraumatic Growth Inventory (PTGI-42; Baker, Kelly, Calhoun, Cann, & Tedeschi, 2008), a 42-item questionnaire designed to measure both positive changes (PTG) and negative changes (PTD) that occur in the aftermath of difficult events. Participants used a 6-point Likert scale to rate 21 pairs of statements describing such changes. Statements are presented in pairs in order to encourage participants to consider both positive and negative changes at the same time, and to use the same scale for both kinds of changes. The PTGI-42 yields two composite scores corresponding to participants' PTG ( $\alpha = .94$ ) and PTD ( $\alpha = .94$ ). Replicating past findings (e.g., Cann, Calhoun, Tedeschi, & Solomon, 2010), the correlation between PTG and PTD in this sample was low and nonsignificant ( $r = -.08, p = .13$ ), and participants reported significantly more PTG ( $M = 70.72, SD = 26.31$ ) than PTD ( $M = 42.99, SD = 21.19$ ),  $t(372) = 15.29, p < .001$ . The PTG and PTD subscales were further subdivided into five domains (the respective reliabilities of test scores on the PTG and PTD domains are reported in parentheses): Relationships ( $\alpha = .87$  and  $\alpha = .86$ ), new possibilities ( $\alpha = .85$  and  $\alpha = .84$ ), personal strength ( $\alpha = .84$  and  $\alpha = .80$ ), spirituality ( $\alpha = .81$  and  $\alpha = .69$ ), and appreciation for life ( $\alpha = .79$  and  $\alpha = .74$ ). As the present study hypothesized that self-reported creativity would differentially relate to these domains of PTG, domain scores were used in statistical analyses rather than the composite PTG and PTD scores. Thus, 10 variables were extracted from the PTGI-42, corresponding to the five domains of both PTG and PTD.

**Event Related Rumination Inventory.** Participants used a 3-point scale (1 = *not at all*, 3 = *often*) to complete the Event Related Rumination Inventory (ERRI; Cann et al., 2011; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2011), a self-report instrument that includes two 10-item subscales assessing intrusive ( $\alpha = .97$ ) and deliberate ( $\alpha = .92$ ) rumination in the weeks following the main event. Thus, two variables were extracted from the ERRI (intrusive and deliberate rumination composite scores).

**Creative Domains Questionnaire.** Participants completed a modified version of the Creative Domains Questionnaire (CDQ; Silvia, Kaufman, & Pretz, 2009), an instrument designed to assess self-reported creativity in a wide range of domains. Participants selected a subset of 56 domains in which they had demonstrated creativity. To increase the objectivity of this self-report measure, participants were asked to think about whether other people had commented on their ability or talent in the domains listed. This yielded a score describing the number of creative domains endorsed by participants, which reflected the breadth of their creativity.

In addition, participants selected the domain in which they felt most creative (among the ones they previously selected), and indicated the age at which they started engaging in this activity, as well as the age at which they felt that they reached their peak in this activity. Domains selected were categorized according to the seven empirically derived overarching areas described by Kaufman, Cole, and Baer (2009): artistic/verbal, artistic/visual, entrepreneur, interpersonal, math/science, performance, and problem-solving. Because Kaufman and colleagues identified a number of domains that did not fall cleanly into one of these categories (they

either did not load onto any area or loaded onto multiple areas), a few participants ( $n = 29$ ) could not be included in the analyses that included these variables (see below).

Finally, participants described in a textbox what accomplishments they had achieved in this domain at the peak of their creativity. These achievements were then coded by three independent raters (research assistants) on a 5-point scale (1 = *little or no creativity, mostly subjective in nature*; 5 = *very high levels of creativity with objective indicators of accomplishment and recognition by others*) in order to determine the peak level of creative achievement reached by each participant. The interrater agreement was excellent ( $\alpha = .93$ ), suggesting that a reliable estimate of their creative achievement could be reached by averaging the scores produced by raters.

Thus, five variables resulted from the administration of the CDQ and were used in statistical analyses:

- Breadth of creativity: The number of creative domains endorsed by each participant.
- Main creative area: The area corresponding to the domain in which each participant reported being most creative (artistic/verbal, artistic/visual, entrepreneur, interpersonal, math/science, performance, or problem-solving).
- Peak creative achievement scores: The scores corresponding to the peak creative achievements reported by participants (as coded by raters).
- Age at peak: The age at which each participant reported reaching peak creative achievement in his or her main creative area.
- Event-peak interval: The interval (in years) between each participant's main event and peak creative achievement.

**Perceived Creative Growth scale.** Participants completed a brief self-report instrument, including eight items developed for the purpose of this study, using a 5-point Likert scale (1 = *not at all*, 5 = *extremely*). This scale aimed to measure the extent to which participants perceived that their creativity increased as a result of the main event reported on the LEC. Four items described general changes in one's creativity or in one's motivation to engage in creative activities. The remaining four items described the use of creative activities as a way to cope with the experience of adversity. As a result, it was hypothesized that the scale would yield two factors (*creative growth* and *creative coping*). The reliability of scores, factor structure, and final version of this scale are described in the Results section. Thus, one variable was extracted from this scale corresponding to participants' perceived creative growth in the aftermath of the main events they reported.

## Results

### Perceived Creative Growth Scale

The 8-item scale created for the purpose of this study (see Appendix A) had adequate internal consistency ( $\alpha = .85$ ), but two items had unacceptably low corrected item-total correlations ( $<.20$ ). These corresponded to the two items phrased negatively (which were reverse scored before the reliability analysis). These items were therefore excluded from the final version of the scale. The internal consistency of the resulting 6-item scale was good ( $\alpha = .93$ ), with all corrected item-total correlations ranging from .68 to .83. Next, the scale was

submitted to exploratory factor analysis, to verify whether items loaded onto two separate factors, creative growth and creative coping (see Method section). Principal axis factoring was carried out using promax rotation, since creative growth and creative coping would likely be correlated constructs. The scree plot as well as the Kaiser criterion indicated a one-factor solution accounting for 73.50% of the variance. Item communalities ranged from .50 to .76. Factor loadings of all six items ranged from .71 to .87. Contrary to hypotheses, the scale constructed yielded only one factor corresponding to the general construct of creative growth. This one-factor solution was retained, and a composite score was calculated by adding the scores of the six items.

### Exposure to Traumatic/Difficult Events

On the LEC, 91.90% of participants had personally experienced at least one traumatic/difficult event ( $M = 3.46$ ,  $SD = 2.57$ , median = 3, mode = 1); 78% of participants had witnessed at least one such event ( $M = 2.83$ ,  $SD = 2.73$ , median = 2, mode = 0); finally, 89.20% had learned about such an event happening to someone close to them at least once ( $M = 4.84$ ,  $SD = 3.94$ , median = 4, mode = 4). These estimates are consistent with epidemiological studies indicating that most individuals living in the United States have experienced at least one traumatic event in their lifetimes (Breslau, 2009; Breslau & Alvarado, 2007), and estimates as high as 92% in males and 87% in females have been found (Breslau et al., 1998). Nevertheless, the results of this study fall on the high end of what has been previously reported. This may be explained by the fact that the present study did not strictly apply the criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (4<sup>th</sup> ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) in order to determine what constitutes a traumatic/difficult event, (e.g., participants were not asked whether their responses to the event involved fear, helplessness, or horror), but rather simply asked whether participants had experienced particular types of events. This may have resulted in somewhat higher estimates than would have been found using *DSM-IV-TR* criteria. The choice not to use these criteria was based on the necessity to include participants falling on a spectrum of levels of distress (and to avoid possible restriction of range in the main exogenous variable included in the path analysis below).

The main event kind reported by participants fell into the following categories: illness/suffering (26%), death of other (22.80%), sexual assault (15%), accidents (12%), physical assault (7.50%), natural disasters (4%), combat (1.30%), harming someone else (1.30%), and other (10.20%). Participants were on average 24.22 years old when the event occurred ( $SD = 14.25$ ). The mean level of distress at main event was 4.30 ( $SD = 0.95$ , min = 1, max = 5).

### Path Analysis

The main analyses for this study were conducted in AMOS (SPSS, Inc., Chicago, IL) and consisted of testing the path model and hypotheses outlined in the Introduction and illustrated in Figure 1. Error terms of intrusive and deliberate rumination<sup>2</sup> were allowed to covary. In a similar way, error terms of all PTSD and PTG domains were allowed to covary. Finally, the error terms of the two main creativity outcomes (perceived creative growth and breadth of creativity) were also allowed to covary. Six direct paths from distress at main event

and from intrusive/deliberate rumination to perceived creative growth and breadth of creativity were also included in order to test a nested mediation model (in which these six paths were constrained to zero). This nested model, if superior to the model in which the path coefficients were allowed to vary, would suggest that the effect of distress at main event on perceived creative growth and breadth of creativity was fully accounted for by mediators (rumination and PTSD/PTG domains). The model tested also controlled for the effect of other important variables. Age, gender, education level, ethnicity, age at main event, main event kind, and lifetime number of events were treated as covariates. Table 1 includes all means and standard deviations for all continuous variables included in this analysis. Appendix B describes correlations among variables.

The unconstrained model (in which the six direct paths from distress at main event and intrusive/deliberate rumination to perceived creative growth and breadth of creativity were allowed to vary) had a very good fit, examined using multiple indices. The chi-square fit statistic was nonsignificant,  $\chi^2(10) = 11.05$ ,  $p = .35$ , suggesting that no significant discrepancy existed between the observed covariance matrix and the one implied by the model. Examination of the standardized residual covariances all fell below an absolute value of 1.96, again indicating minimal discrepancy between predicted and observed covariances. Three additional fit indices supported the model as a very good fit for the data: the standardized root mean squared residual (SRMR; summary of the average covariance residual) = .01, the root mean square error of approximation (RMSEA; estimate of the “misfit” of the model based on a noncentral index) = .02, and the comparative fit index (CFI; another noncentral index of fit) = 1.00. This model explained 44.80% of the variance in perceived creative growth, and 18.60% of the variance in breadth of creativity. The nested model in which the six direct paths described above were constrained to zero was a poorer fit for the data according to a chi-square difference test,  $\Delta\chi^2(6) = 13.92$ ,  $p = .03$ . The effect of distress at main event on perceived creative growth and breadth of creativity was therefore not fully mediated by rumination and PTSD/PTG domains, and the unconstrained model was retained for further examination.

Path coefficients of this unconstrained model were examined to verify whether the hypothesized relationships between variables were confirmed (see Figure 2). Table 2 and Appendix C list all unstandardized estimates, standard errors, standardized estimates, and  $p$  values for the main paths and covariates tested. The direct paths from distress at main event to perceived creative growth and breadth of creativity were nonsignificant, suggesting that the effect of distress at main event was fully mediated by the other variables included in the model. Contrary to hypotheses, however, deliberate rumination directly predicted perceived creative growth.

The path analysis therefore supported a partial mediation model in which:

- The effect of distress at main event on both perceived creative growth and breadth of creativity was fully mediated by intrusive/deliberate rumination and PTSD/PTG domains.

<sup>2</sup> For the sake of concision and clarity, scores on all measures described in the Method section are simply referred to by the name of the relevant construct (e.g., “intrusive rumination” corresponds to scores on the intrusive rumination subscale of the ERRI, “Perceived Creative Growth” corresponds to scores on the Perceived Creative Growth scale, etc.).

Table 1  
Means and Standard Deviations for all Continuous Variables Included in the Main Path Model

Variable	M	SD
Age	39.63	13.64
Education	4.68	1.53
Age at Main Event	24.22	14.25
Distress at Main Event	4.30	0.95
Lifetime Number of Events	11.13	6.92
Intrusive Rumination	3.90	1.53
Deliberate Rumination	3.51	1.32
PTG Relationships	22.65	9.22
PTG New Possibilities	15.95	7.55
PTG Personal Strength	14.41	6.01
PTG Spirituality	6.13	3.60
PTG Appreciation for Life	11.58	4.37
PTD Relationships	15.91	8.29
PTD New Possibilities	9.57	5.81
PTD Personal Strength	8.15	4.86
PTD Spirituality	3.68	2.68
PTD Appreciation for Life	5.68	3.58
Breadth of Creativity	12.11	7.64
Perceived Creative Growth	17.13	7.41

Note. PTG = posttraumatic growth; PTD = posttraumatic depreciation.

• The effect of intrusive rumination on both perceived creative growth and breadth of creativity was fully mediated by PTD domains. Self-reported negative changes in new possibilities predicted reduced perceived creative growth, whereas self-reported

negative changes in relationships predicted increased perceived creative growth. Self-reported negative changes in new possibilities predicted increased breadth of creativity, whereas self-reported negative changes in appreciation for life predicted decreased breadth of creativity.

• The effect of deliberate rumination on breadth of creativity was fully mediated by PTG domains. Self-reported positive changes in personal strength predicted increased breadth of creativity.

• The effect of deliberate rumination on perceived creative growth was only partially mediated by PTG domains, as it retained a direct relationship with perceived creative growth. Self-reported positive changes in relationships and new possibilities predicted increased perceived creative growth.

• The residual correlation between the two self-reported creativity outcomes, perceived creative growth and breadth of creativity, was small but significant ( $r = .14, p = .02$ ).

### Peak Creative Achievement

Additional analyses were conducted to examine whether participants' perceived creative growth as well as breadth of creativity (both self-reported, and therefore mostly subjective in nature) related to higher peak creative achievement scores (a somewhat more objective indicator of creativity). Participants' peak creative achievement scores could not be included in the main path analysis because 20.60% of participants reported that their peak creative achievement occurred before the main event they encountered. These participants were therefore excluded from the prior anal-

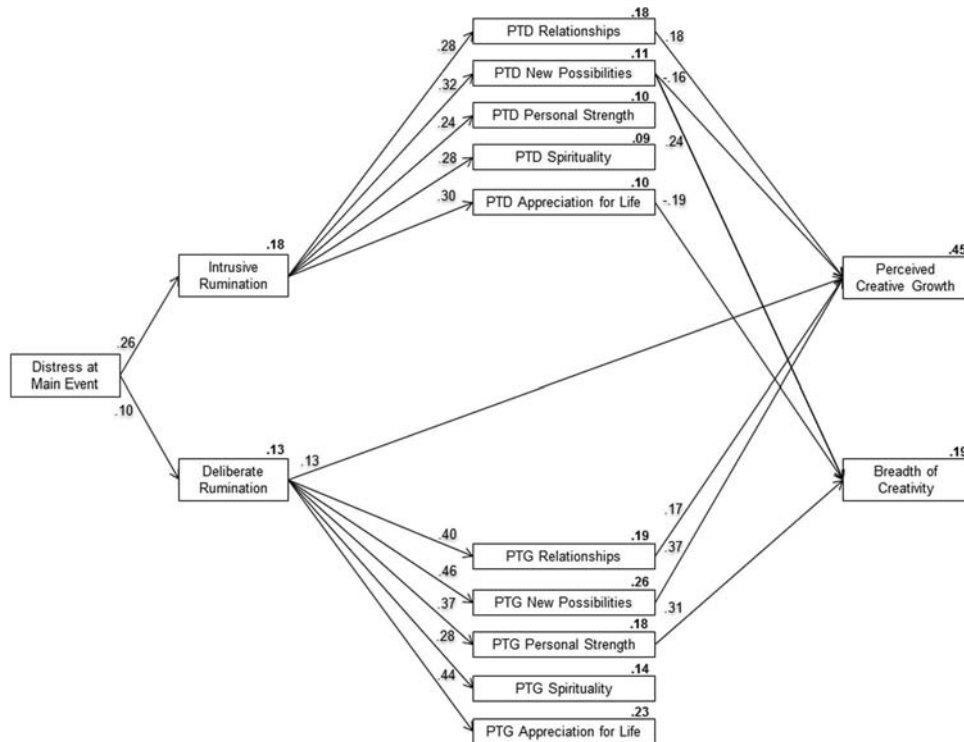


Figure 2. Results of the path analysis (including standardized path coefficients and amount of variance explained). Nonsignificant paths, covariate paths, and error covariance paths are omitted from the model (see Results section for a description of these paths).



Table 2  
*Unstandardized Estimates, Standard Errors, Standardized Estimates, and p Values for Paths Included in the Main Path Model (See Appendix C For Covariate Paths)*

Path	Unstd.	SE	Std.	p
Distress at Main Event → Deliberate Rumination	0.14	0.07	.10	.05
Distress at Main Event → Intrusive Rumination	0.42	0.08	.26	<.001
Distress at Main Event → Breadth of Creativity	0.44	0.41	.06	.28
Distress at Main Event → Perceived Creative Growth	0.41	0.33	.05	.21
Intrusive Rumination → PTD Appreciation for Life	0.69	0.14	.30	<.001
Intrusive Rumination → PTD New Possibilities	1.22	0.22	.32	<.001
Intrusive Rumination → PTD Relationships	1.52	0.30	.28	<.001
Intrusive Rumination → PTD Spirituality	0.42	0.10	.24	<.001
Intrusive Rumination → PTD Personal Strength	0.76	0.18	.24	<.001
Intrusive Rumination → PTG Appreciation for Life	0.02	0.15	.01	.88
Intrusive Rumination → PTG New Possibilities	-0.11	0.26	-.02	.66
Intrusive Rumination → PTG Relationships	-0.15	0.33	-.03	.65
Intrusive Rumination → PTG Spirituality	-0.10	0.13	-.04	.46
Intrusive Rumination → PTG Personal Strength	0.08	0.22	.02	.70
Intrusive Rumination → Breadth of Creativity	0.39	0.30	.08	.19
Intrusive Rumination → Perceived Creative Growth	0.07	0.24	.01	.78
Deliberate Rumination → PTD Appreciation for Life	-0.25	0.16	-.09	.11
Deliberate Rumination → PTD New Possibilities	-0.18	0.25	-.04	.47
Deliberate Rumination → PTD Relationships	0.04	0.34	.01	.90
Deliberate Rumination → PTD Spirituality	0.04	0.12	.02	.77
Deliberate Rumination → PTD Personal Strength	0.04	0.21	.01	.84
Deliberate Rumination → PTG Appreciation for Life	1.44	0.18	.44	<.001
Deliberate Rumination → PTG New Possibilities	2.65	0.30	.46	<.001
Deliberate Rumination → PTG Relationships	2.78	0.38	.40	<.001
Deliberate Rumination → PTG Spirituality	0.76	0.15	.28	<.001
Deliberate Rumination → PTG Personal Strength	1.67	0.25	.37	<.001
Deliberate Rumination → Breadth of Creativity	0.23	0.35	.04	.51
Deliberate Rumination → Perceived Creative Growth	0.72	0.28	.13	.01
PTD Appreciation for Life → Breadth of Creativity	-0.41	0.19	-.19	.03
PTD New Possibilities → Breadth of Creativity	0.31	0.13	.24	.02
PTD Relationships → Breadth of Creativity	-0.06	0.08	-.07	.45
PTD Spirituality → Breadth of Creativity	-0.25	0.17	-.09	.15
PTD Personal Strength → Breadth of Creativity	0.06	0.15	.04	.66
PTG Appreciation for Life → Breadth of Creativity	-0.11	0.14	-.06	.45
PTG New Possibilities → Breadth of Creativity	0.04	0.09	.04	.67
PTG Relationships → Breadth of Creativity	-0.06	0.07	-.08	.38
PTG Spirituality → Breadth of Creativity	-0.26	0.14	-.12	.07
PTG Personal Strength → Breadth of Creativity	0.39	0.13	.31	<.01
PTD Appreciation for Life → Perceived Creative Growth	0.21	0.15	.10	.16
PTD New Possibilities → Perceived Creative Growth	-0.21	0.10	-.16	.05
PTD Relationships → Perceived Creative Growth	0.16	0.06	.18	.01
PTD Spirituality → Perceived Creative Growth	-0.08	0.14	-.03	.58
PTD Personal Strength → Perceived Creative Growth	-0.05	0.12	-.04	.65
PTG Appreciation for Life → Perceived Creative Growth	0.03	0.11	.02	.77
PTG New Possibilities → Perceived Creative Growth	0.36	0.07	.37	<.001
PTG Relationships → Perceived Creative Growth	0.13	0.06	.17	.02
PTG Spirituality → Perceived Creative Growth	-0.02	0.11	-.01	.89
PTG Personal Strength → Perceived Creative Growth	0.06	0.10	.05	.56

ysis, as their peak creative achievement scores would not have been influenced by the main event they experienced.

A multiple regression analysis tested whether perceived creative growth and breadth of creativity predicted peak creative achievement scores, controlling for age, gender, ethnicity, education, age at peak, main creative area (excluding 29 participants whose creative domain did not fall into the seven main areas; see Method section), and the event-peak interval ( $n = 275$ ). Results showed that perceived creative growth did not predict peak creative achievement scores,  $\beta = -.04$ , part  $r = -.04$ ,  $p = .49$ . In contrast, breadth of creativity did predict peak creative achievement scores,  $\beta = .16$ , part  $r = .15$ ,  $p = .01$ . The

effects of all other predictors but one, the main creative area endorsed ( $p = .03$ ), were nonsignificant (all  $ps > .10$ ; see Table 3a). This finding is investigated further below.

### Exploratory Analyses

Additional exploratory analyses were conducted to investigate whether the main creative area endorsed, particular features of the main event considered, and the lifetime number of events reported predicted perceived creative growth, breadth of creativity, and peak creative achievement scores.

Table 3

Results of Multiple Regression Analyses (Including Unstandardized  $\beta$  coefficients, Standard Errors, Standardized  $\beta$  Coefficients,  $t$  Values, and  $p$  Values)

Variable	Unstd. $\beta$	SE	Std. $\beta$	Part $r$	$t$	$p$
a. Dependent Variable: Peak Creative Achievement Scores ( $n = 275$ )						
Constant	2.92	.37			7.93	<.001
Age	.01	.01	.10	.06	1.06	.29
Gender	.08	.13	.04	.03	.58	.57
Ethnicity	-0.01	.03	-.03	-.03	-.43	.67
Education	.03	.04	.04	.04	.70	.49
Age at Peak	.00	.01	-.05	-.03	-.44	.66
Main Creative Area	-.07	.03	-.13	-.13	-2.19	.03
Event-Peak Interval	-.01	.01	-.08	-.06	-1.07	.29
Perceived Creative Growth	-.01	.01	-.04	-.04	-.69	.49
Breadth of Creativity	.02	.01	.16	.15	2.58	.01
b. Dependent Variable: Perceived Creative Growth ( $n = 373$ )						
Constant	10.61	2.36			4.50	<.001
Age	.01	.03	.02	.02	.31	.75
Gender	.03	.92	.11	.11	2.21	.03
Ethnicity	.20	.20	.05	.05	1.01	.32
Education	.10	.26	.02	.02	.40	.69
Lifetime Number of Events	.15	.06	.14	.14	2.69	.01
c. Dependent Variable: Breadth of Creativity ( $n = 373$ )						
Constant	1.28	2.34			.55	.58
Age	.03	.03	.05	.05	1.03	.31
Gender	2.72	.91	.15	.15	2.99	<.01
Ethnicity	-.20	.20	-.05	-.05	-.99	.32
Education	.34	.25	.07	.07	1.35	.18
Lifetime Number of Events	.32	.06	.29	.28	5.74	<.001
d. Dependent Variable: Peak Creative Achievement Scores ( $n = 296$ )						
Constant	2.57	.33			7.71	<.001
Age	.01	.01	.11	.07	1.21	.23
Gender	.05	.13	.02	.02	.39	.70
Ethnicity	-.01	.03	-.02	-.02	-.34	.73
Education	.06	.04	.09	.08	1.43	.15
Age at Peak	-.01	.01	-.10	-.07	-1.16	.25
Lifetime Number of Events	.00	.01	.03	.03	.50	.62

**Main creative area.** Three ANCOVAs (covarying age, gender, ethnicity, and education) were conducted to determine whether the main creative area endorsed by participants predicted levels of perceived creative growth, breadth of creativity, or peak creative achievement scores (again excluding 29 participants whose creative domain did not fall into the seven main areas, see Method section). There were no differences between main creative areas for perceived creative growth and breadth of creativity (both  $n_s = 344$ , both  $p_s > .10$ ). Peak creative achievement scores ( $n = 275$ , also excluding participants who reported that their peak creative achievement occurred before the main event) differed significantly according to the main creative area endorsed,  $F(6, 264) = 4.12, p = .001$ , partial  $\eta^2 = .09$ . Table 4 provides estimated marginal means, standard errors, and sample sizes for each area. Participants who reported that their main creative area was entrepreneurship had the highest peak creative achievement scores, followed by the artistic/verbal, math/science, performance, artistic/visual, interpersonal, and problem-solving areas (see Figure 3). Post hoc tests using Bonferroni-Holm corrections, however, only showed that the artistic/verbal group had higher levels of peak creative achievement scores than the interpersonal group ( $p = .01$ , Cohen's  $d = .69$ ). All other comparisons were nonsignificant ( $p_s > .10$ ).

**Features of the main event considered.** Three mixed-design ANCOVAs (covarying age, gender, ethnicity, education, age at

main event and distress at main event) were conducted to examine whether characteristics of the main event experienced predicted perceived creative growth, breadth of creativity, or peak creative achievement scores. Independent variables included the main event kind considered (natural disaster, accident, physical assault, sexual assault, combat, illness, death, harm to others, other difficult events) as well as the type of main event involvement (whether the person personally experienced, witnessed, or learned about the event).

For breadth of creativity ( $n = 373$ ) and peak creative achievement scores ( $n = 296$ , excluding participants who reported that

Table 4

Estimated Marginal Means, Standard Errors, and Sample Sizes for Peak Creative Achievement Scores by Main Creative Area Endorsed (Covarying Age, Gender, Ethnicity, and Education)

Main Creative Area	$M$	SE	$n$
Entrepreneur	3.43	0.27	12
Artistic/Verbal	3.37	0.15	37
Math/Science	3.34	0.35	7
Performance	3.30	0.18	26
Artistic/Visual	3.18	0.12	55
Interpersonal	2.76	0.08	114
Problem Solving	2.73	0.19	24

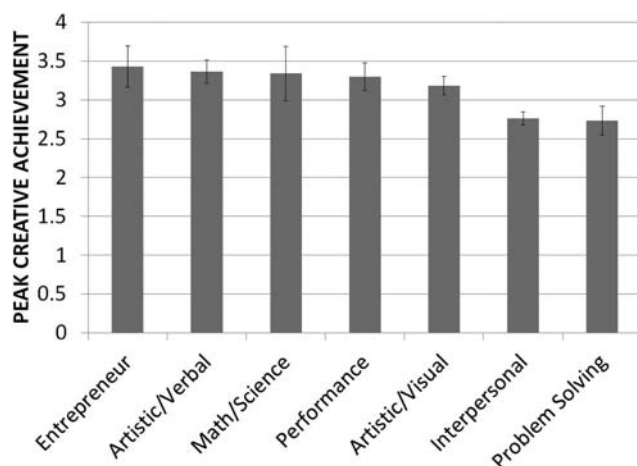


Figure 3. Peak creative achievement scores by main creative area endorsed (covarying age, gender, ethnicity, and education). Error bars represent standard errors.

their peak creative achievements occurred before their main events), both main effects and the interaction were nonsignificant (all  $ps > .10$ ). For perceived creative growth ( $n = 373$ ), results showed that the main effect of the type of main event involvement as well as the Main Event Kind  $\times$  Type of Main Event Involvement interaction were nonsignificant (both  $ps > .10$ ). In contrast, the main effect of the main event kind considered was significant,  $F(8, 342) = 2.56, p = .01$ , partial  $\eta^2 = .06$  (See Figure 4). Table 5 reports means and standard errors. Pairwise comparisons using Bonferroni-Holm corrections showed that participants who experienced accidents reported significantly less creative growth than participants who reported physical assaults (Cohen's  $d = .91$ ), illnesses (Cohen's  $d = .68$ ), witnessing/learning about the death of someone else (Cohen's  $d = .63$ ), other difficult events (Cohen's  $d = .65$ ) and natural disasters (Cohen's  $d = .75$ ; all  $ps < .05$ ). Participants who experienced accidents did not differ significantly from participants who experienced sexual assault (Cohen's  $d =$

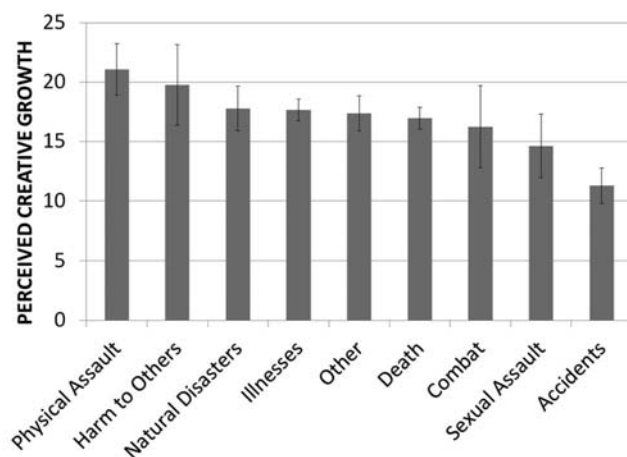


Figure 4. Perceived creative growth by main event kind (covarying age, gender, ethnicity, education, age at main event and distress at main event). Error bars represent standard errors.

Table 5

Estimated Marginal Means, Standard Errors, and Sample Sizes for Perceived Creative Growth by Main Event Kind (Covarying Age, Gender, Ethnicity, Education, Age at Main Event and Distress at Main Event)

Main event kind	M	SE	n
Physical assault	21.09	2.17	28
Harm to others	19.77	3.41	5
Natural disasters	17.77	1.89	15
Illnesses	17.65	0.91	97
Other	17.38	1.47	38
Death	16.97	0.90	85
Combat	16.26	3.46	5
Sexual assault	14.63	2.69	56
Accidents	11.30	1.47	44

.21), combat (Cohen's  $d = .56$ ), or harming others (Cohen's  $d = .97$ ), perhaps as a result of small sample sizes for some of these types of events, and all comparisons between other main event kinds were nonsignificant (all  $ps > .05$ ).

**Lifetime Number of Events.** Three multiple regression analyses were conducted to determine whether the lifetime number of events reported by participants predicted perceived creative growth, breadth of creativity, and peak creative achievement scores, controlling for age, gender, ethnicity, and education. Lifetime number of events was a significant predictor of perceived creative growth,  $\beta = .14$ , part  $r = .14, p = .01$  (see Table 3b) and breadth of creativity,  $\beta = .29$ , part  $r = .28, p < .001$  (see Table 3c), but not of peak creative achievement scores,  $\beta = .03$ , part  $r = .03, p = .62$  (also controlling for age at peak, in addition to other variables listed above; see Table 3d). Two additional quadratic trend analyses showed that both the relationships between lifetime number of events and perceived creative growth, as well as breadth of creativity, were linear in nature—both linear trend components were significant (both  $ps < .01$ ), whereas both quadratic trend components were nonsignificant (both  $ps > .10$ ).

### Discussion

The present study provided support for the existence of a relationship between the experience of adversity and self-reported creativity, and for the hypothesis that perceptions of increased creativity constitute a manifestation of PTG. A path analysis supported a model based on assumptive world theory (Janoff-Bulman, 1992, 2006; Tedeschi & Calhoun, 2004). This model demonstrated that the relationship between adversity-induced distress and self-reported creativity outcomes was mediated by two main sets of paths: The first set of paths showed that this relationship was mediated by intrusive rumination and a subset of PTD domains; the second set of paths showed that this relationship was also mediated by deliberate rumination and a subset of PTG domains.

In the first set of paths, intrusive rumination predicted all five PTD domains. In turn, self-reported negative changes in the perception of new possibilities for one's life predicted reduced levels of perceived creative growth, but, contrary to hypotheses, increased breadth of creativity (perhaps reflecting an attempt to cope through increased engagement in creative activities, among other

possibilities). Also contrary to hypotheses, self-reported negative changes in personal strength were not related to creativity outcomes. Self-reported negative changes in appreciation for life however also predicted reduced breadth of creativity. In addition, self-reported negative changes in relationships predicted increased perceived creative growth. This finding, while somewhat surprising, does make sense in light of the fact that both positive and negative interpersonal events have provided rich raw material for creative works, especially in artistic domains. For example, Tennessee Williams' plays such as *The Glass Menagerie* (1944) are thought to be inspired by his own dysfunctional family, whereas Louisa May Alcott's novel *Little Women* (1868) was likely influenced by the novelist's strong bond with her own sisters.

In the second set of paths, deliberate rumination directly predicted perceived creative growth (but not breadth of creativity), as well as all five PTG domains. In turn, self-reported positive changes in relationships and in the perception of new possibilities for one's life predicted increased perceived creative growth. Self-reported positive changes in personal strength predicted increased breadth of creativity.

Additional analyses showed that perceived creative growth did not predict peak creative achievement scores, whereas breadth of creativity did have a small relationship to this outcome. Furthermore, creativity outcomes were, in general, not related to the main creative area endorsed, although the lack of significant differences may have been due to sample size considerations (the only exception to this result was that participants who endorsed the artistic/verbal area had significantly higher peak creative achievement scores than participants who endorsed the interpersonal area). In addition, participants who experienced accidents were somewhat less likely to report perceived creative growth than others. Finally, the lifetime number of events reported by participants linearly predicted perceived creative growth and breadth of creativity, but not peak creative achievement scores.

### Limitations and Future Directions

This study had a number of limitations. First, and as noted earlier, the cross-sectional nature of its design made it impossible to establish whether the relationships found were causal in nature. This study employed either retrospective reports of change (e.g., the Perceived Creative Growth scale) or measures assessing outcomes at one time point only (e.g., the breadth of creativity and peak creative achievement measures). Longitudinal investigations are needed in order to determine whether scores on these measures validly represent actual growth in creativity. Frazier et al. (2009), for example, recently demonstrated that self-reported retrospective reports of PTG did not relate to growth assessed longitudinally in the same domains using other self-report scales (administered before and after the occurrence of adverse events).

Second, the conclusions of this study are limited by the nature of the outcome measures used, which were mostly subjective. As explained above, it is therefore unclear whether participants' subjective reports of creativity correspond to objective creative behavior and performance, and, as with all face-valid self-report measures, answers may have been influenced by demand characteristics and/or social desirability. The examination of participants' peak creative achievement scores (evaluated by raters) provided preliminary information regarding the nature of the relationship

between subjective and more objective measures of creativity. Results showed that breadth of creativity had a small but significant association with peak creative achievement scores. In contrast, perceived creative growth did not relate to peak creative achievement scores. Perceived creative growth could, however, still be associated with intraindividual changes (as opposed to between-individual differences) in creative achievement, a hypothesis which was not tested by the present study and which should be examined by further research.

The need to distinguish between creativity construed as a subjective judgment and creativity construed as an objectively measurable behavior ties in to an important controversy in the field of research on PTG. As mentioned earlier, researchers have questioned whether retrospective reports of growth reflect actual psychological change or only constitute motivated positive illusions used as a coping strategy (Taylor, 1983). Individuals may therefore be inclined to report positive changes in any domain queried following the experience of adversity. This study however found that only a subset of PTG/PTD domains predicted creativity outcomes, weakening the possibility that the effect found was the result of nonspecific positive illusions.

In addition, given the nature of the questionnaires used, the construct of "growth" was operationalized as a quantity (with higher scores reflecting "more" of something). Future research, however, needs to adopt more nuanced approaches to assessing growth by examining this construct both from qualitative and quantitative points of view. Growth can refer not only to *how much* of a construct (e.g., creativity) occurs, but also *how* it occurs (emphasizing the nature of the process, as opposed to the magnitude of change). In more concrete terms, positive changes in creativity could indeed correspond to experiencing an increased subjective sense of creativity, to engaging in creative activities more frequently, to taking part in a wider range of activities, or to making objectively more imaginative products or ideas, and so forth. Positive changes in creativity could also correspond to developing a new relationship toward one's creativity—for example, by discovering new motivations, goals, or preferred ways of creating—changes that would not be captured by quantitative measures such as the ones used in the present study. Further research is needed to explore the various ways in which positive changes in creativity may be experienced and expressed.

Other researchers have argued that subjective growth (such as the growth documented in the present study) may be the precursor to more genuine psychological or behavioral growth (Calhoun & Tedeschi, 2006; for a review see Zoellner & Maercker, 2006). In agreement with the view proposed by Tedeschi, Calhoun, and Cann (2007), the present study considered that subjective growth is an important and valuable outcome in its own right. A person could indeed "feel" creative even if others disagree, or even if the subjective feeling of creativity is not accompanied by commensurate changes in behavior (assessed either intra- or interindividually). As mentioned earlier, this study departed from previous research on the adversity-creativity link (which has mostly focused on eminent individuals) by focusing on a sample of non-eminent creators, and it is possible that the relationship between subjective and objective markers of creativity could be stronger in eminent individuals as a result of other factors (e.g., expertise, skill, etc.). Kaufman and Beghetto's (2009) four-c model of creativity can help place the results of the present study within the

context of existing knowledge on the development of creativity. The peak creative achievements reported by participants (which represented creative achievements at *one timepoint*, as opposed to change in creativity) in this study appeared to range from “mini-c” creativity (which is generally subjective in nature and inherent in the learning process), through “little-c” creativity (observable everyday creativity), to “Pro-c” (which represents professional levels of expertise and achievement that do not reach “Big-C,” or eminent, creativity). However, as the present study found that perceived creative growth did not relate to peak creative achievement, it is possible that the perceptions of *changes* in creativity were mostly subjective in nature (i.e., mini-c changes). Mini-c creativity, although typically not manifested by observable accomplishments, is thought to represent an important step in the developmental process of creativity, and researchers have called for its recognition and promotion to make sure that all creative potential is nurtured (Kaufman & Beghetto, 2009). This position is in line with Vygotsky’s (1967/2004, p. 7) claim that “any human act that gives rise to something new is referred to as a creative act, regardless of whether what is created is a physical object or some mental or emotional construct that lives within the person who created it and is known only to him.”

Nevertheless, future studies using behavioral measures of creative growth are needed in order to examine the relationships between changes in subjective and objective markers of creativity that follow adverse experiences. In addition to using behavioral tasks, future studies should also use a wide range of measures to investigate the particular psychological processes at play. PTG may have differential relationships to scores on tasks assessing divergent thinking, associative thinking, insight and convergent thinking, evaluative processes, or creativity-relevant personality traits, among other aspects of creativity (Kaufman, Plucker, & Baer, 2008).

Furthermore, future studies should look at other relationships between the variables at hand. For example, the present study hypothesized that adversity would predict both PTG/PTD and perceived creative growth (conceptualizing particular domains of PTG/PTD as mediators between adversity and perceived creative growth). Another possibility is that adversity may foster perceived creative growth, which may in turn enhance PTG as a whole—indeed, the therapeutic potential of creative activities has, for example, been noted by researchers in the field of creative-arts therapies (Forgeard & Eichner, in press; Slayton, D’Archer, & Kaplan, 2009). Future studies should investigate under which conditions creative involvement may lead to increased PTG.

Finally, demographic characteristics of the sample used should be kept in mind when interpreting the results of the present study. This sample was mostly Caucasian, female, educated, and from North America, and future research is therefore needed to look at the generalizability of these findings, as well as to explore the role of other demographic factors (e.g., professional affiliations, rural vs. urban locations, etc.). The construct of PTG and its relationship with aspects of creativity may not constitute a cultural universal (Forgeard et al., in press; Splevins, Cohen, Bowley, & Joseph, 2010).

### Conclusion

The present study constitutes the first empirical demonstration that perceptions of increased creativity constitute a manifestation

of PTG. What this study did *not* show, however, is that adversity is *needed* for creativity. Creativity is a multidetermined psychological construct, and many levers of change can be acted upon to foster both subjective and objective manifestations of creativity. Results of this study therefore do not imply that suffering is necessary for creativity. Other environmental influences, including nonadverse life events, for example, may contribute just as much to perceptions of growth and creativity (e.g., Roepke, 2011).

What this study did suggest is the following: Given that a majority of individuals unfortunately experience adverse events at some point in their lives, they may be able to use their experiences—alone or with the help of competent clinical counsel (Calhoun & Tedeschi, 1999)—to heal, grow, and fulfill their creative potential. This first study will hopefully stimulate further research to refine our understanding of the ways in which adversity contributes to both subjective and objective manifestations of creativity.

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(Appendices follow)

**Appendix A**  
**Perceived Creative Growth Scale**

Items included in the final version of the scale:

1. The difficult event I experienced made me a more creative person.
2. Engaging in a creative activity helped me cope with the difficult event I went through.
3. The pain I felt after experiencing the difficult event gave me an urge to become more creative.
4. The difficult event I went through allowed me to be more open to new ideas.
5. Creative activities helped me deal with the feelings I developed as a result of the difficult event I went through.
6. The difficult event I went through gave me a greater appreciation for the personal benefits of creative activities.

Items excluded from the final version of the scale:

1. The difficult event I went through made me question the point of engaging in creative activities.
2. The difficult event I went through discouraged me from pursuing creative activities.

*(Appendices continue)*



Appendix B

Correlations (Pearson's *r*) and *p* Values for all Continuous Variables Included in the Main Path Model

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1. Age																				
<i>r</i>	1.00	.21	.46	.10	-.12	.15	.08	.08	.05	.04	.11	.01	-.03	.00	.00	-.04	.01	.00	.06	
<i>p</i>		<.001	<.001	.05	.02	<.001	.13	.14	.33	.48	.03	.89	.59	.98	1.00	.42	.89	.96	.24	
2. Education																				
<i>r</i>	.21	1.00	-.04	-.01	-.13	-.06	.02	-.03	.04	.06	.05	-.07	.00	-.04	-.08	-.04	-.06	.01	.06	
<i>p</i>	<.001		.41	.86	.01	.26	.68	.62	.49	.26	.38	.20	.96	.50	.12	.47	.24	.77	.25	
3. Age at Main Event																				
<i>r</i>	.46	-.04	1.00	.21	-.12	.06	.15	.12	.03	-.01	.07	.07	-.16	-.01	-.04	-.13	-.05	-.07	-.05	
<i>p</i>	<.001	.41		<.001	.02	.21	<.001	.02	.55	.84	.20	.21	<.001	.89	.46	.01	.30	.20	.34	
4. Distress at Main Event																				
<i>r</i>	.10	-.01	.21	1.00	-.02	.31	.15	.10	.09	.11	.06	.16	.06	.01	.01	.03	-.01	.13	.10	
<i>p</i>	.05	.86	<.001		.64	<.001	<.001	.04	.08	.03	.25	<.001	.22	.78	.91	.57	.86	.01	.05	
5. Lifetime Number of Events																				
<i>r</i>	-.12	-.13	-.12	-.02	1.00	.15	.22	.10	.20	.14	.13	.17	.25	.12	.14	.13	.14	.14	.26	
<i>p</i>	.02	.01	.02	.64		<.001	<.001	.04	<.001	.01	.01	<.001	<.001	.02	.01	.01	.01	.01	<.001	
6. Intrusive Rumination																				
<i>r</i>	.15	-.06	.06	.31	.15	1.00	.44	.18	.22	.21	.12	.22	.31	.31	.26	.22	.26	.23	.20	
<i>p</i>	<.001	.26	.21	<.001	<.001		<.001	<.001	<.001	<.001	.02	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
7. Deliberate Rumination																				
<i>r</i>	.08	.02	.15	.15	.22	.44	1.00	.42	.49	.39	.32	.47	.15	.12	.13	.10	.05	.41	.19	
<i>p</i>	.13	.68	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	.02	.01	.05	.32	<.001	<.001	
8. PTG Relationships																				
<i>r</i>	.08	-.03	.12	.10	.10	.18	.42	1.00	.69	.65	.54	.68	-.15	-.05	-.03	-.04	-.07	.48	.12	
<i>p</i>	.14	.62	.02	.04	.04	<.001	<.001		<.001	<.001	<.001	<.001	<.001	.37	.51	.48	.20	<.001	.02	
9. PTG New Possibilities																				
<i>r</i>	.05	.04	.03	.09	.20	.22	.49	.69	1.00	.77	.54	.72	.14	-.06	-.07	.08	-.07	.62	.20	
<i>p</i>	.33	.49	.55	.08	<.001	<.001	<.001	<.001		<.001	<.001	<.001	.01	.23	.17	.14	.19	<.001	<.001	
10. PTG Personal Strength																				
<i>r</i>	.04	.06	-.01	.11	.14	.21	.39	.65	.77	1.00	.56	.68	.09	-.13	-.28	-.02	-.13	.54	.25	
<i>p</i>	.48	.26	.84	.03	.01	<.001	<.001	<.001	<.001		<.001	<.001	.10	.01	<.001	.71	.01	<.001	<.001	
11. PTG Spirituality																				
<i>r</i>	.11	.05	.07	.06	.13	.12	.32	.54	.54	.56	1.00	.53	.04	.01	-.04	-.27	-.02	.37	.10	
<i>p</i>	.03	.38	.20	.25	.01	.02	<.001	<.001	<.001	<.001		<.001	.48	.79	.42	<.001	.74	<.001	.07	
12. PTG Appreciation for Life																				
<i>r</i>	.01	-.07	.07	.16	.17	.22	.47	.68	.72	.68	.53	1.00	-.05	-.16	-.15	-.07	-.23	.49	.15	
<i>p</i>	.89	.20	.21	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		.30	<.001	<.001	.20	<.001	<.001	<.001	
13. PTD Relationships																				
<i>r</i>	-.03	.00	-.16	.06	.25	.31	.15	-.15	.14	.09	.04	-.05	1.00	.65	.61	.47	.62	.18	.11	
<i>p</i>	.59	.96	<.001	.22	<.001	<.001	<.001	<.001	.01	.10	.48	.30		<.001	<.001	<.001	<.001	<.001	.03	
14. PTD New Possibilities																				
<i>r</i>	.00	-.04	-.01	.01	.12	.31	.12	-.05	-.06	-.13	.01	-.16	.65	1.00	.78	.40	.82	-.02	.07	
<i>p</i>	.98	.50	.89	.78	.02	<.001	.02	.37	.23	.01	.79	<.001	<.001		<.001	<.001	<.001	.77	.21	
15. PTD Personal Strength																				
<i>r</i>	.00	-.08	-.04	.01	.14	.26	.13	-.03	-.07	-.28	-.04	-.15	.61	.78	1.00	.39	.70	-.01	.01	
<i>p</i>	1.00	.12	.46	.91	.01	<.001	.01	.51	.17	<.001	.42	<.001	<.001	<.001		<.001	<.001	.85	.83	
16. PTD Spirituality																				
<i>r</i>	-.04	-.04	-.13	.03	.13	.22	.10	-.04	.08	-.02	-.27	-.07	.47	.40	.39	1.00	.41	.07	.00	
<i>p</i>	.42	.47	.01	.57	.01	<.001	.05	.48	.14	.71	<.001	.20	<.001	<.001	<.001		<.001	.17	.93	

(Appendices continue)

Appendix B (continued)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
17. PTD Appreciation for Life																			
<i>r</i>	.01	-.06	-.05	-.01	.14	.26	.05	-.07	-.07	-.13	-.02	-.23	.62	.82	.70	.41	1.00	.02	-.01
<i>p</i>	.89	.24	.30	.86	.01	<.001	.32	.20	.19	.01	.74	<.001	<.001	<.001	<.001	<.001		.75	.81
18. Perceived Creative Growth																			
<i>r</i>	.00	.01	-.07	.13	.14	.23	.41	.48	.62	.54	.37	.49	.18	-.02	-.01	.07	.02	1.00	.23
<i>p</i>	.96	.77	.20	.01	.01	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	.77	.85	.17	.75		<.001
19. Breadth of Creativity																			
<i>r</i>	.06	.06	-.05	.10	.26	.20	.19	.12	.20	.25	.10	.15	.11	.07	.01	.00	-.01	.23	1.00
<i>p</i>	.24	.25	.34	.05	<.001	<.001	<.001	.02	<.001	<.001	.07	<.001	.03	.21	.83	.93	.81	<.001	

Appendix C

Unstandardized Estimates, Standard Errors, Standardized Estimates, and *p* Values for all Covariate Paths Included in the Main Path Model

Path	Unstd.	SE	Std.	<i>p</i>
Age → Deliberate Rumination	0.00	0.01	.03	.64
Age → Intrusive Rumination	0.02	0.01	.17	.00
Age → PTD Appreciation for Life	0.01	0.02	.04	.50
Age → PTD New Possibilities	-0.01	0.03	-.02	.73
Age → PTD Relationships	0.02	0.04	.04	.48
Age → PTD Spirituality	0.00	0.01	.02	.79
Age → PTD Personal Strength	0.01	0.02	.03	.57
Age → PTG Appreciation for Life	0.00	0.02	-.01	.84
Age → PTG New Possibilities	0.02	0.03	.04	.44
Age → PTG Relationships	0.03	0.04	.05	.41
Age → PTG Spirituality	0.03	0.02	.11	.06
Age → PTG Personal Strength	0.01	0.03	.02	.72
Age → Breadth of Creativity	0.06	0.03	.10	.09
Age → Perceived Creative Growth	0.00	0.03	.01	.87
Gender → Deliberate Rumination	0.24	0.16	.08	.12
Gender → Intrusive Rumination	0.68	0.18	.19	<.001
Gender → PTD Appreciation for Life	-0.41	0.44	-.05	.35
Gender → PTD New Possibilities	-0.21	0.71	-.02	.77
Gender → PTD Relationships	1.35	0.97	.07	.17
Gender → PTD Spirituality	-0.64	0.33	-.10	.05
Gender → PTD Personal Strength	0.35	0.60	.03	.55
Gender → PTG Appreciation for Life	0.15	0.50	.01	.76
Gender → PTG New Possibilities	0.77	0.84	.04	.36
Gender → PTG Relationships	0.67	1.07	.03	.53
Gender → PTG Spirituality	0.18	0.43	.02	.68
Gender → PTG Personal Strength	0.61	0.71	.04	.39
Gender → Breadth of Creativity	1.69	0.92	.09	.07
Gender → Perceived Creative Growth	0.52	0.74	.03	.48
Education → Deliberate Rumination	0.04	0.04	.04	.41
Education → Intrusive Rumination	-0.10	0.05	-.10	.05
Education → PTD Appreciation for Life	-0.08	0.12	-.03	.54
Education → PTD New Possibilities	0.01	0.20	.00	.98
Education → PTD Relationships	0.11	0.27	.02	.69

(Appendices continue)

## Appendix C (continued)

Path	Unstd.	SE	Std.	<i>p</i>
Education → PTD Spirituality	-0.02	0.09	-.01	.83
Education → PTD Personal Strength	-0.20	0.17	-.06	.22
Education → PTG Appreciation for Life	-0.20	0.14	-.07	.15
Education → PTG New Possibilities	0.09	0.23	.02	.70
Education → PTG Relationships	-0.28	0.30	-.05	.35
Education → PTG Spirituality	0.04	0.12	.02	.75
Education → PTG Personal Strength	0.17	0.20	.04	.38
Education → Breadth of Creativity	0.18	0.25	.04	.47
Education → Perceived Creative Growth	-0.07	0.20	-.01	.74
Ethnicity → Deliberate Rumination	0.03	0.03	.04	.40
Ethnicity → Intrusive Rumination	-0.01	0.04	-.01	.86
Ethnicity → PTD Appreciation for Life	0.16	0.09	.09	.08
Ethnicity → PTD New Possibilities	0.17	0.15	.06	.26
Ethnicity → PTD Relationships	0.30	0.21	.07	.14
Ethnicity → PTD Spirituality	0.08	0.07	.06	.27
Ethnicity → PTD Personal Strength	0.25	0.13	.10	.05
Ethnicity → PTG Appreciation for Life	0.00	0.10	.00	.97
Ethnicity → PTG New Possibilities	-0.05	0.18	-.01	.78
Ethnicity → PTG Relationships	0.15	0.23	.03	.52
Ethnicity → PTG Spirituality	0.03	0.09	.02	.72
Ethnicity → PTG Personal Strength	-0.21	0.15	-.07	.15
Ethnicity → Breadth of Creativity	-0.09	0.19	-.02	.63
Ethnicity → Perceived Creative Growth	0.08	0.15	.02	.62
Age at Main Event → Deliberate Rumination	0.01	0.01	.12	.04
Age at Main Event → Intrusive Rumination	-0.01	0.01	-.08	.14
Age at Main Event → PTD Appreciation for Life	-0.01	0.02	-.05	.36
Age at Main Event → PTD New Possibilities	0.00	0.02	.00	.97
Age at Main Event → PTD Relationships	-0.10	0.03	-.17	.00
Age at Main Event → PTD Spirituality	-0.02	0.01	-.13	.03
Age at Main Event → PTD Personal Strength	-0.02	0.02	-.05	.37
Age at Main Event → PTG Appreciation for Life	0.00	0.02	.00	.95
Age at Main Event → PTG New Possibilities	-0.03	0.03	-.06	.25
Age at Main Event → PTG Relationships	0.02	0.04	.03	.56
Age at Main Event → PTG Spirituality	-0.01	0.01	-.04	.53
Age at Main Event → PTG Personal Strength	-0.04	0.02	-.09	.12
Age at Main Event → Breadth of Creativity	-0.06	0.03	-.11	.07
Age at Main Event → Perceived Creative Growth	-0.06	0.03	-.11	.02
Main Event Kind → Deliberate Rumination	0.09	0.03	.15	.00
Main Event Kind → Intrusive Rumination	0.04	0.03	.06	.18
Main Event Kind → PTD Appreciation for Life	-0.01	0.08	.00	.94
Main Event Kind → PTD New Possibilities	0.04	0.13	.02	.74
Main Event Kind → PTD Relationships	-0.18	0.18	-.05	.33
Main Event Kind → PTD Spirituality	-0.06	0.06	-.05	.34
Main Event Kind → PTD Personal Strength	-0.02	0.11	-.01	.84
Main Event Kind → PTG Appreciation for Life	0.15	0.09	.08	.10
Main Event Kind → PTG New Possibilities	0.31	0.16	.09	.05
Main Event Kind → PTG Relationships	0.35	0.20	.08	.08
Main Event Kind → PTG Spirituality	0.24	0.08	.15	.00
Main Event Kind → PTG Personal Strength	0.17	0.13	.06	.19
Main Event Kind → Breadth of Creativity	0.08	0.17	.02	.65
Main Event Kind → Perceived Creative Growth	0.11	0.14	.03	.44
Lifetime Number of Events → Deliberate Rumination	0.05	0.01	.25	<.001
Lifetime Number of Events → Intrusive Rumination	0.04	0.01	.18	<.001
Lifetime Number of Events → PTD Appreciation for Life	0.05	0.03	.09	.08
Lifetime Number of Events → PTD New Possibilities	0.06	0.04	.07	.19
Lifetime Number of Events → PTD Relationships	0.22	0.06	.18	<.001
Lifetime Number of Events → PTD Spirituality	0.02	0.02	.05	.31
Lifetime Number of Events → PTD Personal Strength	0.06	0.04	.08	.13
Lifetime Number of Events → PTG Appreciation for Life	0.04	0.03	.06	.20

(Appendices continue)

## Appendix C (continued)

Path	Unstd.	SE	Std.	<i>p</i>
Lifetime Number of Events → PTG New Possibilities	0.12	0.05	.11	.02
Lifetime Number of Events → PTG Relationships	0.04	0.07	.03	.60
Lifetime Number of Events → PTG Spirituality	0.05	0.03	.09	.08
Lifetime Number of Events → PTG Personal Strength	0.07	0.04	.08	.13
Lifetime Number of Events → Breadth of Creativity	0.28	0.06	.25	<.001
Lifetime Number of Events → Perceived Creative Growth	−0.04	0.05	−.04	.37

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