

From Trauma to Growth: The Roles of Event Centrality,  
Posttraumatic Stress Symptoms, and Deliberate Rumination

by

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## Abstract

Researchers have increasingly recognized that traumatic events can lead to both pathological outcomes such as posttraumatic stress disorder (PTSD) and positive outcomes such as posttraumatic growth (PTG). Consistent with Tedeschi and Calhoun's (2004) conceptual model of PTG, it appears that individuals must experience at least a moderate level of distress to experience growth. Moderate distress can trigger deliberate rumination or meaning making, which can lead to PTG. Berntsen & Rubin (2006) have proposed that a traumatic event is most likely to elicit distress and subsequent rumination when it involves a fundamental or central aspect of one's identity. Accordingly, in a large sample of trauma-exposed undergraduates, the present study aimed to examine a serial mediational model in which the effect of event centrality on PTG is mediated by both PTSD symptom severity and deliberate rumination. Results supported this full model, indicating that traumatic events that are appraised as central can lead to both distress and reexamination of core beliefs, which activates deliberate rumination, which has a positive effect on development of PTG. These findings highlight the contributions of event centrality, PTSD symptom severity, and deliberate rumination in the development of PTG. Thus, by specifically examining the ways in which individuals engage in cognitive processing, such as through a more deliberate, focused strategy, trauma survivors could experience greater positive outcomes. The present study contributes to the PTG literature by identifying additional cognitive constructs that are involved in the development of PTG. Longitudinal studies should be conducted to assess the path of the aftermath of traumatic events.

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## **Introduction**

### **Deliberate Rumination**

The psychological study of traumatic stress has focused primarily on pathological responses to traumatic events, particularly posttraumatic stress disorder (PTSD). However, over the last 25 years, researchers have increasingly examined positive responses to trauma, which are reported by many trauma survivors following a wide range of traumatic events (Tedeschi, Park, & Calhoun, 1998). However, relatively little is known about the mechanisms by which these positive responses occur. It is critical to understand how some individuals are able to experience positive change after a traumatic event because this could inform prevention and treatment of PTSD and other stress-related disorders and reduce the financial burden on the healthcare system (Carver, 1998; Morril, et al., 2008; Zoellner & Maercker, 2006).

A variety of concepts have been proposed to describe positive outcomes after traumatic events, including finding benefits (Affleck & Tennen, 1996), thriving (O’Leary, Alday, & Ickovics, 1998), positive psychological changes (Yalom & Lieberman, 1991), and posttraumatic growth (PTG; Tedeschi & Calhoun, 1996). Although these concepts differ in subtle ways, they overlap substantially and in large part refer to essentially the same phenomenon. The most inclusive, well-explicated, and widely accepted of these is PTG, which was put forth by Tedeschi and Calhoun, who are considered the seminal researchers of positive outcomes after traumatic events (Zoellner & Maercker, 2006).

According to Tedeschi and Calhoun’s (2004) model of PTG, PTG refers to the idea that positive outcomes can be reported after traumatic experiences by way of internal transformation

within the individual. A traumatic experience can cause significant conflict with one's preconceived notions of the self and of the world, and the struggle with the new reality posed by a traumatic experience can result in PTG. It is important to note that PTG does not occur immediately; rather, it develops gradually over time as an individual searches for meaning in the traumatic experience and reassesses its implications.

Since the same type of event has been found to give rise to both PTSD and PTG, researchers have questioned whether these constructs are independent or related outcomes. The relationship of PTSD symptoms and PTG is inconsistent across studies, with studies finding either no association or inverse, positive, and curvilinear associations. In an early review Zoellner & Maercker (2006) found that studies employing standardized measures of PTG found either no systematic relationship or a positive association between PTG and PTSD. With respect to inverse relationships, Frazier, Conlon, and Glaser (2001) concluded that growth and distress could be considered mutually exclusive and thus could not coexist in same individual. However, there is ample evidence that growth and distress covary and thus are not mutually exclusive. For example, Solomon and Dekel (2007) found that ex-prisoners of war exhibited higher levels of both PTSD and PTG compared to a control group of combat veterans. Similarly, Kleim and Ehlers (2009) found significant curvilinear associations between PTG and PTSD in a sample of physical assault survivors. Participants with either low or high growth reported fewer PTSD symptoms than those who reported moderate growth. They suggested that posttraumatic growth is most relevant in trauma survivors who attach enduring significance to the trauma and show initial distress.

The inconsistency in delineating the relationship between PTSD and PTG could be related to how researchers have operationally defined the negative outcomes after a traumatic

event. Studies that have shown a weak or nonexistent relationship between these negative and positive outcomes have variously defined negative outcomes as psychological distress (Liu, Wang, Wang, Su, & Wang, 2014), negative coping (Zhang, Yan, Du, & Lu, 2013), or negative affect (Boyratz & Efstathiou, 2011). Further, the two most highly cited articles in this literature – Helgeson, Reynolds, and Tomich (2006) and Zoellner and Maercker (2006) -- are inconsistent when defining negative outcomes and alternate between global distress, psychological adjustment, and other unspecific measures of distress.

Despite these inconsistencies in the literature regarding the relationship between PTSD and PTG, there is a growing consensus that individuals must experience at least moderate levels of distress to begin the coping process, which can lead to PTG. It appears that individuals must experience traumatic events that are sufficiently stressful to challenge existing schemas, which will propel someone to rebuild his or her schemas through cognitive processing (Tedeschi & Calhoun, 2004; also, see Janoff-Bulman, 1992). Experiencing PTG does not imply that an individual is free from symptoms of PTSD; rather, PTG emerges through an individual's emotional struggle and distress. As Joseph (2011) explains, PTSD is the “engine” that drives psychological growth following traumatic events. Studies have supported this assumption that extreme events are associated with higher levels of PTG. For example, Staton et al. (2006)'s review demonstrated that growth is positively related to perceived severity of the traumatic event, but not necessarily to the objective severity of the traumatic event. In addition, Morris, Shakespeare-Finch, Rieck, & Newbery (2005) found that trauma severity significantly predicted PTG, suggesting that perceptions of more severe traumatic events are associated with higher levels of growth.

Cognitive processing models have demonstrated that thinking about a traumatic event can help resolve the disruption of previously held fundamental assumptions and begin the process of growth. Cognitive processing can activate the process of making sense of the trauma, integrating new understandings into beliefs and assumptions about others and the world, and working through intense emotions resulting from the event (Harber & Pennebaker, 1992; Horowitz, 1986; Janoff-Bulman, 1992; Resick et al., 2008). However, the cognitive processing aspect of PTG is in contrast to some research indicating that it can actually lead to more frequent posttraumatic stress symptoms. Hobfoll et al. (2007) suggested that purely cognitive methods of dealing with events might be associated with less growth or even negative outcomes compared to more action-oriented methods of coping. Although research has demonstrated that cognitive processing of a traumatic event can lead to both PTG and PTSD, there is still some ongoing debate in the literature. Again, this discrepancy requires further investigation of how cognitive processing of the event has been shown to be linked to both positive and negative outcomes post-trauma (Janoff-Bulman, 1992).

It is well established that repetitively thinking about a traumatic event is linked to pathological outcomes (e.g., Ehlers, Mayou, Davies, & Roth, 1998; Nolen-Hoeksema, 2000; Nolen-Hoeksema & Morrow, 1993). Specifically, a type of repetitive thought strategy, rumination, is defined as a stereotypical pattern of repetitive negative thinking about one's self and one's experiences (Nolen-Hoeksema & Morrow, 1991, 1993). Cognitive models of the development of PTSD have demonstrated the role of cognitive processes such as rumination in predicting current levels of distress (Kleim, Ehlers, & Glucksman, 2007). Although research has identified a range of negative outcomes associated with rumination (Clohessy & Ehlers, 1999;

Steil & Ehlers, 2000), evidence also links ruminative thoughts to positive outcomes, such as perceived PTG (Benetato, 2011; Helgeson, Reynolds, & Tomich, 2006).

Accordingly, when discussing rumination, two different dimensions of rumination are important to consider in order to predict the potential outcomes of a traumatic event. The first important dimension to consider is whether the focus of the thought is specific to an experienced traumatic event (i.e., is event-related) or more general and dispositional in nature. Typically, rumination has been described as a trait-like repetitive thought strategy that is not focused on a specific event or events (Nolen-Hoeksema & Morrow, 1991, 1993). In contrast, Calhoun, Cann, Tedeschi, and McMillan (2000) have defined rumination as a thoughtful focus on a specific event, which may lead to problem solving, meaning making, and ideally, resolution of the trauma or stressor. Specifically, event-related thought has more recently been associated with PTG (Tedeschi & Calhoun, 2004).

The second dimension of rumination refers to whether the individual has control over the repetitive thoughts (Treyner, Gonzalez, Nolen-Hoeksema, & 2003). Rumination, as it is generally defined, simply means repetitive thought, or pondering on information. Ruminative thoughts following a highly stressful event can include a variety of different types of recurrent thinking, such as intrusive or deliberate thoughts. Intrusive rumination is defined as unwanted, repeated thinking about the traumatic event. These types of uncontrollable thoughts come to mind when an individual is not actively trying to think about the event. This type of rumination has been linked to distress (e.g., Taku, Kilmer, Cann, & Tedeschi, 2011; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012). Intrusive rumination can be understood as a reexperiencing of the event, in which the individual remains in a state of fear/threat, which maintains the symptoms of PTSD (Ehlers & Clark, 2000). On the other hand, deliberate rumination is an intentional

attempt to think about the event and understand the implications of the event. Deliberate rumination has been reported to be associated with higher levels of self-reported posttraumatic growth (Cann et al., 2011; Triplett, et al., 2011). Lancaster, Klein, Nadia, Szabo, & Mogerma (2015) found that intrusive rumination predicted only PTSD symptoms, while deliberate rumination predicted only PTG.

Deliberate rumination is the meaning-making process necessary to foster the development of PTG. Calhoun and Tedeschi (1998) have proposed that PTG is more likely to occur if the individual purposely ruminates over the event to both process what has happened and also to attribute meaning to the traumatic occurrence. Individuals who engage in purposeful cognitive processing of the event may be more likely to find the meaning that helps rebuild the challenged assumptive world. After this purposeful process, individuals are more likely to focus on understanding the traumatic experience and successfully assimilate this understanding into one's life. With deliberate rumination, individuals seek resolution, search for meaning, and reframe and re-author their lives.

Thus, there is a conceptual basis for a relationship between PTSD and PTG, in that a high-magnitude stressor can lead to moderate levels of distress, which can propel the meaning-making process that is necessary for the development of growth. This raises the question of what kinds of traumatic events are likely to trigger PTSD and thus potentially lead to PTG. Based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) diagnostic criteria for PTSD, traumatic events must meet a two-part definition. Criterion A1 specifies the type of exposure (experienced, witnessed, or confronted with) and the nature of the event (actual or threatened death or serious injury, or a threat to the physical integrity of self or others), and Criterion A2 requires a peritraumatic

emotional response involving “intense fear, helplessness, or horror.” The specific nature of a traumatic event has been debated extensively in the PTSD literature, and has been dubbed the Criterion A problem because it centers around the definition of a trauma in Criterion A, the stressor criterion for PTSD (Weathers & Keane, 2007). This debate focuses on various questions concerning the nature of the traumatic event, including how broadly or narrowly should the trauma be defined and what is the relationship between trauma and PTSD. Regarding posttraumatic growth, the majority of the studies only examine traumatic events that meet *DSM-IV-TR* Criterion A. In the PTG literature researchers have been less specific about the nature of stressors that are thought to lead to PTG, and currently there is no clear consensus about this issue.

However, in the PTSD literature, a number of studies have found that relative to A1 events some other non-A1 stressful events are associated with equivalent (Boals & Schuettler, 2009) or higher levels of PTSD symptoms (Gold, Marx, Soler-Baillo, & Sloan, 2005; Long et al., 2008; Van Hooff, McFarlane, Baur, Abraham, & Barnes, 2009). If non-A1 events, i.e., stressful events not typically viewed as traumatic, can lead to clinically significant levels of PTSD symptoms, these same events should theoretically also be capable of leading to PTG. In addition, Tedeschi and Calhoun (2004) have suggested that positive change can occur after an individual “struggles with highly challenging life crises,” which suggests that it might not be necessary for an individual to experience a traumatic event as defined by Criterion A to experience growth. Although the triggering event objectively must be a high-magnitude stressor, even if it doesn’t meet the Criterion A definition of a trauma, it appears that one’s subjective view of an event as being stressful or difficult might better predict PTG compared to a more objective assessment.

Directly relevant to this issue, Bernsten and Rubin (2006) proposed the construct of event centrality to emphasize the importance of subjective appraisal in understanding the impact of a stressful event on an exposed individual. In some sense event centrality is conceptually related to Criterion A2, which involves subjective appraisal of a stressor with respect to how stressful or distressing it is to an individual. According to Bernsten and Rubin (2006), a stressful event that is high in event centrality is one that is closely tied to the core aspects of one's identity. Following exposure, the stressful event becomes an organizing principle for the individual's sense of self and view of the world. Memories for such personally salient events can function as personal reference points for the attribution of meaning to other experiences as well as future expectations. Thoughts about the event are more easily accessible or more highly available when the event is perceived as central. This leads to rehearsal, which maintains and strengthens the memory and the memory's emotional impact over long periods of time. If a trauma memory is seen as a central turning point in one's life story, it would also most likely be regarded as a central component of one's personal identity. Furthermore, having a traumatic event as central to personal identity is likely to mean that the trauma is seen as representative for the person's self and for reoccurring themes in the person's life narrative (Berntsen & Rubin, 2006).

Event centrality provides a potential solution to the Criterion A debate by explaining why exposure to objectively high-magnitude stressors does not necessarily lead to development of PTSD. To lead to PTSD symptoms, and subsequently to PTG, a stressor must also be subjectively appraised as having high event centrality for an individual. Studies have found a strong association between event centrality and negative outcomes, such as PTSD (Berntsen & Rubin, 2006; Boals, 2010; Brown, Antonius, Kramer, Root, & Hirst, 2010). Lancaster et al. (2011) found in a sample of undergraduate students that event centrality uniquely predicted

PTSD symptoms. In addition, individuals whose symptoms met criteria for PTSD reported higher levels of centrality for traumatic events compared to those whose symptoms did not meet criteria for a diagnosis (Berntsen & Rubin, 2007). Event centrality has also shown to be one of the strongest predictors of PTSD symptoms, even when controlling for other known predictors, such as anxiety, depression, and dissociation (Berntsen & Rubin, 2007; Boals & Schuettler, 2011).

These findings contradict the widespread view that poor integration of the traumatic memory into one's life story is a main cause of PTSD symptoms. Instead, enhanced integration appears to be a key issue. Rather than becoming poorly integrated, the distinctiveness and emotional impact of the traumatic memory force it to become highly accessible and form a cognitive reference point for the organization of autobiographical knowledge. Having a traumatic memory as highly central in an individual's cognitive schema could potentially lead to reactions that are similar to symptoms of PTSD, including vivid and intrusive memories of the trauma and avoidance of reliving the trauma and its associated emotions.

Berntsen and Rubin (2006) have stated that centralized events are considered “anchoring events” that guide current beliefs, feelings, and behaviors. Thus, centralized, traumatic events can create internal, stable, and global attributions (Abramson & Seligman, 1978), or attributions that the event can predict characteristics and behaviors across different situations. If the event signifies “unfinished business” (Beike & Wirth-Beaumont, 2005), negative affect and stress can occur. The traumatic event can become a continuous impact on the interpretation of non-traumatic experiences and expectations for the future. The individual may attempt to avoid negative beliefs and emotions; experience physiological symptoms, anxiety, and stress; and tend toward PTSD symptoms (Berntsen, Willert, & Rubin, 2003). The high availability of a traumatic

memory and its use as a personal reference point for everyday inferences and heuristic may lead to the development of PTSD.

Traumatic events also trigger within the individual the need to tell stories in order to make sense of the rupture in life story (Joseph, 2011). Stories help us bind together our thoughts, feelings, and behaviors in a way that is continuous with our view of ourselves and our past. It is only through telling new stories that we are also able to rebuild our sense of self. We are able to reconstruct our understanding of who we are, our place in the world, and what our expectations of the world are. Through storytelling, individuals first comprehend what has happened, interpret it, and then understand the significance and meaning of what has happened. Stories we tell in which we adopt the view that we are the victims, and that the world is unsafe, unpredictable, or other people untrustworthy are associated with higher levels of distress. However, the stories that construct meaning, in which we view ourselves as survivors, will lead towards growth.

Thus, event centrality has been found to similarly predict posttraumatic growth. Boals and Schuettler (2011) found that event centrality is associated with PTG, even after controlling for PTSD symptoms, depression, DSM-IV A1 and A2 status of the event, coping styles, and cognitive processing of the event. Lancaster, Kloep, Rodriguez, and Weston's (2013) reported that centrality of the event was a significant predictor for all five domains of PTG. Groleau, Calhoun, Cann, and Tedeschi (2013) also examined the unique contribution of centrality of the event to the development of both posttraumatic distress and posttraumatic growth. Event centrality was a unique predictor of both variables. Event centrality contributed to the explained variance of posttraumatic distress and perceived growth after controlling for impact on core beliefs, deliberate rumination, and finding meaning in the event (Groleau, Calhoun, Cann, & Tedeschi, 2013).

Boals, Steward, and Schuettler (2010) analyzed the relationships between PTG, depression, and positive affect and found that the relationships were stronger only when examining events central to identity. Additionally, previously nonsignificant correlations with anxiety, global distress, and physical health became significant in expected directions. Limiting analyses to only events meeting the Criterion A1 did not produce similar results. Lastly, Johnson and Boals (2015) found that Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) scores were, at first, associated with greater levels of stress, depression, and anxiety. However, when they examined events that were high in event centrality, they found that PTGI correlated highly with measures of emotional and psychological functioning and were associated with less stress, depression, and anxiety. Thus, it has been demonstrated that when individuals identify an event as central to their identity, greater levels of PTG are reported (Boals, Steward, & Schuettler, 2010). According to the definition of event centrality, individuals are more likely to balance their shattered assumptions, which should lead to the development of PTG. The highly central event demands assimilation into their perspective of themselves and the world (Lancaster, Kloep, Rodriguez, & Weston, 2013).

Therefore, strong associations have been found between event centrality and both PTSD symptoms and PTG. This suggests that construing an event as central to one's identity can be thought of as a double-edged sword, allowing for both distress and growth (Boals & Schuettler, 2011). The conflicting results related to event centrality may be the result of various cognitive processes in which centrality acts as a mechanism for paths to both PTSD symptoms and perceived PTG (Boals & Schuettler, 2011; Boals, Steward, & Schuettler, 2010). Bernstein, Willert, and Rubin (2003) found that avoidant coping, negative event perspectives (e.g., "I don't see how bringing up the past can help me"), and visceral reactions predicted PTSD symptoms.

In contrast, problem-focused coping and positive event perspectives (e.g., “Working through feelings will make me a healthier person”) predicted PTG. The extent to which an event is determined central might lead one to transform cognitions about the event to initiate action-orienting coping strategies, thus increasing the likelihood of growth (Hobfoll et al., 2007; Tedeschi et al., 2007). If centrality is considered a double-edged sword, understanding the cognitive processes that follow trauma can better predict whether an individual is able to experience negative and/or positive outcomes.

Creating a narrative is a linguistic tool that allow an individual to reflect how and what they think about, understand, and make meaning of their past. Research has suggested that when individuals consider the event as part of their identity, they are also more likely to have successfully incorporated the event into their existing schemas or narratives, which can prompt additional cognitive mechanisms that are necessary to make sense of the event (Boals, 2010; Boelen, 2009). If the event is perceived as high in centrality, it is possible that this can influence the outcome of rumination by intensifying the attention paid to the thoughts and limiting an individual’s ability to avoid them. Models of PTG have demonstrated that challenging one’s understanding of the world and of the self, and then building a more meaningful and/or coherent view of the self and world (Joseph & Linley, 2005), is required for growth to occur. Events that are truly central to one’s identity could lead to “shattered assumptions” and worldviews that are considered to lead to PTG via meaning-making processes (Janoff- Bulman, 2004). By completing a more deliberate and meaningful cognitive processing of the event, individuals are better at determining how much change can be attributed to that event. If the traumatic event is cognitively perceived as controllable and changeable, the individual may be more likely to use

problem-focused coping, experience less distress, and tend toward growth (Janoff-Bulman, 1979).

### **The Present Study**

Tedeschi and Calhoun (1996) determined that to experience significant personal growth following a traumatic experience, functioning must first be disrupted. Current research continues to explore what distinguishes those with maladaptive trajectories from individuals who report posttraumatic growth (Tedeschi & Calhoun, 2004). Cognitive construals can play an important role in psychopathology, as well in the potential for PTG. Specific ways in which individuals engage in thinking about the traumatic event, whether through intrusive or deliberate focused strategies, can impact the trajectory. Individuals who process traumas in “healthier” ways are less likely to incorporate negative events into their identity, which is more likely to lead to growth. Fostering deliberate rumination will allow individuals to take control of their traumatic thoughts.

The present study examined a model of posttraumatic growth incorporating various predictors, including event centrality, PTSD, and deliberate rumination, in a sample of trauma-exposed undergraduates. As shown in Figure 1, a serial mediation model tested whether PTSD symptoms and deliberate rumination sequentially mediate the relationship between event centrality toward development of posttraumatic growth. This specific model involved four pathways: a direct effect, two indirect mediator effects, and a serial multiple mediator effect, predicting that each of these effects will be statistically significant. The corresponding hypotheses are as follows:

*Hypothesis 1:* There will be a direct effect of event centrality on posttraumatic growth.

*Hypothesis 2:* The relationship between event centrality and posttraumatic growth will be

mediated by posttraumatic stress symptoms.

*Hypothesis 3:* The relationship between event centrality and posttraumatic growth will be mediated by deliberate rumination.

*Hypothesis 4:* The relationship between event centrality and posttraumatic growth will be sequentially mediated by posttraumatic stress symptoms and deliberate rumination.

Although some elements of this model have been previously tested, this is the first study to integrate previously identified predictors using the revised *DSM-5* PTSD symptom criteria. With the addition of a new PTSD symptom cluster labeled as “negative alterations in cognitions and mood,” the new criteria highlight the importance of understanding the cognitive processing of a traumatic event (Weathers, Marx, Friedman & Schnurr, 2014). It is necessary to expand on previous findings using the revised PTSD criteria. In addition, there is a lack of consensus about the nature of the relationship between PTSD and PTG. The literature has consistently kept these two outcomes as separate dependent variables. However, the present study integrates PTSD and PTG in a single model, which is consistent with the idea that PTSD symptoms “drive” growth.

In addition, the present study also examined one exploratory question, which involved testing each of the four *DSM-5* PTSD symptom clusters to determine if they contributed differentially to the prediction of PTG. The model was first run using total PTSD symptom severity score. The model was then re-run four more times, using one of the four PTSD symptom cluster scores as the PTSD variable. This exploratory question is based on the fact that PTSD has been shown to be multifactorial. The PTSD diagnostic criteria were recently revised for *DSM-5* (APA, 2013). One of the key revisions in *DSM-5* is the reorganization and expansion of the PTSD symptom clusters. In *DSM-IV*, PTSD symptoms were grouped into three different clusters: reexperiencing, avoidance and numbing, and hyperarousal. In *DSM-5*, the avoidance and

numbing cluster was divided into two separate clusters, viz., avoidance and negative alterations in cognition and mood; thus, the four *DSM-5* factors are intrusions, effortful avoidance, negative alterations in cognitions and mood, and increased arousal and reactivity.

Research is inconsistent regarding the specific relations between the various PTSD symptom clusters and PTG. For example, Tedeschi and Calhoun (2004) suggest that experiencing intrusive thoughts about a stressor may be a signal that individuals are cognitively processing the stressor and confronting the situation, and that this process could lead to growth. However, in relation to avoidance as an indicator of growth, it could be that individuals using these strategies to avoid aspects of the traumatic situation may be less capable of experiencing feelings of growth. Several studies have found no significant relationship between PTSD symptoms and PTG (e.g., Cordova, Cunningham, Carlson, & Andrykowski, 2001; Cordova, et al., 2007; Grubaugh & Resick, 2007). On the other hand, Shigemoto and Poyrazli (2013) and Jaarsma, Pool, Sanerman, and Ranchor (2006) found that intrusion was the only factor that predicted PTG. Thus, it appears that reexperiencing symptoms may not only be pathological symptoms, but also key symptoms that will lead to deliberative cognitive processing and eventually to the development of PTG. The different directions of relationships between PTSD clusters and PTG illustrate that different modes of relationship may co-exist between these two constructs depending on the specific aspect of PTSD examined.

## **Method**

### **Participants**

Undergraduate students 18 and older enrolled in a psychology course at Auburn University were invited to complete an online survey related to “a very stressful life event” and were compensated with extra credit. Participants first read an informed consent letter and

electronically indicated their consent to participate, and then they responded to online questionnaires. The questionnaires took approximately 90 minutes to complete. The University's Institutional Review Board approved the study protocol in January 2016.

Trauma exposure was assessed through participants' responses on the Detailed Assessment of Posttraumatic Stress (DAPS) and by reviewing participants' narrative descriptions of their index event. Index events were initially classified as meeting *DSM-5* Criterion A if participants (a) either experienced or witnessed them and they involved life threat or sexual violence, or (b) learned about them happening to a loved one and they involved serious injury, sexual violence, or accidental or violent death. ( $n = 461$ ). Index events that did not meet any of these requirements were coded as not meeting *DSM-5* Criterion A ( $n = 274$ ).

Next, two graduate students independently reviewed participants' narrative descriptions of their index event to verify *DSM-5* Criterion A status. Of the 461 participants with index events that initially met Criterion A, 338 provided a narrative that confirmed their Criterion A status. Of those participants whose narrative did not confirm Criterion A status, 96 provided a narrative that explicitly contradicted the initial Criterion A classification and 27 did not provide a narrative at all; these participants were excluded from the final sample. An additional 69 participants were excluded because they only completed the trauma assessment portion of the protocol and did not respond to the rest of the questionnaires. Last, raters classified index events by event type. See Table 1 for a breakdown of the most common event types included in the analyses.

Disagreements between the raters were resolved through discussion among the raters and an expert in the field of traumatic stress.

The final sample who met *DSM-5* Criterion A status consisted of 269 individuals ages 18 to 27 ( $M = 19.08$  years;  $SD = 1.36$ ). The sample was 79.2% female ( $n = 213$ ), 87.0% White ( $n =$

234), 8.2% African American/Black ( $n = 22$ ), 3.0% Other ( $n = 8$ ), 1.5% Asian ( $n = 4$ ), 2.4%, and .40% Native Hawaiian/Pacific Islander ( $n = 1$ ).

## Measures

See Table 2 for descriptive statistics and number of participants who responded to each measure.

*Demographics* – A custom demographics questionnaire was used to assess sex, age, race, ethnicity, income, parent relationship status (e.g., never married, married, divorced) relationship status (e.g., single, married), student status (e.g., part-time, full-time), and work status (e.g., part-time, full-time).

*Detailed Assessment of Posttraumatic Stress (DAPS)*. The DAPS (Briere, 2001) is a 104-item, self-report test of posttraumatic response using *DSM-IV-TR* (American Psychiatric Association, 2000) criteria to assess for the likelihood of a PTSD diagnosis. The DAPS has two response validity scales: Positive Bias, which assesses the extent to which respondents deny low-level psychological symptoms; and Negative Bias, which assesses the willingness to present oneself as especially symptomatic. It evaluates a range of trauma-related variables, including lifelong exposure to traumatic events, immediate cognitive, emotional, and dissociative responses to a specified trauma, and the symptoms of PTSD and Acute Stress Disorder. DAPS items are rated on a 5-point frequency scale ( $1=never$ ,  $2=once\ or\ twice$ ,  $3=sometimes$ ,  $4=often$ ,  $5=very\ often$ ). The measure is divided into three parts: Part 1 consists of the Trauma Specific Scale, Part 2 consists of the Posttraumatic Stress Scales, and Part 3 consists the Associated Feature scales which include Trauma-Specific Dissociation (T-DIS), Substance Abuse (SUB), and Suicidality (SUI). The DAPS is currently undergoing revision because of the updated *DSM-5* PTSD criteria. The revision includes adding items to Part 1 to provide full coverage of *DSM-5*

criteria. The revised version was used in the present study as an investigative version of the *DSM-5* criteria. The previous version of the DAPS was found to agree well (diagnostic efficiency = .87) with the Clinician-Administered PTSD Scale (CAPS) clinical interview. DAPS scores have shown to have good reliability and validity (Briere, 2001).

*PTSD Checklist for DSM-5 (PCL-5)*. The PCL-5 (Weathers, Litz, Keane, Palmieri, Marx, & Schnurr, 2013) is a 20-item self-report measure designed to assess the *DSM-5* symptoms of PTSD. For each symptom, respondents provide a severity rating ranging from 0 to 4 that indicates the degree of distress associated with each symptom (0 = *not at all* to 4 = *extremely*). PCL-5 scores have demonstrated high internal consistency ( $\alpha = .94$ ), test-retest reliability ( $r = .82$ ), and convergent ( $r_s = .74$  to  $.85$ ) and discriminant ( $r_s = .31$  to  $.60$ ) validity (Blevins, Weathers, Davis, Witte, & Domino, 2015). In the present study, Cronbach's alpha was .96.

*Posttraumatic Growth Inventory (PTGI)*. The PTGI (Tedeschi & Calhoun, 1996) is a self-report measure that consists of 21 items of positive change (e.g., new possibilities, relating to others, personal strength, spiritual change, and appreciation for life) resulting from a highly challenging life crisis. Higher scores on the PTGI indicate higher levels of posttraumatic growth. In the present study, participants were asked to respond to the PTGI keeping the event they identified as the worst on the DAPS in mind. Respondents choose one of six statements that is true in their life as a result of experiencing a traumatic event (e.g., *I did not experience this change as a result of my crisis, I experienced this change to a very great degree as a result of my crisis.*) PTGI scores have demonstrated high internal consistency ( $\alpha = .90$ ) and test-retest reliability ( $r = .71$ ; Tedeschi & Calhoun, 1996). In the present study, Cronbach's alpha was .97.

*Centrality of Event Scale (CES)*. The CES (Bernsten & Rubin, 2006) is a 20-item questionnaire used to measure the degree to which a stressful event is regarded as central to

one's identity. Each item is assessed on a five-point Likert scale ranging from 1=*totally disagree* to 5=*totally agree*). Total score is calculated by summing all individual item scores, and higher scores indicate a more highly central event. Examples of the items on the CES include "This event has become a reference point for the way I understand new experiences" and "If this event had not happened to me, I would be a different person today." CES scores possess excellent internal consistency reliability ( $\alpha = .94$ ; e.g., Berntsen & Rubin, 2007). The scale has been shown to distinguish between individuals whose symptoms meet criteria for PTSD from those whose symptoms do not meet criteria (Berntsen & Rubin, 2006) and it shows the expected patterns of correlations with other scales (Berntsen, Rubin, & Siegler, 2011). In the present study, Cronbach's alpha was .97.

*Event Related Rumination Inventory* (ERRI.) The ERRI (Cann, et al., 2011) was developed as a means of measuring both intrusive and deliberate rumination. The scale consists of 20 items for which participants are asked to identify the frequency of their thoughts within a particular timeframe, with items being rated from 0 = *not at all* to 3 = *often*. Ten of the items focus on intrusive rumination and address the frequency of involuntary thought about a traumatic event immediately following the event. The other 10 items assess deliberate rumination, or the frequency of purposeful thought about the event in the weeks following the event. An example of an individual item is "I thought about what the experience might mean for my future." Subscale scores are calculated by summing items on each subscale, and higher scores indicate more intrusive or deliberate rumination. Validation study revealed robust factors, and the alphas of the intrusive and deliberate subscales were found to be .94 and .88, respectively (Cann et al., 2011). In the present study, Cronbach's alpha was .98.

## Statistical Analyses and Results

Descriptive statistics were first computed for all variables and can be found in Table 2. Multiple imputation with 24 imputed datasets was performed to calculate Cronbach's alpha for each of the measures (Bodner, 2008). The analyses were conducted as a series of path models in Mplus (Version 7.11; Muthén & Muthén, 1998-2013) using robust maximum likelihood as an estimator to account for the fact that some measures were not normally distributed. Missing data was handled by full-information maximum-likelihood estimators (the default in Mplus). Covariance coverage for the proportion of pairwise present data ranged from 0.81 to .95. Data were missing because participants chose not to respond to certain questions. Bivariate correlations, as shown in Table 3, were also computed to test the magnitude and direction of associations among variables.

The analysis involves calculating point estimates for the direct and indirect effects linking event centrality to posttraumatic growth. In addition, inferential tests were run to determine whether these effects are different from zero (Preacher and Hayes, 2008). The serial mediation model was based on model 6 in PROCESS (Hayes, 2012). To test the main hypotheses, as illustrated in Fig. 1, a two-step mediational analysis was proposed, whereby a positive association between event centrality and PTSD symptoms was tested in a trauma-exposed population, which then can increase deliberately ruminating on the event, and, in turn, increased the likelihood of the development of posttraumatic growth.

To conduct significance tests for the indirect effects, a bootstrapping procedure was used that involves repeatedly drawing 5,000 samples of size  $n$  (where  $n$  is equal to the original sample size) from the existing data, sampling with replacement, and then estimating the indirect effect in each resampled dataset. Repeating this process thousands of times creates an empirical

approximation of the underlying sampling distribution of the indirect effect which is then used to construct confidence intervals for the indirect effect. Among the methods that allow for hypothesis testing of indirect effects, the consensus is that bootstrapping is superior in that it makes no assumptions about normality in the sampling distribution and has better control over Type I error (Preacher and Hayes, 2004; MacKinnon et al., 2004). Bootstrapping was implemented in these analyses to obtain bias-corrected 95% confidence intervals for making statistical inference about specific and total indirect effects (Preacher & Hayes, 2008).

Fig. 1 shows the hypothesized path model with each of the paths labeled. The total effect,  $c$ , of event centrality on a given indicator of posttraumatic growth (Y) is given by the coefficient on event centrality (X) in a model predicting posttraumatic growth, but excluding the proposed mediating variables—PTSD (M1) and deliberate rumination (M2). The total effect consists of four effects—a direct effect,  $c_0$ , from X to Y and three specific indirect effects. The direct effect is given by the coefficient on X in a model predicting Y from X, M1 and M2. The first specific indirect effect links X to Y through M1 and is equivalent to the product of the  $a_1$  and  $b_1$  paths, where  $a_1$  is the coefficient on X in a model predicting M1 from X and  $b_1$  is the coefficient on M1 in a model predicting Y from X, M1, and M2. The second specific indirect effect connects X to Y through M2 and is equal to the product of  $a_2$  and  $b_2$ , where  $a_2$  is the coefficient on X from a model predicting M2 from X and M1 and  $b_2$  is the coefficient on M2 in a model predicting Y from X, M1 and M2. The third specific indirect effect runs from X to M1 to M2 to Y and is equal to the product of  $a_1$ ,  $a_3$  and  $b_2$ , where  $a_3$  is the coefficient on M1 for a model predicting M2 from X and M1, and  $a_1$  and  $b_2$  are computed the same way as above. The sum of these three specific indirect effects is the total indirect effect of X on Y:

$$\text{Total indirect effect of X on Y} = a_1b_1 + a_2b_2 + a_1a_3b_2$$

Thus, integrating the two models with mediation through PTSD symptoms and with mediation through deliberate rumination yields a three-path mediation model, depicted in Figure 1. The present study tested whether PTSD symptoms and deliberate rumination sequentially mediate the relationship between event centrality toward development of posttraumatic growth.

*Serial Multiple Mediation Analyses for Efficacy Variables.*

It was first tested whether PTSD total score and deliberate rumination sequentially mediate event centrality on posttraumatic growth. A serial mediation analysis was conducted with bootstrap methods (Hayes, 2012). All paths for the full model are illustrated in Figure 2 and their corresponding coefficients are provided in Table 4. The total effect (c) of event centrality on posttraumatic growth was significant ( $\beta = .426, SE = .061, p < .001$ ) and so was the direct effect (c'), removing the effect of the mediators ( $\beta = .261, SE = .077, p < .001$ ). The total indirect effect, the sum of the specific indirect effects, was significant with a point estimate of .111 and a 95% confidence interval between .011 and .223. The specific indirect effect through PTSD symptoms only was not significant ( $a_1b_1 = -.008; CI = -.062 \text{ to } .026$ ). However, the specific indirect effect through deliberate rumination only was significant ( $a_2b_2 = .108; CI = .007 \text{ to } .210$ ). When testing serial multiple mediation, the specific indirect effect of the event centrality through both PTSD symptoms and deliberate rumination ( $a_1a_3b_2$ ) was significant, with a point estimate of .011 and a 95% confidence interval between .0011 and .223. Thus, event centrality was positively associated with PTSD symptoms, which in turn were positively associated with deliberate rumination, which in turn was positively associated with posttraumatic growth.

To answer the exploratory question, the serial mediation model was run four more times, each time using one of the four PTSD symptom cluster scores as the PTSD variable. First, the reexperiencing symptoms were examined. The direct effect (c'), removing the effect of the

mediators was significant ( $\beta = .251, SE = .076, p < .001$ ). The total indirect effect, the sum of the specific indirect effects, was significant with a point estimate of 1.036 and a 95% confidence interval between .830 and 1.283. The specific indirect effect through reexperiencing only was not significant ( $a_1b_1 = -.023; CI = -.091 \text{ to } .046$ ). However, the specific indirect effect through deliberate rumination only was significant ( $a_2b_2 = .942; CI = .737 \text{ to } 1.181$ ). When testing serial multiple mediation, the specific indirect effect of the event centrality through both reexperiencing and deliberate rumination ( $a_1a_3b_2$ ) was significant, with a point estimate of .116 and a 95% confidence interval between .058 and .200. Thus, event centrality was positively associated with reexperiencing symptoms, which in turn were positively associated with deliberate rumination, which in turn was positively associated with posttraumatic growth (see Table 5 and Figure 3).

Second, the avoidance symptoms were examined. The direct effect ( $c'$ ), removing the effect of the mediators was significant ( $\beta = .262, SE = .076, p < .001$ ). The total indirect effect, the sum of the specific indirect effects, was significant with a point estimate of 1.044 and a 95% confidence interval between .824 and 1.300. The specific indirect effect through avoidance only was not significant ( $a_1b_1 = -.008; CI = -.068 \text{ to } .046$ ). However, the specific indirect effect through deliberate rumination only was significant ( $a_2b_2 = 1.008; CI = .794 \text{ to } 1.256$ ). When testing serial multiple mediation, the specific indirect effect of the event centrality through both avoidance and deliberate rumination ( $a_1a_3b_2$ ) was significant, with a point estimate of .060 and a 95% confidence interval between .003 and .051. Thus, event centrality was positively associated with avoidance symptoms, which in turn were positively associated with deliberate rumination, which in turn was positively associated with posttraumatic growth (see Table 6 and Figure 4).

Third, the negative alterations in cognition and mood symptoms were examined. The

direct effect ( $c'$ ), removing the effect of the mediators was significant ( $\beta = .285, SE = .077, p < .001$ ). The total indirect effect, the sum of the specific indirect effects, was significant with a point estimate of 1.064 and a 95% confidence interval between .855 and 1.315. The specific indirect effect through negative alterations in cognitions and mood only was not significant ( $a1b1 = .015; CI = -.019 \text{ to } .054$ ). However, the specific indirect effect through deliberate rumination only was significant ( $a2b2 = 1.036; CI = .819 \text{ to } 1.286$ ). When testing serial multiple mediation, the specific indirect effect of the event centrality through both alterations in cognitions and mood and deliberate rumination ( $a1a3b2$ ) was significant, with a point estimate of .013 and a 95% confidence interval between .001 and .037. Thus, event centrality was positively associated with alterations in cognitions and mood symptoms, which in turn were positively associated with deliberate rumination, which in turn was positively associated with posttraumatic growth (see Table 7 and Figure 5).

Last, the increased arousal and reactivity symptoms were examined. The direct effect ( $c'$ ), removing the effect of the mediators was significant ( $\beta = .279, SE = .075, p < .001$ ). The total indirect effect, the sum of the specific indirect effects, was significant with a point estimate of 1.468 and a 95% confidence interval between 1.207 and 1.758. The specific indirect effect through arousal and reactivity only was significant ( $a1b1 = .571; CI = .315 \text{ to } .856$ ), as was the specific indirect effect through deliberate rumination only was significant ( $a2b2 = .485; CI = .303 \text{ to } .745$ ). When testing serial multiple mediation, the specific indirect effect of the event centrality through both arousal and reactivity and deliberate rumination ( $a1a3b2$ ) was significant, with a point estimate of .412 and a 95% confidence interval between .243 and .621. Thus, event centrality was positively associated with arousal and reactivity symptoms, which in turn were positively associated with deliberate rumination, which in turn was positively associated with

posttraumatic growth (see Table 8 and Figure 6).

## **Discussion**

A growing body of literature suggests that some individuals experience positive psychological changes in the aftermath of traumatic events (Zoellner & Maercker, 2006). This phenomenon has been described as a “significant positive change arising from the struggle with a major life crisis” (Calhoun, et al., 2000, p. 521). Individuals also differ with respect to the extent to which a traumatic event becomes central to their identity, life story and understanding of the world, and such individual differences seem to be critically related to both PTSD symptomatology and development of PTG. Event centrality has been gaining recognition as an important factor in psychological response to stress and traumatic events.

The present study sought to determine if the effect of event centrality on PTG is mediated by PTSD symptom severity and deliberate rumination. The first hypothesis was that there would be a total effect of event centrality on PTG. Consistent with prior research (e.g, Boals & Schuettler, 2011; Groleau et al., 2012; Schuettler & Boals, 2011) this hypothesis was supported, as event centrality was found to be related to greater PTG.

Similar to contemporary models of PTSD (Dalgleish, 2004), Tedeschi and Calhoun (2004) suggested that PTG emerges from a crisis in global meaning and subsequent attempts to reexamine one’s assumptive worldviews after a traumatic event. The second hypothesis was that PTSD symptoms would mediate the relationship between event centrality and PTG. This hypothesis was based on Schuettler’s (2011) suggestion of event centrality as a double-edged sword, in that it can contribute to both PTSD symptomatology and perceived personal growth. However, this hypothesis was not supported. As discussed below, it appears that cognitive processes are necessary for the development of growth. In addition to total PTSD symptom

severity, only the increased arousal and reactivity PTSD clusters were found to significantly mediate the relationship between event centrality and PTG. Since this was an exploratory analysis, this was considered an unexpected finding. Further replication is necessary to determine its significance. One possible explanation is that increased arousal can instigate more awareness. This increased awareness and arousal could make it less likely for an individual to disengage, which in turn could lead to PTG. Another possible explanation is that this is an indication of those who are experiencing sufficient PTSD symptoms to possibly meet criteria, since arousal and reactivity symptoms are more specific to PTSD compared to the other PTSD clusters.

Although the second hypothesis was not supported, consistent with recent models of rumination (Cann et al., 2010), the third hypothesis was that deliberate rumination would significantly mediate the relationship between event centrality and growth. Event centrality was hypothesized to influence rumination following a traumatic event by intensifying the attention paid to the thoughts and limiting an individual's ability to disengage. This hypothesis was supported. The findings suggest that the centrality of an experienced event does impact the adaptive nature of this type of cognitive coping strategy. Individuals with a more integrated or central event seem to benefit from increased deliberate processing due to the event's relative importance to the individual. This finding could suggest that reevaluating one's value system after traumatic event may lead to greater engagement with growth-inducing development.

Last, the fourth hypothesis was that the relationship between event centrality and posttraumatic growth would be found to be sequentially mediated by posttraumatic stress symptoms and deliberate rumination. This hypothesis was also supported. Since challenging one's core beliefs is essential for the development of PTG (Payne, Joseph, & Tudway, 2007), it seems that appraising a traumatic event as central to one's identity leads to individuals

reevaluating and accommodating their worldviews. Research suggests that when individuals consider the event as part of their identity, they are also more likely to have successfully incorporated the event into their existing schemas, which can prompt additional cognitive mechanisms necessary to make sense of the event (Boals, 2010; Boelen, 2009). Highly central events then prompt processes such as narrative organization, which may stimulate the additional cognitive factors (Rubin, Boals, & Berntsen, 2008).

As the results demonstrate, cognitive processes in the aftermath of experiencing a traumatic event play an important role in the impact of the event on the person. Intrusive thoughts about the event are likely to be associated with continued distress and failure to cope effectively, while deliberate rumination, aimed at understanding and problem-solving, seems to be predictive of posttraumatic growth (PTG). Accordingly, it was found that deliberate cognitive processing about the event is beneficial in facilitating the coping process. Deliberate rumination about an event indicates engagement in a process of examining the event and its implications that could lead to understanding, to restoring previous, or to rebuilding revised, core beliefs. For many people dealing with life's serious stressors, it is through a process of deliberate rumination that they recognize how they have changed and how they have grown. Thus, consistent with Calhoun and Tedeschi's (2006) model, PTG was found to more likely occur when the individual purposely ruminated over the event. This allowed individuals to both process what has happened and also to attribute meaning to the traumatic occurrence. Consistent with previous studies (Affleck & Tennen, 1996; Cann et al., 2010; Taku et al., 2008) and Calhoun and Tedeschi's (2006) model of PTG, the findings of this study supported the idea that individual's deliberate rumination activated by challenges to core beliefs has a positive effect on development of PTG.

According to Calhoun and Tedeschi (2006), intrusive rumination soon after traumatic events can provide individuals with traumatic cues that provide opportunities for further cognitive processing of the traumatic events, which in turn result in deliberate rumination. Deliberate rumination then can change pathological thinking styles and reduce trauma-related fear, which in turn ameliorates PTSD symptoms (Ehlers & Steil, 1995). Thus, deliberate rumination is proposed as a protective factor against PTSD and a predictive factor for PTG. A response to core beliefs being challenged by traumatic event might lead to struggles to process the event. Struggles such as reexperiencing, arousal, and avoidance/ numbing can aggravate PTSD symptoms; however, other attempts to reorder and redefine life goals and priorities may lead to increased satisfaction with life and relationships, and enhance individual strength, and as a result lead to PTG (Calhoun & Tedeschi, 2001; Tedeschi & Calhoun, 1995).

Once this struggle has occurred, the individual is confronted with reanalyzing and making revisions to his or her views of the self and world. This shattering of beliefs can cause a major reexamination of one's view of the world. If a negative event is construed as central to one's identity and life story, it causes a reexamination of values and beliefs. This reexamination could set the stage for the possibility of impairment. For instance, subsequent construals such as a negative perspective of the event, negative posttrauma cognitions of the self and world, and intrusive ruminations likely contribute to the development of PTSD symptoms. However, the reexamination also sets the stage for the possibility of growth. Subsequent construals such as positive perspectives of the event, a lack of negative posttraumatic cognitions about the self and world, and deliberate rumination likely contribute to PTG.

Thus, the present study identified two elements that can lay the foundation for the possibility of growth: the degree to which an individual appraises the traumatic event as being

central to their identity, and the degree to which the central event initiates deliberate cognitive processes. When a major stressful event seriously challenges individuals' beliefs about how the world works and their place in the world, they have lost a sense of understanding. However, through the process of attempting to understand the event and rebuilding those core beliefs about the world, individuals are provided with the opportunity for realizing growth. Effective cognitive work that confronts the challenged beliefs can help restore or revise the assumptive world and allow the person to appreciate how they have been challenged and changed by the experience of a major crisis (Janoff-Bulman, 2006). Events that are highly central to one's identity may perpetuate rumination processes and decrease the ability to disengage from this strategy and switch to something more adaptive in the situation. Thus, the centrality of an experienced event to one's identity could be conceptualized as a context under which the adaptiveness of rumination strategies might be expected to change.

### **Implications**

The question of what distinguishes adaptive from maladaptive processing of traumatic experiences is of high clinical importance and of great interest to therapists. It appears that traumatic events that are appraised as central can lead to reexamination of core beliefs. Thus, if studies measuring posttraumatic growth limit the type of events to those appraised as highly central, this could increase chances that the PTGI is measuring actual growth, as opposed to other positive constructs such as coping strategies. The present study could lead to improved measurement of PTG, which will in turn could lead to larger effect sizes, more consistency across studies, and a better understanding of how individuals truly grow from adversity.

Clinically, identifying highly meaningful events may provide focal points around which interventions and coping strategies could be structured. When treating individuals with PTSD,

clinicians may want to attend to the adaptive rebuilding of the assumptive world (Janoff-Bulman, 2006). People who are better able to find meaning in the event experienced higher levels of PTG. When highly stressful events become central to identity, the valence of this centrality is an important consideration. Clinicians need to be aware to the degree to which traumatic events are becoming either positive and adaptive components of the individual's identify and life narrative, or negative and maladaptive components.

Deliberate rumination is also an equally important cognitive factor related to both distress and growth after trauma. Cognitive therapy and cognitive-behavior therapy studies of PTSD have emphasized that active thinking about traumatic events can change pathological thinking styles and reduce trauma-related fear and PTSD symptoms (Ehlers & Steil, 1995; Paunovic & Öst, 2001). Subsequently, this can also help trauma survivors reconstruct positive meanings in traumatic events, resulting in PTG (Cann et al., 2010; Taku, Calhoun, Cann, & Tedeschi, 2008). Thus, conceptualizing deliberate rumination as a protective factor related to PTSD can also be conducive to the development of PTG. This conceptualization of predictors of PTSD and PTG via cognitive processes may enable clinicians to better help clients navigate their cognitive responses following traumatic events in a way that fosters positive coping strategies. For example, clinicians can work with clients to identify both the frequency and type of event-related rumination and target strategies that lead to more beneficial forms of this process.

Clinicians are unable control whether people experience traumatic events, but do have the ability influence the narrative that follows. There is some empirical evidence that changes in narratives are related to better outcomes (Foa, Molnar, & Cashman, 1995). Through expressive writing, narratives are revised such that a coherent story emerges (Graybeal, Sexton, & Pennebaker, 2002). By increasing the use of cognitive processing words in narratives, better

outcomes have been found to occur (Klein & Boals, 2001). Therefore, cognitive processing words is believed to be a part of the meaning-making process (Boals, 2012; Boals et al., 2011). Creating a coherent narrative should be a primary goal to help individuals cope with traumatic experiences. This can help therapists not only reduce negative trauma outcomes such as PTSD symptoms, but also foster growth.

Findings confirm the importance of exploring the meaning of a traumatic event to the individual's identity and highlights the importance of the type of rumination within an intervention. Therapeutic work with survivors of trauma has long integrated cognitive and emotional processing of experienced events. A number of different therapies exist that specifically include cognitive reprocessing and meaning making of the traumatic experience (e.g., cognitive processing, cognitive restructuring, and schema therapies). It is believed that purposeful contemplation about a traumatic event can help address and resolve discrepancies between cognitions and the shattering of one's core beliefs. Such contemplation can facilitate making sense of the trauma, integrating these new understandings into beliefs and assumptions about others and the world, and can help to cope with intense distress resulting from the experience (Janoff-Bulman, 1992). This type of cognitive processing of traumatic experiences is consistent with Calhoun and colleagues' (2000) conceptualization of deliberate event-related rumination. Clients presenting with PTSD typically do experience symptom reduction following cognitive therapies, but there is room for considerable improvement. The present findings highlight the importance of specifically examining the ways in which clients are encouraged to engage in cognitive processing, as a deliberate, focused strategy might be associated with improvements.

## **Limitations**

The present study has several limitations. First, a nonclinical college student sample was used. It is possible that college students could exhibit rates and severity of pathology lower than clinical and community-based samples. However, past research suggests that trauma exposure for college students is comparable to that of the general population (Bernat, Ronfeldt, Calhoun, & Arias, 1998). Future studies should seek to address the relationship between event centrality and psychological well-being in clinical populations in which levels of psychopathology (e.g., PTSD, depression) may be more severe. The majority of the students in the present study self-identified as White or African American. The use of a self-selecting nonclinical undergraduate population from an academically rigorous university may limit the generalizability of the results based on a number of known and unknown factors, including limited range in terms of race, socioeconomic status, and overall life experiences.

The second limitation of this present study is that the results of the study are correlational, making it difficult to draw causal inferences regarding the data. No studies, to date, have attempted to manipulate levels of centrality, which could further explain the impact of centrality on subsequent functioning. However, since event centrality is an individual difference variable, it cannot be manipulated. Additionally, results of the present study are limited by its cross-sectional design, making conclusions regarding long-term effects of centrality difficult. Since this study includes cognitive measures, it would be important to address this limitation, as many feedback loops likely exist (e.g., as symptoms increase, it is likely the individual will appraise the traumatic event as either more or less central). It has also been found that some of the potential positive effects of deliberate rumination may be seen over time (Taku et al., 2011),

but assessment of growth was obtained at only one time point in the present study. Thus, the need for longitudinal studies in this area is clear.

Last, although study results are consistent with existing literature, the study is further limited by all measures being self-report which may introduce method bias. Specifically, the reliance on self-reported growth has yielded inconsistent findings in previous research (Frazier et al., 2009). Though no known clinician-administered interview for PTG exists, it would be integral to measure PTG across various forms of measurement.

### **Future Directions**

As already alluded to, longitudinal studies should be conducted to assess the path of the aftermath of traumatic events. If the observed links between centrality of events, rumination, and trauma aftermath are indeed causal, clinicians should consider administering the Centrality of Event Scale (CES) and Event-Related Rumination Inventory (ERRI) as part of a comprehensive diagnostic assessment when working with clients who have experienced traumatic events. When formulating a treatment plan, level of event centrality will likely influence the amount of traumatic response to the event, and the type of rumination could indicate the direction of trauma aftermath (PTG versus PTSD). Future research should examine possible cut-off scores for centrality of event to better guide clinicians in treatment planning and to assess effectiveness of treatment plans. It would also be beneficial if future studies address the development and maintenance of centrality over long periods of time. In addition, studies that incorporate an experimental design that can manipulate event centrality can further clarify the impact of centrality on subsequent functioning.

Just because an individual experienced an event that meets the *DSM* criteria as a traumatic event does not necessarily mean the event was highly influential to the individual

(Boals & Hathaway, 2010). The events may not have been significant or central enough to challenge their worldviews. This explanation could possibly clarify why correlations involving PTG and other related constructs have been small and inconsistent. Studies could be examining inapplicable events. Thus, a participant's inclusion into PTG studies should not be based simply on whether he or she had experienced "trauma", but rather whether the event challenged the individual's core beliefs and view of the world.

Additionally, more work is needed to clarify the relationship between deliberate and intrusive forms of rumination. Longitudinal work could clarify whether intrusive rumination can lead to deliberate rumination. Though this study did not examine intrusive rumination specifically, future research should examine the distinction between the intrusive items on the ERRI and the intrusive symptoms of PTSD. This would elucidate the overlap in these constructs, the separate paths by which they develop, and the utility of treatments in addressing each.

Given the strong, direct association between centrality of an event and positive mental health outcome, it may be important for future research to examine other aspects of an event that may interact with rumination to exacerbate or improve outcome. This could include the type, severity, and duration of the traumatic event, length of time that has passed since the experience, or the accumulation of other traumatic experiences. As these findings suggest, both cognitive and emotional processing of the traumatic memory with respect to one's identity are important for fully understanding outcome.

Thus, future studies should explore additional cognitive variables and their influence on the development of growth and symptoms of distress. Numerous other cognitive construals and narrative components possibly play key roles that are yet to be identified and examined. Future

research should continue to address various aspects of narratives and the role they play in trauma outcomes.

Overall, this study is unique in that it examined both centrality and cognitive coping strategies as predictors of simultaneous positive and negative outcomes, and that it examined these factors in individuals who met *DSM-5* criteria for a traumatic event. These findings add to the small, but growing literature that looks at both positive and negative outcomes within individuals. This study contributes new knowledge to previous theoretical and empirical studies that examine the relationship between event centrality, rumination, PTSD, and PTG, and further suggests that deliberate rumination elicits PTG.

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## Appendix

Table 1

*Frequency of Event Type for Criterion A Group*

Event	Total % (n)
Transportation Accident	36.1 (97)
Sexual Assault	21.2 (57)
Natural Disaster	8.9 (24)
Serious Accident	7.8 (21)
Physical Assault	6.3 (17)
Other	4.8 (13)
Suicide	4.5 (12)
Sudden Violent Death	4.1 (11)
Assault with a Weapon	3.3 (9)
Fire or Explosion	3.0 (8)

Table 2

*Descriptive Statistics of the CES, PCL-5, ERRI, and PTGI*

Measure	N	M(SD)	$\alpha$	Range	Median
CES	201	40.29 (19.32)	.97	20-74	36
PCL-5	193	11.06 (14.38)	.96	0-77	7
ERRI	206	8.79 (14.4)	.98	0-30	7
PTGI	202	22.93 (21.06)	.97	0-82	18

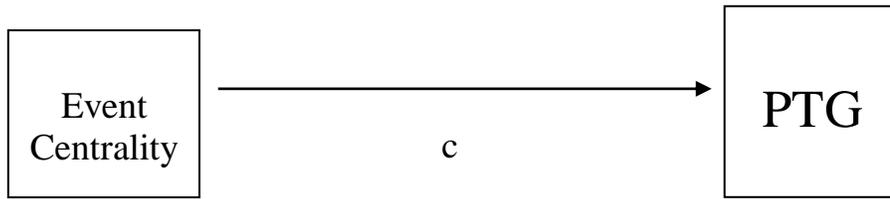
*Note.* CES = Centrality of Event Scale; PCL-5 = Posttraumatic Stress Disorder Checklist-5; ERRI = Event Related Rumination Inventory; PTGI = Posttraumatic Growth Inventory; *n* = sample size; M (*SD*) = sample mean and standard deviation;  $\alpha$  = Cronbach's alpha coefficient.

Table 3

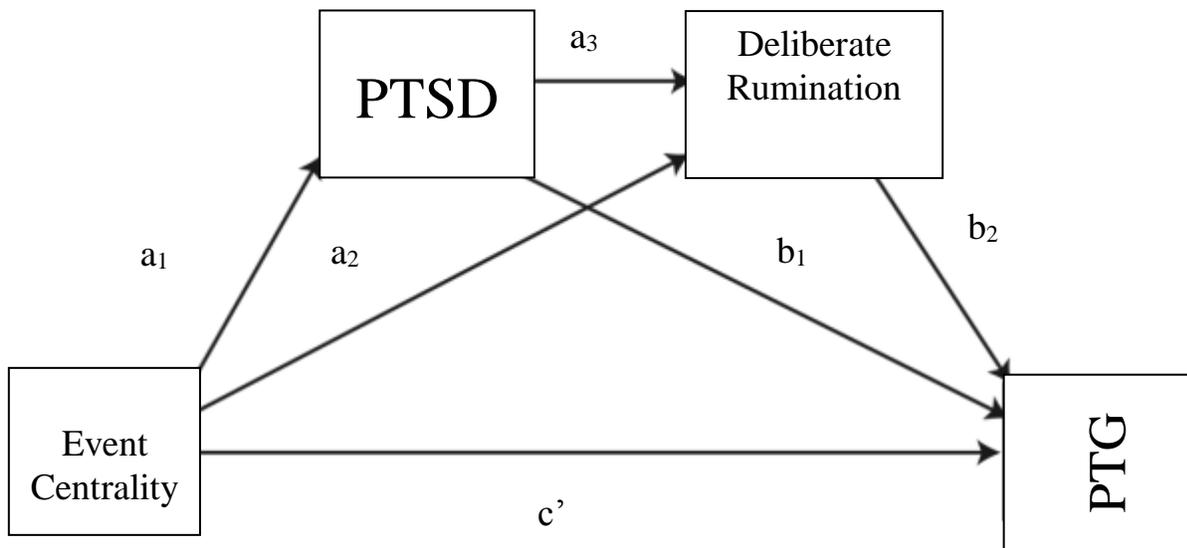
*Associations Among Event Centrality, PTSD, Deliberate Rumination, and Posttraumatic Growth*

Measure	1.	2.	3.	4.	5.	6.	7.
1. Event Centrality (CES)							
2. PTSD (PCL-5)	.48						
3. Deliberate Rumination (ERRI)	.55	.38					
4. Posttraumatic Growth (PTGI)	.39	.29	.36				
5. Reexperiencing (PCL-5)	.44	.89	.31	.29			
6. Avoidance (PCL-5)	.48	.83	.44	.31	.79		
7. NACM (PCL-5)	.46	.92	.36	.24	.71	.70	
8. AR (PCL-5)	.38	.91	.31	.24	.73	.65	.80

*Note.* CES = Centrality of Event Scale; PCL-5 = Posttraumatic Stress Disorder Checklist– 5; ERRI = Event Related Rumination Inventory; PTGI = Posttraumatic Growth Inventory; NACM= Negative Alterations in Mood and Cognition; AR= Arousal and Reactivity; all  $r$ 's are significant at  $p < .01$ .



H1 = Event Centrality  $\longrightarrow$  PTG



H2 = Event Centrality  $\longrightarrow$  PTSD  $\longrightarrow$  PTG

H3 = Event Centrality  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

H4 = Event Centrality  $\longrightarrow$  PTSD  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

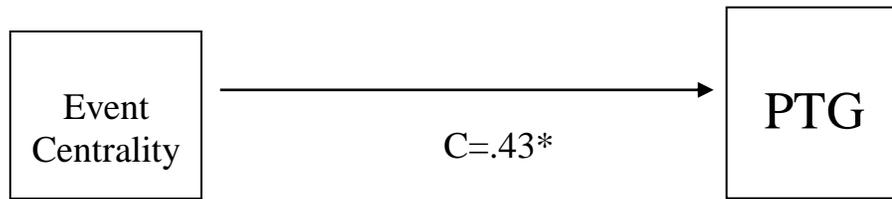
*Figure 1. Serial Multiple Mediation Model*

Table 4

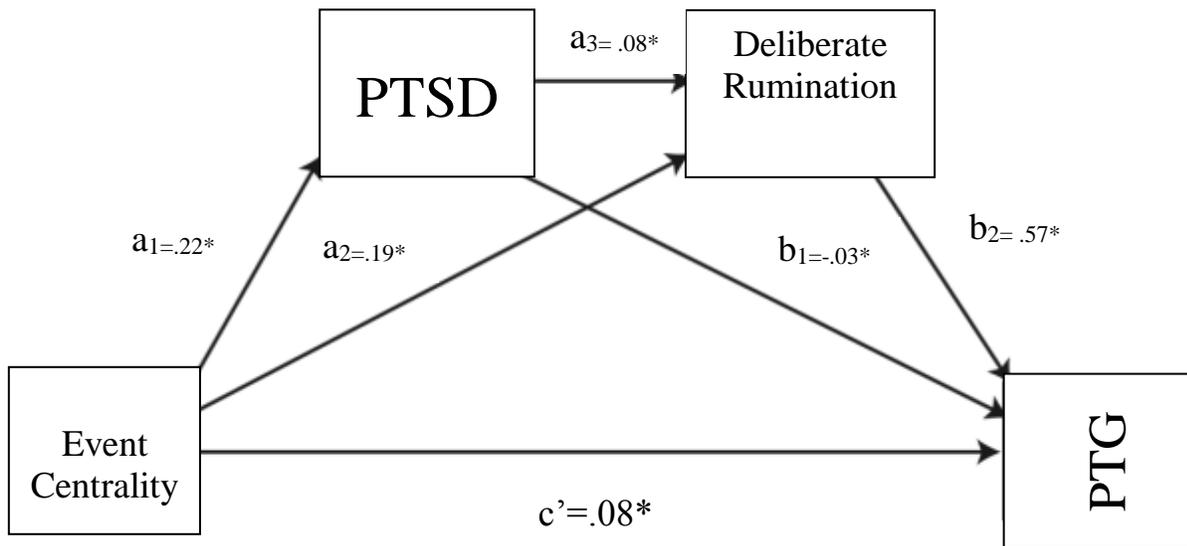
*Path Coefficients and Indirect Effects for Mediation Model with PTSD Total Score*

	Unstandardized Path Coefficients			Standardized Path Coefficients			R <sup>2</sup>	Estimate	Indirect Effects Bias-Corrected Bootstrap 95% Confidence Interval
	To PTG	To PTSD	To DR	To PTG	To PTSD	To DR			
Event Centrality	.59 (.11)	.22 (.09)	.19 (.02)	.47 (.08)	.28 (.11)	.54 (.05)			
PTSD	-.03 (.11)		.08 (.03)	-.02 (.07)		.19 (.06)	.08 (.06)		
DR	.57 (.32)			.16 (.09)			.38 (.06)		
PTG							.33 (.05)		
Total									.01, .22
EC->PTSD->PTG								-.08 (.03)	-.06, .03
EC->DR->PTG								.12 (.07)	.01, .21
EC->PTSD->DR->PTG								.01 (.01)	.01, .04

*Note.* DR = Deliberate Rumination; N =269. Bootstrap confidence intervals were constructed using 5000 resamples. Standard error in parenthesis.



H1 = Event Centrality  $\longrightarrow$  PTG



H2 = Event Centrality  $\longrightarrow$  PTSD  $\longrightarrow$  PTG

H3 = Event Centrality  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

H4 = Event Centrality  $\longrightarrow$  PTSD  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

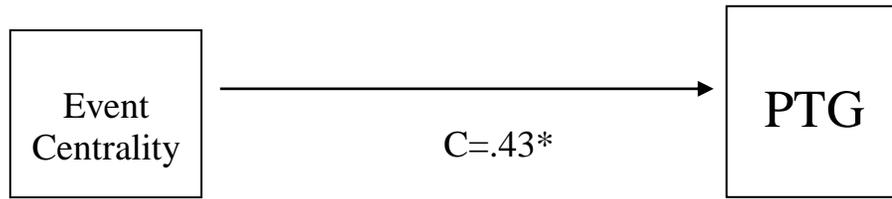
Figure 2. Serial Multiple Mediation Model with PTSD Total Score. Note.  $*p < .001$ .

Table 5

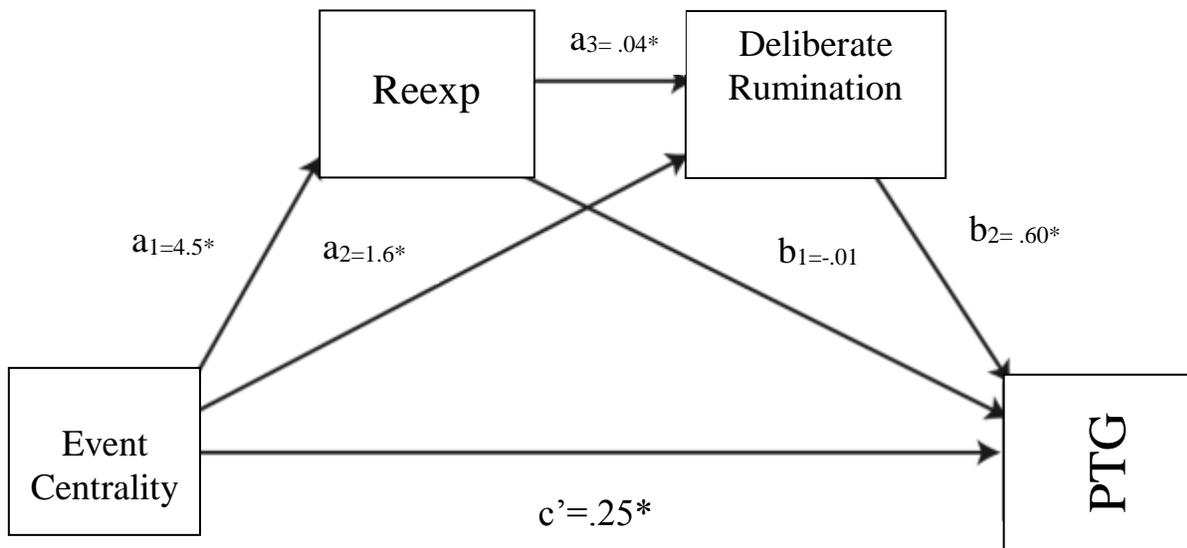
*Path Coefficients and Indirect Effects for Mediation Model with Reexperiencing Total Score*

	Unstandardized Path Coefficients			Standardized Path Coefficients			R <sup>2</sup>	Estimate	Indirect Effects Bias-Corrected Bootstrap 95% Confidence Interval
	To PTG	To Reexp	To DR	To PTG	To Reexp	To DR			
Event Centrality	.40 (.15)	4.5 (.52)	1.6 (.18)	.18 (.07)	.48 (.06)	.62 (.06)			
Reexp	-.01 (.01)		.05 (.01)	-.02 (.04)		.16 (.05)	.23 (.05)		
DR	.60 (.15)			.69 (.07)			.51 (.07)		
PTG							.66 (.06)		
Total								1.0 (.04)	.83, 1.3
EC->Reexp->PTG								-.02 (.04)	-.09, .05
EC->DR->PTG								.94 (.14)	.74, 1.2
EC->Reexp->DR->PTG								.12 (.04)	.06, .20

*Note.* Reexp. = Reexperiencing; DR = Deliberate Rumination; N = 269. Bootstrap confidence intervals were constructed using 5000 resamples. Standard error in parentheses.



H1 = Event Centrality  $\longrightarrow$  PTG



H2 = Event Centrality  $\longrightarrow$  Reexp  $\longrightarrow$  PTG

H3 = Event Centrality  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

H4 = Event Centrality  $\longrightarrow$  Reexp  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

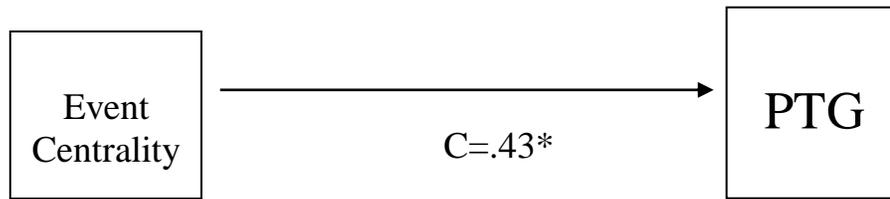
Figure 3. Serial Mediation Model with Reexperiencing Score. Note. Reexp = Reexperiencing; \* $p < .001$ .

Table 6

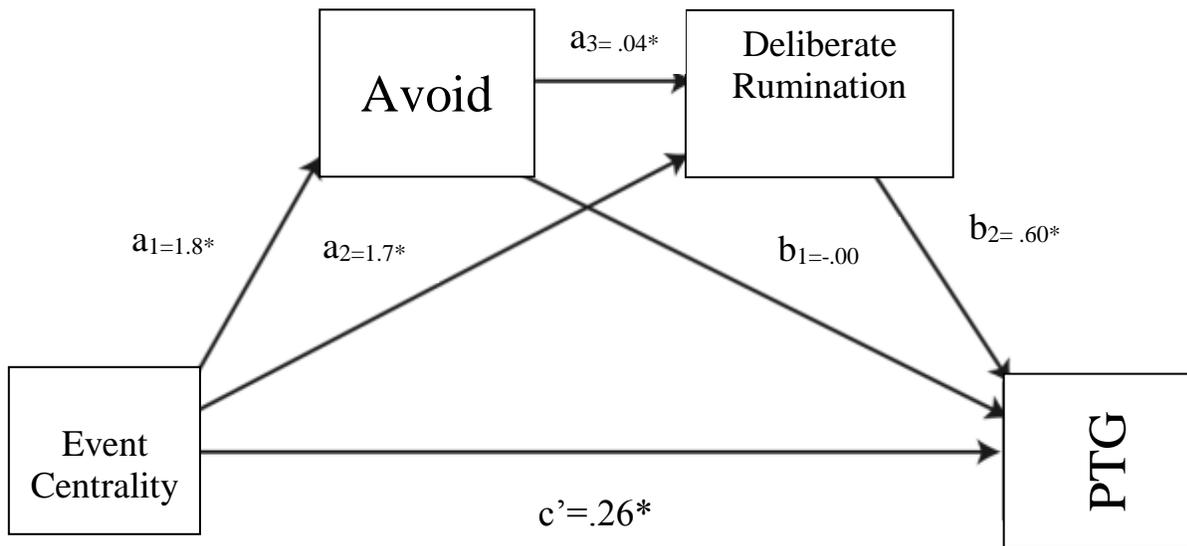
*Path Coefficients and Indirect Effects for Mediation Model with Avoidance Total Score*

	Unstandardized Path Coefficients			Standardized Path Coefficients			R <sup>2</sup>	Estimate	Indirect Effects Bias-Corrected Bootstrap 95% Confidence Interval
	To PTG	To Avoid	To DR	To PTG	To Avoid	To DR			
Event Centrality	.39 (.16)	1.8 (.21)	1.7 (.19)	.18 (.07)	.43 (.05)	.67 (.06)			
Avoid	.00 (.12)		.04 (.04)	-.01 (.04)		.07 (.06)	.19 (.04)		
DR	.60 (.07)			.68 (.07)			.49 (.07)		
PTG							.66 (.06)		
Total								1.0 (.14)	.82, 1.3
EC->Avoid->PTG								-.01 (.04)	-.07, .05
EC->DR->PTG								1.1 (.14)	.80, 1.3
EC->Avoid->DR->PTG								.02 (.01)	.00, .05

*Note.* Avoid = Avoidance; DR = Deliberate Rumination; N = 269. Bootstrap confidence intervals were constructed using 5000 resamples. Standard error in parentheses.



H1 = Event Centrality  $\longrightarrow$  PTG



H2 = Event Centrality  $\longrightarrow$  Avoid  $\longrightarrow$  PTG

H3 = Event Centrality  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

H4 = Event Centrality  $\longrightarrow$  Avoid  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

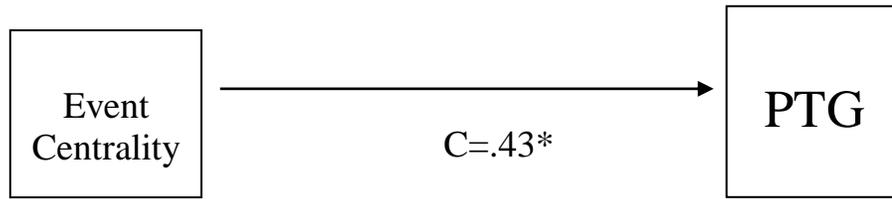
Figure 4. Serial Multiple Mediation Model with Avoidance Score. Note. Avoid = Avoidance; \* $p < .001$ .

Table 7

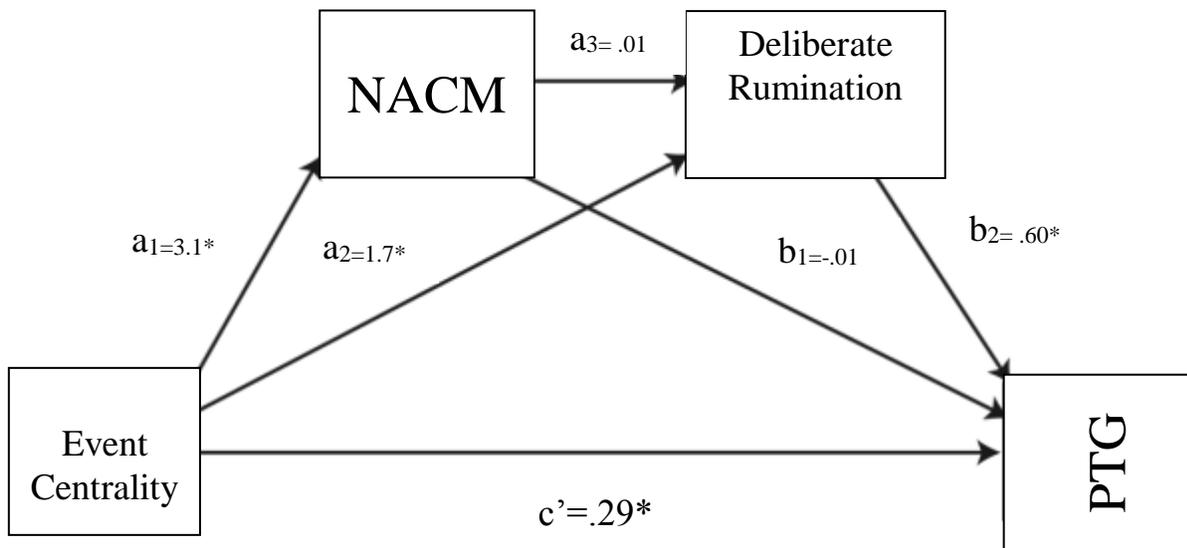
*Path Coefficients and Indirect Effects for Mediation Model with NAMC Score*

	Unstandardized Path Coefficients			Standardized Path Coefficients			R <sup>2</sup>	Estimate	Indirect Effects Bias-Corrected Bootstrap 95% Confidence Interval
	To PTG	To NACM	To DR	To PTG	To NACM	To DR			
Event Centrality	.37 (.15)	3.1 (.64)	1.7 (.18)	.17 (.07)	.31 (.06)	.69 (.05)			
NACM	.01 (.01)		.01 (.01)	.02 (.03)		.03 (.05)	.09 (.04)		
DR	.60 (.07)			.68 (.06)			.49 (.07)		
PTG							.66 (.06)		
Total								1.1 (.14)	.86, 1.3
EC->NACM->PTG								.02 (.01)	-.02, .05
EC->DR->PTG								1.0 (.14)	.82, 1.3
EC->NACM->DR->PTG								.01 (.02)	.01, .04

*Note.* NACM = Negative Alterations in Cognition and Mood; DR = Deliberate Rumination; N = 269. Bootstrap confidence intervals were constructed using 5000 resamples. Standard error in parentheses.



H1 = Event Centrality  $\longrightarrow$  PTG



H2 = Event Centrality  $\longrightarrow$  NACM  $\longrightarrow$  PTG

H3 = Event Centrality  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

H4 = Event Centrality  $\longrightarrow$  NACM  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

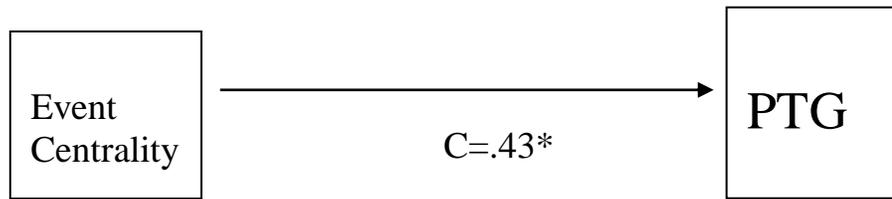
Figure 5. Serial Multiple Mediation Model with NACM Score. Note. NACM = Negative Alterations in Cognition and Mood; \* $p < .001$ .

Table 8

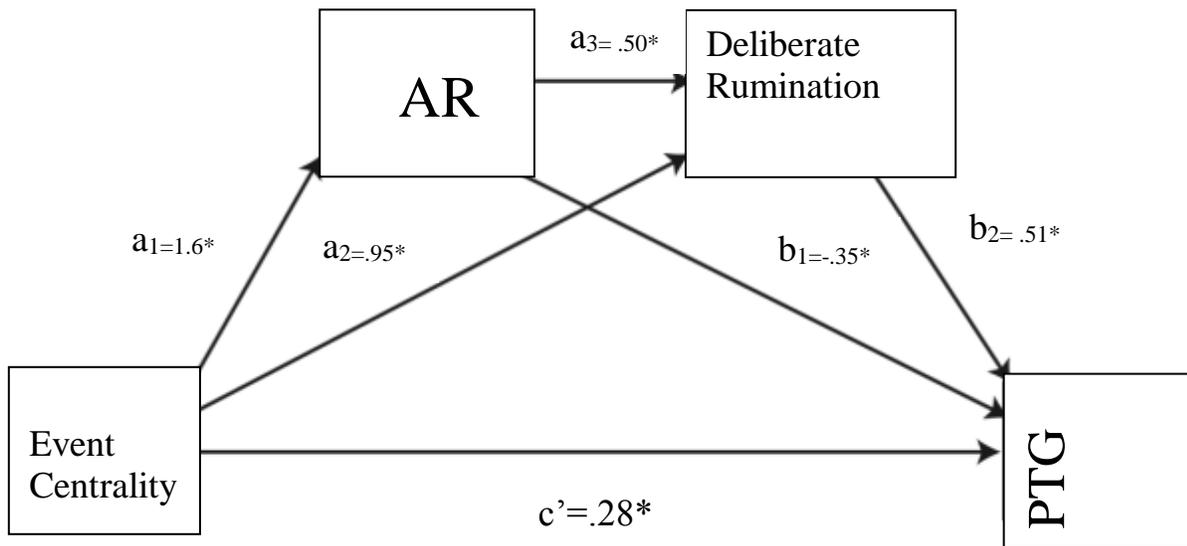
*Path Coefficients and Indirect Effects for Mediation Model with AR Score*

	Unstandardized Path Coefficients			Standardized Path Coefficients			R <sup>2</sup>	Estimate	Indirect Effects Bias-Corrected Bootstrap 95% Confidence Interval
	To PTG	To AR	To DR	To PTG	To AR	To DR			
Event Centrality	.04 (.15)	1.6 (.11)	.95 (.23)	.02 (.07)	.79 (.04)	.39 (.08)			
AR	.35 (.01)		.50 (.11)	.33 (.09)		.41 (.09)	.62 (.06)		
DR	.51 (.08)			.58 (.08)			.55 (.07)		
PTG							.70 (.05)		
Total								1.4 (.17)	1.2, 1.8
EC->AR->PTG								.57 (.17)	.32, .86
EC->DR->PTG								.49 (.13)	.30, .75
EC->AR->DR->PTG								.41 (.11)	.24, .62

*Note.* AR = Arousal and Reactivity; DR = Deliberate Rumination; N = 269. Bootstrap confidence intervals were constructed using 5000 resamples. Standard error in parentheses.



H1 = Event Centrality  $\longrightarrow$  PTG



H2 = Event Centrality  $\longrightarrow$  AR  $\longrightarrow$  PTG

H3 = Event Centrality  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

H4 = Event Centrality  $\longrightarrow$  AR  $\longrightarrow$  Deliberate Rumination  $\longrightarrow$  PTG

Figure 6. Serial Multiple Mediation Model with AR Score. Note. AR = Arousal and Reactivity;  $*p < .001$ .