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Table of Contents

Acknowledgements ........................................................................................................i
Table of Contents .......................................................................................................... ii
List of Tables ................................................................................................................ iii
List of Appendices ........................................................................................................ iv
Abstract ......................................................................................................................... 1
Review of the Literature ................................................................................................. 2
Method .......................................................................................................................... 7
Procedure ....................................................................................................................... 12
Results ............................................................................................................................ 13
Discussion ...................................................................................................................... 17
References ...................................................................................................................... 24
Tables ............................................................................................................................. 30
Appendices .................................................................................................................... 36
Summary ......................................................................................................................... 47
# List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frequency of Reported Traumatic Events</td>
<td>30</td>
</tr>
<tr>
<td>2. Frequency of Trauma Types</td>
<td>31</td>
</tr>
<tr>
<td>3. Means and Standard Deviations for Study Variables</td>
<td>33</td>
</tr>
<tr>
<td>4. Multiple Regression Analysis for All Variables</td>
<td>34</td>
</tr>
<tr>
<td>5. Multiple Regression for Exploratory Analysis</td>
<td>35</td>
</tr>
</tbody>
</table>
## List of Appendices

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Xavier University IRB Approval Letter</td>
<td>36</td>
</tr>
<tr>
<td>B. Demographics Questionnaire</td>
<td>37</td>
</tr>
<tr>
<td>C. Trauma History Questionnaire</td>
<td>38</td>
</tr>
<tr>
<td>D. Modified Impact of Events Scale-Revised</td>
<td>39</td>
</tr>
<tr>
<td>E. Core Beliefs Inventory</td>
<td>40</td>
</tr>
<tr>
<td>F. Event Related Rumination Inventory</td>
<td>41</td>
</tr>
<tr>
<td>G. Posttraumatic Growth Inventory</td>
<td>42</td>
</tr>
<tr>
<td>H. Participant Pool Flyer</td>
<td>43</td>
</tr>
<tr>
<td>I. Informed Consent Form</td>
<td>44</td>
</tr>
<tr>
<td>J. Psychological Resources</td>
<td>45</td>
</tr>
<tr>
<td>K. Research Credit Form</td>
<td>46</td>
</tr>
</tbody>
</table>
Abstract

Exposure to trauma is a pervasive problem that can result in a myriad of symptoms and pathologies and affects individuals across all demographics. Following trauma exposure, some individuals reconstructed their world views, sought meaning and experienced the phenomenon of posttraumatic growth (PTG). Undergraduate participants \((N=106, M_{\text{age}}=20.75)\) were recruited to complete phase 1, which was an online, 15 minute questionnaire. Participants who acknowledged trauma exposure completed phase 2, which consisted of four additional measures. Ninety-three participants (87.7%) reported exposure to at least one traumatic event. The sample’s multiple correlation coefficient was .78, indicating that approximately 60% of the variance of PTG was accounted for by the linear combination of the predictors of trauma severity, core beliefs, and degree of intrusive and deliberate rumination. Deliberate rumination and core beliefs were both positive correlated with and accounted for significant variance of PTG; trauma severity was not a significant predictor. A follow-up exploratory analysis revealed that deliberate rumination (when entered without trauma severity and core beliefs) accounted for 53% of the variance of PTG. These results coupled with results from an exploratory analysis provided insight that deliberate rumination is a key component in facilitating PTG, and were consistent with other findings (Benetato, 2011; Stockton, Hunt & Joseph, 2011).
The Relationship of Trauma Severity, Rumination, and Restructured Core Beliefs to Posttraumatic Growth

Exposure to trauma is a common occurrence that affects individuals across all demographics. A recent prevalence study found that 89.7% of 2,953 participants had experienced at least one traumatic event as described in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association [APA], 2013; Kilpatrick et al., 2013). Trauma exposure is also common on college campuses across the United States. Two studies found that 66% of first year university students that participated in the studies reported exposure to at least one traumatic event (Read, Ouimette, White, Colder, & Farrow, 2011; Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008).

The DSM-5 defined a traumatic event as exposure to actual or threatened death or serious injury (APA, 2013). Trauma exposure was defined as occurring in one of four ways: through direct experience, witnessing, learning, and through repeated indirect exposure to the aversive details of events (e.g., first responders). Emotional responses in reaction to the traumatic events are no longer part of diagnostic criteria as they were in the Diagnostic and Statistical Manual of Mental Disorders (4th edition, revised text; DSM-IV-TR; American Psychiatric Association [APA], 2000). Traumatic events were typically examined in reference to the specific trauma types (e.g., victimization versus natural disaster), chronicity (e.g., acute stress-car accident versus chronic stress-physical
abuse by parents), and magnitude of the events (e.g., seismic versus moderately aversive) (Janoff-Bulman, 1992; Schaefer & Moos, 1998). Effects of trauma varied depending on how trauma was examined.

According to the DSM-5, following any major life trauma, individuals typically need about 3-6 months to adjust, although some individuals required years (APA, 2013). Overall, the course of trauma varied depending on many factors, including the person’s age and number and type of traumatic experiences (Aldwin & Sutton, 1998; Sawyer & Ayers, 2009). Typically, survivors of trauma commonly experienced psychological pain, negative affect, physical symptoms, and difficulty concentrating in the short-term following the traumatic event (Tedeschi & Calhoun, 2004). Furthermore, other negative outcomes following trauma commonly included greater risk of developing mood disorders (e.g., depression), increased rumination, potential feelings of shock, withdrawal and avoidance (Calhoun & Tedeschi, 1999; Tedeschi & Calhoun, 2004).

Long-term negative outcomes following trauma exposure are most commonly associated with Posttraumatic Stress Disorder (PTSD), with symptoms of re-experiencing the trauma (e.g., recurrent intrusive rumination), persistent avoidance (e.g., avoiding reminders of trauma), negative alterations in thoughts (e.g., inability to remember important aspects of trauma), and hyperarousal (e.g., problems with concentration; APA, 2013). Several factors associated with increased risk of long term negative outcomes following trauma included greater severity of trauma, closer proximity, larger extent of loss, longer duration, larger degree of unpredictability, extremeness of the event, and unusualness of the trauma (Janoff-Bulman, 1992; Schaefer & Moos, 1998).
In contrast, Tedeschi, Park and Calhoun (1998) described the phenomenon of Posttraumatic Growth (PTG; first termed by Tedeschi & Calhoun, 1995) as an antithesis to PTSD and both a process and an outcome of positive change. Calhoun and Tedeschi (1999) proposed that when individuals encountered a seismic event or trauma, they engaged in a meaning making process to make sense of and cope with the extreme cognitive and emotional turmoil. The seismic event shattered the pre-trauma fundamental assumptions, and individuals were left to rebuild more adaptive, realistic ways of viewing themselves and the world (Janoff-Bulman, 1992; Tedeschi et al., 1998). Tedeschi and Calhoun (2004) hypothesized that individuals who achieved PTG grew in a “transformative” way (qualitative change in functioning) that was beyond the pre-trauma levels of functioning (e.g., new life priorities, a deepened sense of meaning, and more profound connections with others). Trauma survivors demonstrating PTG reported beneficial change in cognitive, emotional, and behavioral functioning post-trauma (Tedeschi et al., 1998). Prevalence rates of PTG have ranged from 29% (older adolescents previously exposed to a variety of trauma; Milam, Ritt-Olson, & Unger, 2004) to 97.6% (women who survived breast cancer; Weiss, 2002).

Janoff-Bulman’s Assumptive World Theory proposed that individuals’ fundamental assumptions about the world were robust with generalized knowledge gained from their life experiences and were resistant to change over time (Janoff-Bulman, 1992). Additionally, he had three hypotheses including (a) individuals tended to view the world at large as compassionate, (b) despite bad things happening, people strove to make meaning of life events, and (c) individuals typically evaluated themselves often and more positively in reference to their strengths and positive attributes. Based on these
assumptions, following major life crises that were of seismic magnitude, individuals’ pre-existing core beliefs were shattered (Janoff-Bulman, 1992; Tedeschi et al., 1998).

Calhoun and Tedeschi (1999) proposed in their theory of PTG that survivors attempted to understand the trauma and, through a struggle of rumination, meaning making, and core belief reconstruction, individuals could potentially grow past pre-trauma functioning in a qualitatively transformative way.

One facet that was emphasized in their research was the role of rumination and cognitive processing (Calhoun & Tedeschi, 1999). The authors theorized that individuals experienced intrusive cognitive revisiting that either a) perpetuated brooding and invasive rumination that potentially led to PTSD, or b) sparked deliberate reflection and desire to search and attribute meaning to the events, which initiated PTG. The authors believed that immediately following trauma, rumination likely tended to be more automatic, distressing and unwelcome. If over time, survivors deliberately and meaningfully revisited the trauma, its precipitating events and consequences, they would likely initiate growth. Thus, Calhoun and Tedeschi (1999) hypothesized that through deliberate rumination, individuals comprehended that the event really took place, and engaged in a process called “meaning making.” During this process, survivors strove to understand why the negative events happened in attempt to assimilate the new aversive information about the world into the shattered, pre-existing schema to create a more well balanced world view. This assimilation and rebuilding process allowed the survivors to move past the trauma with repaired schemas and permitted them to view the world and themselves through more realistic lenses. Lindstrom, Cann, Calhoun and Tedeschi (2013) found that the extent to which core beliefs were challenged, as measured by the Core Beliefs
POSTTRAUMATIC GROWTH

Inventory (CBI), was a significant predictor of PTG as measured by the Posttraumatic Growth Inventory (PTGI). Furthermore, Stockton et al. (2011) found that the more brooding (negative rumination) and intrusive thoughts that were present, the less likely individuals were to develop PTG. The results also illustrated that reflective rumination (deliberate rumination) was associated with PTG, but only in the absence of brooding. The authors concluded that trauma survivors had to accept that their way of previously viewing the world had to change. Participants who achieved successful meaning making had disengaged from beliefs, goals, and activities that no longer fit with their newly developed worldviews (i.e., survivors who suffered paralysis after a car accident must disengage from the belief that they will walk again).

PTG was demonstrated in several studies that examined rates in individuals who served in the armed forces (Benetato, 2011; Feder et al., 2008; Gallaway, Millikan, & Bell, 2011) or survived acts of violence (Shakespeare-Finch and Armstrong, 2010), accidents (Shakespeare-Finch and Armstrong, 2010; Zoellner, Rabe, Karl, & Maercker, 2011), natural disasters (Holgersen, Boe, & Holen, 2010; Pooley, Cohen, O’Connor, & Taylor, 2013), and serious or life threatening illnesses (Posluszny, Baum, Edwards, & Dew, 2011). The current investigation was designed to extend the findings to determine the relationship among predictors (trauma severity, rumination, or extent core beliefs were challenged) with PTG, including directionality and variance in a sample of undergraduate participants. The study was the first to enter all predictors together to determine the relationship with PTG. The current study hypothesized that perceived trauma severity, extent to which core beliefs were challenged, and deliberate rumination would be significantly positively associated with PTG, and intrusive rumination would be
significantly negatively correlated with PTG. Furthermore, trauma severity, core beliefs and deliberate rumination will account for significant variance in PTG.

**Method**

**Participants**

An *a priori* power analysis for a multiple regression with four independent variables, determined that 84 total participants were needed in order to detect a medium effect with an alpha of .05 (Cohen, 1992). Given that previous studies indicated that approximately 66% of undergraduate student samples reported exposure to trauma (Read et al., 2011; Smyth et al., 2008), 128 participants were recruited in order to attain the targeted sample size of 84 participants. Initially, the sample included 132 participants; however 19 participants’ data were excluded due to opening the link to the study measures and not completing any information. Another seven participants’ data were excluded due to completing phase 1 of the study and reporting trauma, but failing to complete the instruments regarding their posttrauma experiences in phase 2. The final sample (*N*=106) included 39 men (36.8%) and 67 women (63.2%). The age range of the participants was from 18-56 years; the oldest participant was at least 33 years older than the rest of the participants, and the mean age was 20.75 (*SD*= 3.88). Caucasian participants were most highly represented within the sample with 83.0%. Smaller proportions of African American (.9%), Asian (2.8%), Hispanic (6.6%), Bi-racial or Multi-racial (3.8%), other ethnicities (1.9%) participated, and less than one percent, (.9%) declined to answer the ethnicity question. Exposure to trauma was widely reported; 87.7% of the sample reported exposure to at least one traumatic event, meaning 93 participants reported trauma exposure and completed measures in phase 2, and were thus
included in the final regression analysis. Approximately 50% of participants reported four or more traumatic experiences, with frequencies of total number of reported experiences found in Table 1. Furthermore, Table 2 presented the frequencies of each specific type of trauma that participants reported.

The university’s Institutional Review Board approved this study prior to recruiting participants (see Appendix A). Undergraduate students were recruited through the psychology department’s participant pool through which they were given research credit in exchange for their participation.

Measures

**Demographic Questionnaire.** All participants completed a demographic questionnaire, which included information about age, gender, and race (See Appendix B).

**Trauma History Questionnaire.** The Trauma History Questionnaire (THQ; Green, 1996) is a 24-item, self-report measure developed to assess history of trauma exposure as defined in the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association [APA], 1994; Hooper, Stockton, Krupnick, & Green, 2011; see Appendix C). The THQ has been used as a screener for trauma exposure in studies involving participants who have experienced a variety of traumatic events (Hooper et al., 2011) The 24 items in the THQ are divided into three categories of trauma: (a) crime related events (e.g., mugging, robbery), (b) general disaster and trauma (e.g., car accident, earthquake), and (c) physical and sexual experiences (e.g., corporal punishment that resulted in injury, inappropriate touching). The measure also included one “other” item, which provided the participant an opportunity to note any trauma not previously covered in the assessment. Participants indicated whether or not they had
experienced the event presented in each item. If they endorsed having experienced a specific trauma event, they then indicated the frequency and age at which the event occurred. Many items also allowed participants to elaborate on their responses (e.g., “Have you ever had a serious accident at work, in a car, or somewhere else? (If yes, please specify below).

**Modified Impact of Events Scale-Revised.** The Impact of Events Scale-Revised (IES-R; Weiss & Marmar, 1997) is a 22-item self-report measure, which assesses the level of subjective distress experienced as a result of trauma exposure (see Appendix D). The IES-R is a revised version of the older, 15-item Impact of Events Scale (IES; Horowitz, Wilner & Alvarez, 1979). Seven additional items were added to create the revised scale, which measure hyperarousal symptoms that were not queried in the original IES. Items on the IES-R correspond to the DSM-IV (APA, 1994) criteria for PTSD divided into three subscales: Avoidance (eight items; e.g., “I stayed away from reminders about it”), Intrusion (eight items; e.g., “I had trouble staying asleep”), and Hyperarousal (six items; e.g., “I was jumpy and easily startled”). On the IES-R, participants are asked to read each item and indicate how distressing each difficulty has been during the past 7 days with respect to their most distressing life event. The directions were altered for this study and participants were asked to read each item and indicate how distressing each difficulty has been following exposure to their most distressing life trauma. The instructions were changed so that the time frame in the measure was more consistent with the time frames reported in the other measures. Since this study is using a modified version of the IES-R, the reliability and validity data do not apply to the modified version. However, other studies have altered the time frame for
reporting perceived severity (Janson & Hazler, 2004; Sanders Thompson, 1996) and found the scale useful under those conditions.

Items were rated on a 5-point Likert scale (0=Not at all, 1=A little bit, 2=Moderately, 3=Quite a bit, and 4=Extremely). Total scores of the modified IES-R were determined through calculating the mean for each subscale (e.g., Avoidance subscale=mean of items 5, 7, 8, 11, 12, 13, 17, and 22) then summing the subscales’ mean scores for a total modified IES-R mean score. Mean subscale scores ranged from 0-4 making the total modified IES-R maximum score 12. Total raw scores were also computed, and the authors reported that total raw scores of greater than 33 were indicative of possible presence of PTSD (D. Weiss, personal communication, September 17, 2013). Lower scores reflected less distress experienced as the result of traumatic events, whereas higher scores were more indicative of posttraumatic stress symptoms.

Core Belief Inventory. The Core Belief Inventory (CBI; Cann, et al., 2010) is a nine-item self-report measure, which assessed the degree to which participants challenged their fundamental core beliefs (e.g., beliefs about themselves, their world and their future) following major stressful life events (see Appendix E). Participants were asked to reflect upon the life event on which they were reporting, and then indicated the extent to which the event led them to seriously examine each of the core beliefs. Items included statements such as: “Because of the event, I seriously examined my assumptions concerning why other people think and behave the way that they do.” Items are rated on a 6-point Likert scale (0=not at all, 1=to a very small degree, 2=to a small degree, 3=to a moderate degree, 4=to a great degree, and 5=to a very great degree). Total CBI scores
were calculated by summing each item score and range from 0 to 45. Higher scores indicated greater number of core beliefs challenged.

**Event Related Rumination Inventory.** The Event Related Rumination Inventory (ERRI; Cann et al., 2011) is a 20-item measure, which assessed intrusive rumination following trauma (10 questions; e.g., “Thoughts about the event came to mind and I could not stop thinking about them”) and deliberate rumination (10 questions; e.g., “I thought about whether I could find meaning from my experience”) (see Appendix F). Items were rated on a 4-point Likert scale (0=Not at all, 1=Rarely, 2=Sometimes, 3=Often) and results were summed under each domain to yield two separate total domain scores. Higher scores indicated greater frequency of either deliberate or intrusive rumination.

**Posttraumatic Growth Inventory.** The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) is a 21-item self-report measure which assessed subjective positive change following exposure to trauma in five domains: Relating to Others (seven items, e.g., “I have a greater sense of closeness with others”), New Possibilities (five items, e.g., “I developed new interests”), Personal Strength (four questions, e.g., “I know better that I can handle difficulties”), Spiritual Change (two questions, e.g., “I have a stronger religious faith”), and Appreciation of Life (three items, e.g., “I changed my priorities about what is important in life.”) (see Appendix G). For each statement, participants were asked to indicate the degree to which the specified positive change occurred in their lives as a result of trauma. Items were rated on a 6-point scale (0=I did not experience this change as a result of my crisis, 1=I experienced this change to a very small degree as a result of my crisis, 2=I experienced this change to a small degree as a
result of my crisis, 3= I experienced this change to a moderate degree as a result of my crisis, 4= I experienced this change to a great degree as a result of my crisis, 5= I experienced this change to a very great degree as a result of my crisis). Summing all responses scored the PTGI. Total scores ranged from 0-105; higher scores indicated greater perceived PTG. Individual domain scores were not used in the current study. All of the aforementioned assessment instruments were chosen because their relevance was not altered by switching to DSM-5.

Procedure

Through a psychology participant pool, participants signed up for this online study with the Survey Gizmo hyperlink (http://tinyurl.com/nq2ju9f) and password (see Appendix H). The first page that appeared introduced participants to the study, informed them of whom to contact with questions or concerns and discussed informed consent (see Appendix I). Following this introductory page, participants were directed to phase 1 of the study. This phase included the demographic page where they provided information regarding their age, gender, and race, followed by the THQ. Participants were then asked “On the previous questionnaire, did you indicate YES to any of the questions?” and could choose “yes” or “no.” Participants who indicated “no,” completed phase 1 of the study and were directed to the credit and debriefing pages where they were provided on-campus psychological resources (see Appendix J) and an opportunity to provide their name, professor’s name and course number for 15 minutes of research credit, if applicable (see Appendix K). This demographic information was not linked to the participant’s survey responses.

After completing phase 1, if participants indicated “yes” to the question noted
above, they were directed to phase 2, which consisted of the modified IES-R, CBI, ERRI, and PTGI in randomized order to control for possible response bias/order effects. Following completion of the study, participants were directed to the same credit and debriefing pages, except they were offered 60 minutes of research credit, if applicable. Information reported on the credit page was not linked to participant’s survey responses.

**Results**

A multiple regression analysis was conducted in order to test the hypothesis that perceived trauma severity, extent to which core beliefs were challenged, and deliberate rumination, were positively and significantly correlated with PTG, and intrusive rumination was negatively and significantly correlated with PTG, and all of the variables listed accounted for significant variance in PTG. The predictors included trauma severity, core beliefs, deliberate and intrusive rumination and the criterion variable was PTG. Preliminary statistics were conducted in order to analyze the statistical assumptions including multicollinearity, normality, outliers and linearity of the data.

There were mixed recommendations regarding how to interpret the results of variance accounted for when the data evidenced some multicollinearity. Farrar and Glauber (1967) described multicollinearity in terms of severity, rather than existence. The authors reported a more conservative rule of thumb to determine severity of multicollinearity, which included $r$ values of greater than $r = .8$ or .9. Pallant (2010) reported that multicollinearity was often problematic when two predictor variables were highly correlated ($r = .9$); however she cautioned researchers who found $r$ values of >.7 to further investigate the potential effects of intercorrelation through additional methods. Other methods to better highlight potential multicollinearity included observing the
tolerance and variance inflation factor (VIF) in the coefficients table of an output. A review of the literature conducted by Dormann et al. (2012) and information provided by Pallant (2010) both reported widely agreed upon cutoff scores for the high potential of multicollinearity between predictor variables included VIF scores above 10, and tolerance values below .1. In this study, the correlation between the modified IES-R and intrusive rumination scale was $r = .7$, and the correlation between the CBI and the deliberate rumination scale was $r = .7$. These scores fell under the cutoff of $r = .8$ that was established based on conservative views of multicollinearity. Furthermore, the VIF scores for measures of the modified IES-R, CBI, and the intrusive and deliberate scales of the ERRI were 2.6, 2.5, 2.4, and 2.4. The tolerance scores for these measures were all equal to .4. All VIF scores were well below the widely used cutoff of 10, and the tolerance scores were all well above the cutoff of .1. The VIF and tolerance scores in this study indicated acceptable evidence of low levels of multicollinearity, which suggested results were interpretable.

The normal probability plot (P-P) of the regression standardized residual displayed a normal curve, which was comprised of a straight diagonal line from left to right. This plot demonstrated no major deviations from normality, thus normality was a reasonable assumption. The scatterplot also demonstrated that the residuals were roughly rectangularly distributed, and there was no systematic pattern to the residuals (e.g., curvilinear or higher on one side) meaning the results were appropriately linear. Outliers were evaluated by examining the maximum mahalanobis distance found in the residual’s statistics box and comparing it to the critical chi-square value for the number of independent variables used in the regression equation. In this study, the maximum
mahalanobis distance was 20.77 and the critical chi-square value for four predictive variables was 18.47. There was one identified outlier with the value of 20.77. Follow up observations of the Cook’s Distance, which was 0.1, was below the agreed upon cutoff of 1 (Pallant, 2010). The Cook’s Distance score indicated that the outlier was not likely causing problematic influence on the results.

In summary, high levels of intercorrelation were found among two pairs of predictors, the modified IES-R and intrusive rumination scale, and the CBI and the deliberate rumination scale; however the values fell below the threshold for multicollinearity based on conservative standards of correlation values, VIF and tolerance scores. There was also a reasonable assumption that the data were normally distributed and likely linear. There was one outlier that was determined not to have undue influence on the results. Given these results, the standard multiple regression analysis was interpretable.

The means and standard deviations of predictor variables are presented in Table 3. The linear combination of predictor variables was significantly related to PTG, $F(4, 88) = 33.67, p < .01$. The sample’s multiple correlation coefficient was .78, indicating that approximately 60% of the variance of PTG was accounted for by the linear combination of the trauma severity, core beliefs, and degree of intrusive and deliberate rumination. As hypothesized, all predictors except intrusive rumination had a positive relationship with PTG. The zero-order correlations, standardized regression coefficients, significance levels and part correlation values were presented in Table 4. Deliberate rumination made the strongest unique and significant contribution, accounting for approximately 10.9% of the variance in PTG. The extent core beliefs were challenged following trauma also made
a unique and significant contribution accounting for approximately 6% of the variance in PTG. Intrusive rumination accounted for approximately .65% of the variance, and perceived severity of trauma accounted for .02% of variance; neither variable accounted for unique or significant variance in PTG.

**Exploratory Analysis**

In order to better understand the relationships among the predictor variables with PTG, an exploratory analysis was conducted with deliberate and intrusive rumination only, with core beliefs and trauma severity removed. The two rumination predictors were retained because prior research documented positive and significant relationships among trauma severity, challenged core beliefs, and PTG (Holgersen, et al., 2010; Lindstrom et al., 2013; Pooley et al., 2013). Additionally, there has been less research specifically examining the relationship between rumination patterns and PTG. To better understand this relationship, predictors included in the exploratory analysis were total deliberate rumination scores and total intrusive rumination scores and the criterion variable was PTG.

Assessment through aforementioned methods revealed that limited evidence of severe multicollinearity, adequate normality and linearity, and no outliers were reasonably assumed. In Table 5, the bivariate correlations between the two predictors and PTG were presented. The linear combination of deliberate and intrusive rumination was significantly correlated with PTG, $F(2, 90) = 51.85, p < .01$. The sample’s multiple correlation coefficient was .7. When the two original predictor variables (extent core beliefs were challenged and perceived trauma severity) were excluded, 53% of the variance of PTG was accounted for by the linear combination of the predictors of
intrusive and deliberate rumination. Deliberate rumination had a positive relationship and intrusive rumination had a negative relationship with PTG. The standardized regression coefficients and their significance levels as well as part correlation values were presented in Table 5. Deliberate rumination made a strong and significant contribution, and accounted for approximately 36.6% of the variance of PTG. Intrusive rumination was not a strong or significant predictor, and only accounted for .06% of the variance of PTG. The remaining 16.3% of the variance accounted for by the linear combination of intrusive and deliberate rumination was attributed to any overlap or shared variance between predictors that was removed or partialled out.

**Discussion**

The purpose of this study was to extend the Posttraumatic Growth (PTG) literature by assessing the unique contributions to PTG by predictors commonly used in previous studies; trauma severity and core beliefs, and less commonly studied predictors including deliberate and intrusive rumination.

The hypothesis that perceived trauma severity, extent to which core beliefs were challenged posttrauma, and deliberate rumination would be significantly and positively correlated with and account for significant variance in PTG, and intrusive rumination would have a significant negative correlation with PTG was partially supported. As predicted, trauma severity, core beliefs and deliberate rumination were positively correlated and intrusive rumination was negatively related to PTG. Deliberate rumination and core beliefs were the only two variables that had significant and unique relationships with PTG, and together accounted for 16.9% of the variance of PTG. These results indicated that there was considerable common variance among predictor variables.
Specifically, the amount of shared variance that was partialled out was higher than the unique variance that deliberate rumination and core beliefs accounted for in PTG. Many items in the CBI and deliberate rumination scale of the ERRI were potentially measuring the process of meaning making. For example, the item in the CBI stating “Because of the event, I seriously examined my beliefs about the meaning of my life,” is potentially measuring meaning making in the same way as a question from the deliberate rumination scale of the ERRI, “I thought about whether I could find meaning from my experience.” In theory, the unique and significant contributions that deliberate rumination and core beliefs accounted for in PTG were consistent with many studies that also found significant positive relationships among these variables (Lindstrom et al., 2013; Stockton et al., 2011). However, statistically the CBI and deliberate rumination scale of the ERRI are likely measuring the same construct, which may be a form of meaning making.

According to the theory presented by Tedeschi et al. (1998), PTG is both a process and an outcome of positive change. Extent core beliefs were challenged and deliberate rumination that the participants reported posttrauma aligned with Calhoun and Tedeschi’s (1999) proposed idea that after trauma individuals engage in meaning making in order to make sense of and cope with turmoil. The meaning making process of challenging core beliefs and cognitively processing trauma through deliberate rumination was theoretically related to PTG, and data in the current study supported this supposition.

Results did not reflect a significant relationship between trauma severity and PTG, despite previous findings to the contrary (Holgersen, et al., 2010; Pooley, et al., 2013). One possible explanation is that perceived trauma severity is related to PTG, however trauma severity may be more strongly associated with specific domains of
growth rather than a composite PTG. For example, Shakespeare-Finch and Armstrong (2010) found that individuals who survived sexual assault had the highest severity scores on the IES-R, and the lowest overall total PTG. Despite lower overall total PTG scores, participants scored relatively higher in specific growth domains of new possibilities and personal strength. These results demonstrated that there may be a relationship between trauma severity and PTG, but the resulting growth is less pervasive within individuals, and is experienced more within specific domains.

Another potential explanation is that although many participants in the present study endorsed multiple trauma exposures, the types of trauma that participants identified as most distressing on the modified IES-R (e.g., receiving news of death or serious injury) were less severe than trauma reported on the IES-R in other studies (total raw score: $M=34.25$, $SD=19.35$). Since participants were asked to complete the modified IES-R with respect to their most distressing life event, the scores on the modified IES-R did not reflect the overall impact of exposure to complex or multiple trauma exposures. Furthermore, participants in other studies that used the IES-R indicated how distressing each difficulty was in the past seven days. Therefore, the participant’s reports of trauma severity in this study may have been inflated because they retrospectively reported their distress rather than reporting current angst. Had the directions not been modified, it is likely that overall trauma severity as reported by participants in this study would be less severe and more comparable to less severe reports in other studies. For example, Shakespeare-Finch and Armstrong (2010) found varying totals on the IES-R depending on the specific trauma the participants experienced. Specifically, they found that survivors of motor vehicle accidents reported an IES-R mean total score of 41.74,
survivors of sexual abuse reported a score of 61.22, and bereaving individuals reported a mean score of 45.98; all of the IES-R scores were greater than modified IES-R scores in the current study. Conversely, survivors of an oil rig disaster in a longitudinal study and participants from cyclone stricken communities in Australia reported less trauma severity on the IES-R than participants in the current study (Holgerson et al., 2010; Pooley et al., 2013). Compared to some studies, trauma in the current study may not have been seismic enough to catalyze meaning making to the extent that participants reported more PTG; even though trauma severity was higher than some other studies (e.g., oil rig survivors), it was not significantly related to PTG.

The exploratory analysis provided a more detailed understanding of the unique contributions of rumination patterns. Deliberate rumination accounted for a greater amount of variance when the other predictors of trauma severity and core beliefs were removed. This result is consistent with Calhoun and Tedeschi’s (1999) theory that a goal of treating individuals who experienced trauma is to encourage clients to create new narratives that assimilated their trauma experiences into their previously held worldviews (believed to be accomplished by deliberate rumination).

**Strengths and Weaknesses**

A strength of the current study is that it is the first study that included previously identified significant predictors of trauma severity and core beliefs, and more newly hypothesized predictors of rumination patterns together in a multiple regression analysis. Adding the new concepts in the present study allowed a better understanding of theorized process in which survivors engage in order to achieve PTG predictors.
Another strength of the current investigation was the methods; specifically, the instruments that were administered in phase 2 were provided in randomized order to control for possible response bias/order effects. Additionally, a study conducted by Kreuter, Presser, and Tourangeau (2008) found that internet administration increased the level of reporting of sensitive and accurate information as opposed to reporting through telephone interviewing or through voice recognition software. This study was online and the participants were offered full privacy and confidentiality of responses. Internet IP addresses were not collected and participation credit information was not linked to assessment responses. Participants were able to conveniently complete the study at their own leisure without disclosing their identities, and likely reported more sensitive and accurate information on the measures regarding exposure to trauma.

A last strength of this study was the sample. This investigation generalized findings to a young adult, college student population. This strength is also a limitation in that this study sample was more homogeneous regarding education (e.g., all participants were current university students) and racial/ethnic identity.

An inherent limitation of this study was that all results were correlational; no causal relationships could be identified. Despite lack of causality, important information regarding relationships of key variables with PTG was identified. Another limitation was that high levels of intercorrelation were found among the predictors, which fell below the threshold for multicollinearity based on some standards (e.g., VIF and tolerance scores) and was at or above it for other standards (e.g., $r > .7-.9$). High levels of intercorrelation can reduce the accuracy of interpreting results of the regression equation including the amount of variance accounted for by each predictor variable. In addition, high
intercorrelations among predictor variables increase standard error values and can result in inaccurate interpretation of results. Lastly, participants answered questions regarding experiences following trauma retrospectively. With retrospective data, there is a potential risk of bias or a less than accurate recall of events. Despite the risk of bias and potentially inaccurate recall, PTG by definition requires individuals to retrospectively recall events in order to grapple with and engage in meaning making in order to inform current growth; thus retrospective recall is a necessary process for successful PTG following trauma.

**Future Directions**

The current study, through both initial and exploratory analyses, found that deliberate rumination is significantly and positively related to PTG and also accounts for significant variance of PTG. Further analysis that examined relationships between deliberate rumination and specific subscales of PTG would provide more specific insight into types of growth to which deliberate rumination may relate. As previously mentioned, although the results of the current investigation generalized findings to young adult populations, future researchers should attempt to broaden the diversity of the sample including factors of age, race and ethnicity. In addition, repeating the study with veterans or young adults who reported greater, more seismic trauma exposure could to better help emphasize the relationship between trauma severity and PTG.

Lastly this study highlighted a strong relationship between deliberate rumination and PTG. Regarding clinical applicability, an investigation that examined trauma survivors’ perceived PTG following completion of treatment that included a narrative intervention could provide further insight of the utility of deliberate rumination in
treatment. Results of this type of investigation would provide invaluable insight into the facilitation of PTG with trauma survivors.
References


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http://dx.doi.org/10.1002/jts.2490090305.


doi:10.1207/s15327965pli1501_01


Table 1

*Frequency of Reported Traumatic Events*

<table>
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<tr>
<th>Traumatic Events</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
</tr>
</tbody>
</table>

*Note.* Frequency of traumatic events reported by all participants.
Table 2

*Frequency of Trauma Types*

<table>
<thead>
<tr>
<th>Trauma Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received news of death or serious injury</td>
<td>73</td>
</tr>
<tr>
<td>Serious accident</td>
<td>35</td>
</tr>
<tr>
<td>Saw dead bodies (other than at funerals)</td>
<td>32</td>
</tr>
<tr>
<td>Witnessed serious injury or death</td>
<td>29</td>
</tr>
<tr>
<td>Attempted to rob or actually robbed</td>
<td>25</td>
</tr>
<tr>
<td>Natural Disaster</td>
<td>24</td>
</tr>
<tr>
<td>Home break-in while gone</td>
<td>20</td>
</tr>
<tr>
<td>Other serious injury</td>
<td>16</td>
</tr>
<tr>
<td>Other feared situation</td>
<td>16</td>
</tr>
<tr>
<td>Family or friend murdered</td>
<td>16</td>
</tr>
<tr>
<td>Sex against will (including oral and anal)</td>
<td>13</td>
</tr>
<tr>
<td>Punished hard enough to cause injury</td>
<td>12</td>
</tr>
<tr>
<td>Other extraordinarily stressful situation</td>
<td>12</td>
</tr>
<tr>
<td>Take something by force or threat of force</td>
<td>12</td>
</tr>
<tr>
<td>Man-made disaster</td>
<td>11</td>
</tr>
<tr>
<td>Serious or life-threatening illness</td>
<td>11</td>
</tr>
<tr>
<td>Touched private parts under force</td>
<td>9</td>
</tr>
<tr>
<td>Attacked without a weapon</td>
<td>7</td>
</tr>
<tr>
<td>Dangerous Chemical Exposure</td>
<td>7</td>
</tr>
<tr>
<td>Type of Trauma</td>
<td>Frequency</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Other unwanted sexual contact</td>
<td>6</td>
</tr>
<tr>
<td>Home break-in while there</td>
<td>4</td>
</tr>
<tr>
<td>Death of spouse, partner, or child</td>
<td>4</td>
</tr>
<tr>
<td>Attacked with weapon</td>
<td>2</td>
</tr>
<tr>
<td>Combat experience</td>
<td>0</td>
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</table>

*Note.* Frequencies of each specific type of trauma that participants reported.
Table 3

*Means and Standard Deviations for Study Variables*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>M IES-R</td>
<td>4.63</td>
<td>2.7</td>
</tr>
<tr>
<td>CBI</td>
<td>24.30</td>
<td>10.83</td>
</tr>
<tr>
<td>IRS</td>
<td>14.75</td>
<td>8.11</td>
</tr>
<tr>
<td>DRS</td>
<td>16.15</td>
<td>7.42</td>
</tr>
<tr>
<td>PTGI</td>
<td>51.23</td>
<td>27.28</td>
</tr>
</tbody>
</table>

*Notes. M IES-R= Modified Impact of Events Scale Revised; CBI= Core Beliefs Inventory; IRS= Intrusive Rumination Scale; DRS= Deliberate Rumination Scale; PTGI= Posttraumatic Growth Inventory; SD= Standard Deviation.*
Table 4

*Multiple Regression Analysis for All Variables (N=93)*

<table>
<thead>
<tr>
<th></th>
<th>PTGI</th>
<th>M IES-R</th>
<th>CBI</th>
<th>IRS</th>
<th>β</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>M IES-R</td>
<td>.48</td>
<td>.48</td>
<td></td>
<td></td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>CBI</td>
<td>.70</td>
<td>.64</td>
<td></td>
<td></td>
<td>.39*</td>
<td>.25*</td>
</tr>
<tr>
<td>IRS</td>
<td>.41</td>
<td>.73</td>
<td>.56</td>
<td></td>
<td>-.13</td>
<td>-.08</td>
</tr>
<tr>
<td>DRS</td>
<td>.73</td>
<td>.58</td>
<td>.74</td>
<td>.59</td>
<td>.51*</td>
<td>.33*</td>
</tr>
</tbody>
</table>

*Notes. M IES-R= Modified Impact of Events Scale Revised; CBI= Core Beliefs Inventory; IRS= Intrusive Rumination Scale; DRS= Deliberate Rumination Scale; PTGI= Posttraumatic Growth Inventory; β= Standardized Coefficient Beta; Part= Partial correlation. *p < .01.*
Table 5

*Multiple Regression for Exploratory Analysis*

<table>
<thead>
<tr>
<th></th>
<th>PTGI</th>
<th>IRS</th>
<th>β</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS</td>
<td>.41</td>
<td>-.03</td>
<td>-.02</td>
<td></td>
</tr>
<tr>
<td>DRS</td>
<td>.73</td>
<td>.59</td>
<td>.75*</td>
<td>.61*</td>
</tr>
</tbody>
</table>

*Notes. IRS= Intrusive Rumination Scale; DRS= Deliberate Rumination Scale; PTGI= Posttraumatic Growth Inventory; β= Standardized Coefficient Beta; Part= Part correlation.*

*p < .01.*
Appendix A

IRB Approval Letter

February 18, 2014

Re: Protocol #13-057, *The Relationship of Trauma Severity, Rumination, and Restructured Core Beliefs to Posttraumatic Growth*

Dear Ms. Williams:

The IRB has reviewed the materials regarding your study, referenced above, and has determined that it meets the criteria for the Exempt from Review category under Federal Regulation 45CFR46. Your protocol is approved as exempt research, and therefore requires no further oversight by the IRB. We appreciate your thorough treatment of the issues raised and your timely response.

If you wish to modify your study, including the addition of data collection sites, it will be necessary to obtain IRB approval prior to implementing the modification. If any adverse events occur, please notify the IRB immediately.

Please contact our office if you have any questions. We wish you success with your project!

Sincerely,

Morell E. Mullins, Jr.,
Ph.D. Chair, Institutional Review Board

MEM/sb

C: Janet Schultz, Advisor
Appendix B
Demographic Questionnaire

Age (in years)_____

Gender
_____ Male
_____ Female
_____ Other
_____ Prefer not to answer

Race/Ethnicity
_____ African American/Black/African Origin
_____ American Indian/Alaska Native
_____ Asian-American/Asian Origin/Pacific Islander
_____ Latino-a/Hispanic
_____ Caucasian/White/European Origin
_____ Bi-Racial/Multi-Racial
_____ Other
_____ Prefer not to answer
Appendix C

Trauma History Questionnaire (THQ)

The Trauma History Questionnaire (THQ) is protected by copyright so it is not reproduced in this document. This measure is available for download through http://ctc.georgetown.edu/toolkit.
Appendix D

Modified Impact of Event Scale-Revised

The Impact of Event Scale-Revised is protected by copyright so it is not reproduced in this document. This measure is available through emailing the author at Daniel.Weiss@ucsf.edu.
Appendix E

Core Beliefs Inventory

The Core Beliefs Inventory is protected by copyright so it is not reproduced in this document. This measure is available through the Posttraumatic Growth Research Group at UNC Charlotte by emailing PosttraumaticGrowth@uncc.edu.
Appendix F

Event Related Rumination Inventory

The Event Related Rumination Inventory (ERRI) is protected by copyright so it is not reproduced in this document. This measure is available through the Posttraumatic Growth Research Group at UNC Charlotte by emailing PosttraumaticGrowth@uncc.edu.
Appendix G

Posttraumatic Growth Inventory

The Posttraumatic Growth Inventory (PTGI) is protected by copyright so it is not reproduced in this document. This measure is available through the Posttraumatic Growth Research Group at UNC Charlotte by emailing PosttraumaticGrowth@uncc.edu.
Appendix H

Participant Pool Flyer

Investigator: Jaclyn Williams, M.A.

Advisor: Janet R. Schultz, Ph.D., ABPP

Purpose of Study: This study is examining factors related to college students’ growth following exposure to trauma. Specifically, trauma severity, how participants’ thought processes were potentially affected and how core beliefs may have been altered following trauma are examined.

Date of Project: Participants will take a slip with the study URL and complete the study online.

Location: Participants may complete the study on any device to which they can access the Internet.

Approximate Time for Completion: The study consists of two phases. Phase 1 takes 15 minutes and involves completion of a brief demographic questionnaire and a short measure that will determine if you meet criteria to complete Phase 2. If Phase 2 criteria are met, you will follow a link to complete the remaining four measures regarding factors related to Posttraumatic Growth, which takes approximately 30-45 minutes. Total participation thus can range from 15-60 minutes.

**If you participated last semester, you are not eligible to participate again and will not receive credit for participating more than once**

http://tinyurl.com/nq2ju9f
Password: 

http://tinyurl.com/nq2ju9f
Password: 

http://tinyurl.com/nq2ju9f
Password: 

http://tinyurl.com/nq2ju9f
Password: 

http://tinyurl.com/nq2ju9f
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http://tinyurl.com/nq2ju9f
Password: 

http://tinyurl.com/nq2ju9f
Password: 

http://tinyurl.com/nq2ju9f
Password:
Appendix I

Informed Consent Form

You have the opportunity to volunteer to participate in a research project conducted through the University.

The purpose of this study is to examine the relationship between trauma severity, rumination styles, and extent core beliefs were challenged following trauma with Posttraumatic Growth. You have been selected because you indicated you were interested in participating in this study. Phase 1 of this study will involve completing one brief demographic questionnaire and a short measure that will determine if you meet criteria to complete phase 2; this takes about 15 minutes. If you do not meet eligibility criteria, the study will conclude and you will be directed to a link to provide information in order to give credit for your participation in Phase 1. If you do meet criteria to participate in phase 2, you will be directed to a link to complete the remainder of the study. Phase 2 takes approximately 30-40 minutes and includes four measures regarding factors related to Posttraumatic Growth.

Your name, professor, and name of course will be collected for the sole purpose of giving you due course credit; however, no identifying information will be linked to your survey responses or to the database containing these responses. Your responses are and will remain anonymous and confidential. Your Internet IP address will not be collected. Data will be stored on a disk that will be in a locked file cabinet for five years following the completion of this study and will then be destroyed. There may be some risk to taking this survey; if you have experienced trauma, it may bring back memories associated with the traumatic event. There are no direct benefits to you for participating in this study. You may receive course credit as compensation for your participation. Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. You are free to withdraw from the study at any time without penalty. If you decide to participate in this project, you will indicate your consent by completing the questionnaires in both phases.

If you have any questions at any time during the study, you may contact Jaclyn Williams at hardestyj1@xavier.edu or Dr. Janet Schultz at (513) 745-3248. Questions about your rights as a research participant should be directed to the University’s Institutional Review Board at (513) 745-2870.
Appendix J

Psychological Resources

Psychological Services Center
Location: 3818 Winding Way
Contact Information: (513) 745-3531
Office Hours: 9:00 A. M. to 5:00 P. M. Monday through Friday

• If you are in crisis and a student, you can be seen on a walk-in basis at the PSC between the hours of 9:00 A.M. and 5:00 P.M. Monday through Friday.

• If you are a student and have an after-hours emergency, you may call 745-1000 to reach the Campus Police who will page the on-call therapist to assist with the emergency.

• If you are an ongoing client at the Psychological Services Center and you experience a clinical emergency, contact your therapist at his/her office number.

• If you are unable to reach your therapist, follow the instructions on his/her voice mail or contact the Campus Police at 745-1000 and the Campus Police will page the on-call therapist at the PSC to assist you.

• You may also go to the emergency room of the closest hospital for immediate assistance.

McGrath Health and Wellness
Location: 1714 Cleneay Avenue
Contact Information: (513) 745-3022
Office Hours: 8:30 A. M. to 5:00 P. M. Monday through Friday

• Walk in appointments during emergencies are permitted

• Call and make an appointment for an intake if not an emergency
Appendix K

Research Credit Form

Thank you for your participation. You have earned 60 minutes of participation credit. In the case that your professor awards research credit as part of his or her class, and you would like proof of completion of this study, please provide your name, professor's name, and name of your course. If you do not provide the information below, you will not receive any credit, if offered. A record of your participation will be sent to the Participant Pool administrator within the week. You may print this page for your records. **As a reminder, this form is not linked to any of your survey responses; your responses will remain anonymous.**

Name:

Professor’s Name:

Name of Your Course:
Summary

**Title:** The Relationship of Trauma Severity, Rumination, and Restructured Core Beliefs to Posttraumatic Growth.

**Problem.** Trauma exposure is common and a recent prevalence study found that 89.7% of 2,953 participants had experienced at least one traumatic event as described in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association [APA], 2013; Kilpatrick et al., 2013). Park and Calhoun (1998) described the phenomenon of Posttraumatic Growth (PTG; first termed by Tedeschi & Calhoun, 1995) as an antithesis to PTSD and both a process and an outcome of positive change. Calhoun and Tedeschi (1999) proposed that when individuals encountered trauma, they engaged in a meaning making process to make sense of and cope with the extreme cognitive and emotional turmoil. The seismic event shattered the pre-trauma fundamental assumptions, and the individual was left to rebuild more adaptive, realistic ways of viewing themselves and the world (Janoff-Bulman, 1992; Tedeschi et al., 1998). Tedeschi and Calhoun (2004) hypothesized that individuals who achieved PTG grew in a “transformative” way (qualitative change in functioning) that was beyond the pre-trauma levels of functioning (e.g., new life priorities, a deepened sense of meaning, and more profound connections with others). The current investigation was designed to extend the findings to determine which predictor (trauma severity, rumination, or extent core beliefs were challenged) would account for the most variance in PTG in a sample of undergraduate participants. The study was the first to enter all predictors together to determine their relationship with PTG.

**Method.** Undergraduate participants \( N=106, M_{\text{age}}=20.75 \) were recruited to complete measures regarding potential exposure to trauma. Participants were directed to an online survey in which they read the informed consent statement, provided demographic information (i.e., sex, age, and ethnicity), and completed phase 1, which was an online, 15 minute questionnaire (Trauma History Questionnaire; Green, 1996). Participants who acknowledged trauma exposure completed phase 2, which consisted of four additional measures: Modified Impact of Events Scale-Revised, Core Beliefs Inventory, Event Related Rumination Inventory, and the Posttraumatic Growth Inventory (Cann, et al., 2010; Cann et al., 2011; Tedeschi & Calhoun, 1996; Weiss & Marmar, 1997).

**Findings.** The final sample \( n=106 \) included 39 men (36.8%) and 67 women (63.2%). The age range of the participants was from 18-56 years; the oldest participant was at least 33 years older than the rest of the participants, and the mean age was 20.75 (SD= 3.88). Caucasian participants were most highly represented within the sample with 83.0%. Smaller proportions of African American (.9%), Asian (2.8%), Hispanic (6.6%), Bi-racial or multi-racial (3.8%), other ethnicities (1.9%) participated. Less than one percent (.9%) declined to answer the ethnicity question. Exposure to trauma was widely reported; 87.7% of the sample reported exposure to at least one traumatic event, meaning 93 participants reported trauma exposure and completed measures in phase 2, and were thus
included in the final regression analysis. Eighty-nine of those 93 participants reported exposure to more than one traumatic event.

The linear combination of predictor variables was significantly related to PTG, $F (4, 88) = 33.67, p < .01$, and accounted for approximately 60% of the variance of PTG. Deliberate rumination made the strongest unique and significant contribution accounting for approximately 10.9% of the variance in PTG. The extent core beliefs were challenged following trauma also made a unique and significant contribution accounting for approximately 6% of the variance in PTG. Intrusive rumination accounted for approximately .65% of the variance, and perceived severity of trauma accounted for .02% of variance; neither variable accounted for unique or significant variance in PTG.

**Implications.** Unique and significant contributions of deliberate rumination and extent core beliefs were challenged with PTG were consistent with many studies that also found significant positive relationships among these variables. Results did not reflect a significant relationship between trauma severity and PTG, despite previous findings to the contrary. This study extended previous findings through highlighting deliberate rumination as an important and significant predictor of PTG, above and beyond other identified predictors. Further analysis that examined relationships between deliberate rumination and specific subscales of PTG would provide more specific insight into types of growth to which deliberate rumination may relate. Although the results of the current investigation generalized findings to young adult populations, future researchers should attempt to broaden the diversity of the sample including factors of age, race and ethnicity.