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**Examining the Relationship Between Posttraumatic Stress Symptoms
and Posttraumatic Growth: Pathways to Thriving in the Face of
Adversity**

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Abstract

Research has largely focused on the negative physical and psychological consequences of trauma exposure. In contrast, posttraumatic growth is a relatively recent addition to our understanding of people's response to life's struggles. Posttraumatic growth (PTG) is conceptualized as positive changes in a person's life following a cognitive struggle in the aftermath of trauma. However, PTG research is a relatively nascent line of empirical inquiry and there are several major unanswered questions about the construct and its utility. Part of this is due to conflicting findings related to the relationship between PTG and psychological distress and adaptive significance. The current study sought to clarify the relationship between posttraumatic stress symptoms (PTSS) and PTG in a large convenience sample of trauma-exposed college students ($N = 572$). Research shows that PTSS and PTG are independently related to ruminative thought processes, religiosity, depression, social support, and physical health functioning. However, little is known about the degree to which these factors influence the relationship between PTSS and PTG. A secondary aim of this study was to examine these processes as potential pathways of influence through which PTG is facilitated or precluded in the aftermath of trauma. Results revealed a positive association between PTSS and PTG across the sample, however subsequent analyses suggested a stronger curvilinear relationship for those identifying as African American and/or female gender. There was no statistically significant association between PTG and measures of physical health functioning. Notably, symptoms of depression served as an inconsistent mediator of the relationship between PTSS and PTG, suggesting depressive symptoms may impede the development of PTG in the aftermath of trauma. Findings indicate some support of the

conceptualization of PTG as an adaptive illusion when it concerns physical health domains but suggest a stronger relationship with affective well-being.

Introduction

“What does not destroy me, makes me stronger.”

Friedrich Nietzsche (Nietzsche, 1990, p. 33)

This dictum from Nietzsche exemplifies the central premise of what was explored in the current study. This study examined the idea that people can not only survive adversity, but also can perhaps transcend it and experience growth as a result of dealing with life's struggles. More specifically, this study endeavored to investigate potential mediating and moderating variables that enhance or inhibit the development of posttraumatic growth following trauma exposure, an area that has received limited empirical attention.

Decades of research and empirical studies support the notion that traumatic life events can lead to a variety of negative physical and psychological consequences (Schnurr, 2004). The National Comorbidity Survey (NCS) estimated that 60% of men and 50% of women in the United States are exposed to at least one traumatic event during their lifetime (Kessler et al., 2005). Although most trauma-exposed individuals experience a negative response in the immediate aftermath of trauma, their symptoms typically reduce after a few weeks (Kearns, Ressler, Zatzick, & Rothbaum, 2012). However, for a substantial minority of people, the symptoms persist and develop into one of several psychiatric disorders, including posttraumatic stress disorder (PTSD), with an estimated 6.4% of adults suffering from PTSD at some point in their life (Pietrzaka, Goldstein, Southwick, & Grant, 2011). Further, the experience of traumatic loss, life threat, and injury have been associated with elevated levels of posttraumatic stress symptoms (PTSS; Cerda et al., 2013; Haagsma, et al., 2012) that may or may not reach diagnostic criteria for PTSD. PTSS have been implicated in the development of

maladaptive emotional responses such as increased anger, anxiety, and depression (Kotler, Iancu, Efroni, & Amir, 2001; Tedeschi and Calhoun, 1996).

Research has focused predominantly on the negative effects of trauma on mental health outcomes (e.g. PTSS and comorbid depression and anxiety; Marshall et al., 2001; Ozer, Best, Lipsey, & Weiss, 2003). However, a growing literature has begun to explore positive effects of trauma on survivors' lives subsequent to exposure to a traumatic event (Frazier, Colnon, & Glaser, 2001; Tedeschi & Calhoun, 2004). The realization that individuals can experience positive changes following adverse life events is hardly new, with many early religious teachings touting the potentially transformative power of suffering (Tedeschi & Calhoun, 1995). For example, Christianity praises the sacrifice of Jesus, with his suffering viewed as having the power to transform others (McGrath, 2006). In some Islamic traditions, suffering is seen as instrumental to the purposes of Allah, teaching that, similarly to that exemplified by the Prophet Muhammad and his worldly sufferings, cruelty and oppression should be met with forgiveness and mercy (Masoodi & Maqbool, 2017). In the Buddhist tradition, the story of Prince Gautama leaving the palace is a testament to knowledge gained through sacrifice. Buddhism holds that life is constantly changing, and suffering is inevitable (Joseph & Hefferon, 2013). Collectively, these traditions suggest the potential for transcending suffering, transforming it into a resource for internal control and meaning. More recently, in psychology, this approach is reminiscent of the works of humanistic psychology (Rogers, 1951). The notion of growth in the face of adversity has therefore been acknowledged in previous works, yet it is only in the last few decades that it has formed the basis of systematic empirical study (e.g., Tedeschi & Calhoun, 1996).

Positive effects in the aftermath of trauma consistently include feelings of personal strength, relating to others more deeply, spiritual growth, a greater appreciation of life, or a sense of new possibilities (Tedeschi & Calhoun, 1996). Taken together, these benefits are conceptualized as comprising posttraumatic growth (PTG), a construct which has been studied subsequent to a variety of traumatic events such as natural disasters (Leykin, Lahad, & Bonne, 2013), terrorist attacks (Val & Linley, 2006), sexual assault (see Ulloa, Guzman, Salazar, & Cala, 2016 for review), serious physical health problems (Yi & Kim, 2014), combat exposure (Tedeschi & McNally, 2011), and within the bereavement literature (Cadell, Regehr, & Hemsworth, 2003; Calhoun, Tedeschi, Cann, & Hanks, 2010). At heightened levels of growth, individuals have been found to report closer relational ties, increased compassion, and a deeper appreciation of life (Ai, Cascio, Santangelo, & Evans-Campbell, 2005). Tedeschi and Calhoun (2004) describe PTG as the result of a post-trauma cognitive struggle. As such, when individuals experience a traumatic event, their basic assumptions of the world can be challenged and shaken. Subsequent growth is thought to occur once these foundations are rebuilt (Calhoun & Tedeschi, 1998). Therefore, the presence of some level of post-trauma distress is a prerequisite for PTG development.

Posttraumatic Growth versus Resilience

While similar, it is important to differentiate between PTG and the construct of resilience. According to Cloitre, Morin, and Linares (2005), resilience is a term used to describe an innately positive psychological and emotional attribute, which allows an individual to maintain their baseline functioning following adverse life events. As such, a resilient person is able to demonstrate effective coping despite experiencing the adversity

of a traumatic event, which in turn inhibits the development of significant lasting stress-related symptomatology. In contrast, PTG occurs following a struggle, which includes challenges to an individual's worldview, sense of understanding, beliefs about the future, and meaning regarding their life or the world around them. According to Tedeschi and Calhoun (1996), PTG occurs following a successful adaptation to a new reality in the aftermath of trauma. An individual who is already resilient when trauma occurs will often fail to experience PTG because a resilient person is able to assimilate a traumatic event into their existing belief system. Less resilient people, on the other hand, may experience significant psychological distress as they attempt to understand the reasons why the event occurred to them and how to continue on with their lives in its aftermath, a process that has the potential to result in a sense of personal growth beyond pre-trauma levels.

Relationships Between Posttraumatic Stress and Posttraumatic Growth

Based on the definition of PTG as positive responses to traumatic events, it stands to reason that PTG would be associated with positive outcomes. Corroborating this, PTG has been associated with better physical health, optimism, increased quality of life, perceived control, and active coping (Updegraff & Taylor, 2000), as well as less anxiety and depression (Park & Fenster, 2004). The relationship between PTSD and PTG has been less clear. Although counterintuitive, research suggests positive and negative reactions to trauma may not be on opposite ends of a spectrum (Linley, Joseph, Cooper, Harris, & Meyer, 2003). In fact, there is overwhelming evidence that individuals facing a wide variety of very difficult life circumstances experience significant changes in their lives that they view as highly positive. While much progress has been made in the previous two decades related to the study of PTG, our understanding of the relationship

between this construct and posttraumatic stress is in its infancy, and less is known about the processes through which individuals experience growth post-trauma.

Numerous studies have examined the relationship between PTSS and PTG, with mixed results. First, a positive, linear relationship between PTSS and PTG was found in a sample of bereaved HIV/AIDS caregivers (Cadell, Regehr, & Hemsworth, 2003). This positive relationship between PTSS and PTG was also found in a sample of bereaved college students (Taku, Calhoun, Cann, & Tedeschi, 2008). Both the HIV/AIDS caregivers (Cadell et al., 2003) and bereaved students (Taku et al., 2008) exhibited low-moderate distress following their respective losses. Although bereaved individuals may endorse PTSS, the death of a loved one does not qualify as a DSM-5 Criterion A event, unless the death was sudden or violent (APA, 2013). Therefore, the lack of a traumatic event in these studies may have resulted in truncated stress responses and may have implications for the observed linear relationship with PTG.

In contrast, Frazier and colleagues (2001) found a negative association between distress and growth in a sample of sexual assault survivors, half of whom met diagnostic criteria for PTSD, such that increased PTSS resulted in lower levels of growth. This finding of a negative relationship between PTSS and PTG was also found more recently in a sample of 225 Korean adolescent and young adult survivors of childhood cancer (Yi & Kim, 2014). Additional studies have found no significant relationship between the constructs of PTSS and PTG among treatment-seeking sexual assault victims suffering from PTSD and in cancer survivors without a PTSD diagnosis (Cordova et al., 2007; Grubaugh & Resick, 2007; Windors, Jacobsen, Booth-Jones, & Fields, 2005).

In summary, definitions of trauma and descriptions of reactions to traumatizing events varied substantially across studies examining the relationship between PTSS and PTG. Whether or not the index event included in the study met Criterion A for PTSD or, instead, fell under a different category (such as prolonged death of a loved one as in the case of cancer) may have influenced the type of reaction for the individual. For instance, rape (clearly a Criterion A event) may result in PTSD, whereas death of a loved one may result in bereavement. Thus, the type of event influences the outcome, which may represent pathology (PTSD) or a normal, non-pathological response (bereavement). It follows then that the type of event and reactions to the event may differentially relate to PTG, such that Criterion A traumatic events result in a negative relationship between PTSS and PTG, while other events result in a positive PTSS-PTG relationship.

The relationship between PTSS and PTG across studies also could be discrepant due to different definitions of growth used in research (Zoellner & Maercker, 2006). For example, some studies have used the terms *benefit finding*, *positive appraisal*, or *PTG* to refer to positive outcomes following trauma exposure. Sears, Stanton, and Danoff-Burg (2003) found that these three constructs were related but had different predictors. For example, positive reappraisal coping was found to be related to PTG, but not benefit finding a year after a cancer diagnosis. Thus, while PTG and benefit finding may appear to overlap, they are not identical. In a similar vein, various test measures have been utilized to examine PTSS as they related to PTG. Given the differences among predictor and outcomes variables across studies, differences in measurement may account for discrepancies in the relationships between PTSS and PTG.

Further, different clinical cutoffs have been used for both PTG and PTSS. In a study examining the relationship between PTSS and PTG in survivors of motor vehicle accidents, Zoellner, Rabe, Karl, and Maercker (2008) divided their sample into a full PTSD, subsyndromal PTSD, and no PTSD subgroup. They then compared these three groups on a continuous PTG score and found that those with PTSD exhibited lower levels of optimism and openness than individuals in the other two subgroups. Laufer and Shechory-Bitton (2013) examined four levels of posttraumatic growth: “no growth,” “low growth,” “medium growth,” and “high growth.” They found a significant decrease in personal strength, a domain of PTG, in those suffering from PTSD following a motor vehicle accident compared to those with subsyndromal or no PTSD. This suggests the presence of full PTSD (but not necessarily PTSS) hinders this specific component of PTG. In a study examining PTG in female assault victims, Grubaugh et al. (2007) used histograms of their data to determine logical cutoffs. They then categorized PTG scores into a “low” (30 or less) and “high” (85 or higher) group and found no significant relationship between PTSS continuous scores and these two categories of PTG. All of these studies utilized a structured clinical interview to assess PTSD symptom severity (Clinician Administered PTSD scale; Blake, Weathers, & Nagy, 2001). However, given that there are no established cutoffs on the measures of PTG, statistically derived cutoffs may be sample specific and result in discrepant relationships between PTSS and PTG across different studies.

In a study following the terrorist attacks on September 11th, 2001, Butler and colleagues (2005) found evidence for a curvilinear relationship between PTSS and PTG. The authors reported an inverted “U” shape in which participants who endorsed moderate

levels of PTSD symptoms reported the highest amount of growth. It may be that individuals need to have some symptomatic response following a trauma in order for growth to occur; yet excessive symptom elevation may preclude optimal levels of growth. This curvilinear function was also found in a sample of physical assault survivors (Kleim & Ehlers, 2009) and a sample of women diagnosed with breast cancer (Lechner, Carver, Antoni, Weaver, & Phillips, 2006). A recent meta-analysis found that the strength of the curvilinear relationship between PTSS and PTG was significantly greater than that of the linear function across 42 studies (Shakespeare-Finch & Lurie-Beck, 2014).

Adding to the complexity of the PTSS – PTG relationship, some studies may not have assessed for the possibility of a stronger curvilinear function in light of an observed linear function (e.g. Cadell et al., 2003). As one exception, Yi et al. (2014) examined and failed to find a curvilinear relationship between PTSS and PTG. However, in this study an average of 12 years had passed between the trauma and assessment of PTG. There is evidence to suggest that PTG is greatest a few months after the traumatic event, while distress often lessens over time. (Danhauer et al., 2013). Joseph and Linley (2005) suggested that over time the relationship between PTG and PTSS changes as individuals cognitively adopt an overall positive or negative evaluation of their life experiences.

This curvilinear relationship may explain the previous mixed findings regarding the PTSS-PTG relationship, as the association may differ depending on which part of the curve is examined. The positive relationship found between PTSS and PTG may be due to relatively low stress responses in those particular samples, which would fail to illuminate the entire curvilinear function (e.g. Taku et al., 2008). Additionally, Butler et al. (2005) found that the negative tail of the curvilinear function appeared once PTSS

reached levels commensurate to a diagnosis of PTSD. Therefore, a negative relationship between PTSS and PTG could be expected in those suffering from PTSD, as demonstrated by Frazier et al. (2001). In their review, Shakespeare-Finch, and Lurie-Beck (2014) indicated that there is a weaker relationship between PTSS and PTG in those suffering from health concerns, consistent with the null findings of Cordova et al. (2007) and Windows et al. (2005), which both looked at cancer survivors. This review further indicated no relationship between PTSS and PTG when the traumatic experience was sexual assault, as demonstrated by Grubaugh and Resick (2007). Therefore, a combination of overall symptom severity, diagnostic classification, and trauma type may contribute to discrepancies in the PTSS-PTG relationship.

Potential Pathways of Influence on the Relationship Between PTSS and PTG

Despite the potential importance of this construct and its consequences for trauma survivors, limited research has examined the factors by which growth can be facilitated or precluded following trauma exposure. The mechanisms underlying the relationship between PTSS and PTG are not well understood, perhaps due to a lack of studies testing mediation effects. A better understanding of the mechanisms through which PTSS and PTG interact may allow for tailored treatments designed to further promote growth and its associated positive outcomes in individuals exposed to traumatic events. Given that PTG is hypothesized to be a result of a cognitive struggle (Tedeschi & Calhoun, 2004), a closer examination of the processes involved in this struggle may elucidate pathways through which growth can be obtained.

Most research on PTG to date has been conducted with adults (see Elderton, Berry, & Chan, 2017; Helgeson, Reynolds, & Tomich, 2006; Linley & Joseph, 2004 for

reviews). A review of these empirical studies has highlighted several factors associated with the development of PTG including cognitive processes (e.g., rumination, Calhoun & Tedeschi, 1998; Garcia, Cova, Rincon, Vazquez, Paez, 2016), depressive symptoms (Kleim & Ehlers, 2009), and religiosity (Bellizi et al., 2010; Shaw, Joseph, & Linley, 2005). While intra-individual pre-trauma variables, social support, and some enduring distress have been assumed to influence the emergence of PTG, these have yet to be empirically examined. A better understanding of the potential causal role of these factors in the development of PTG may aid in our understanding and promotion of this oft-unstudied, yet largely adaptive, consequence of trauma exposure. In addition, PTG has been considered both a process and an outcome (Park, 2004), with research suggesting it may serve to improve overall quality of life (QOL; Siqueland, Nygaard, Hussain, Tedeschi, & Heir, 2015). Therefore, PTG may act to moderate the relationship between PTSS and reduced QOL.

The Role of Rumination

Numerous theories have been posited to explain the seemingly discrepant relationships between PTSS and PTG. Zoellner & Maercker (2006) suggested that PTG might not constitute adaptive positive change after trauma. Instead, they suggested a two-component conceptualization of PTG entitled the Janus-Face model (Maercker & Zoellner, 2004). In this model, PTG is thought to consist of a functional, self-transcending constructive side as proposed by Tedeschi & Calhoun (1996). However, PTG is presumed to concurrently contain an illusory, self-deceptive maladaptive side. The more constructive side is thought to be associated with positive outcomes, while the illusory side is seen as a form of denial, and related to negative outcomes, particularly in

the long-term. This model suggests that ruminative thought patterns may account for either functional or illusory growth (Zoellner & Mercker, 2006). While the Janus-Face model contains some empirical support (Widows et al., 2005; McFarland & Alvaro, 2000), many of its claims remain purely speculative.

Rumination is commonly defined as a repetitive and recurrent pattern of negative thinking about past experiences or mood (Ehlers & Steil, 1995). When empirically evaluated, rumination is consistently found to be a strong predictor of PTSS development and maintenance (Michael, Halligan, Clark, & Ehlers, 2007). Continued negative thinking associated with rumination has been shown to prolong negative mood states and increase arousal (Zetsche, Ehring, & Ehlers, 2009). Rumination also seems to be a trigger of intrusive memories and images (Birrer, Michael and Munsch, 2007; Ehlers, Hackmann, & Michael, 2004) and is used as a strategy to cope with those memories (Michael & Ehlers, 2007), often creating a negative feedback loop. Rumination has been conceptualized as a cognitive avoidance strategy, in which trauma-exposed individuals may ruminate in an attempt to avoid reminders of their trauma exposure (Birrer & Michael, 2011). Rumination is believed to prevent the processing of trauma memories and thereby result in increased re-experiencing symptoms and negative mood (Ehlers, Mayou, & Bryant, 1998), both symptom clusters of PTSD.

While there is a breadth of literature regarding the negative effects of rumination in the context of trauma, rumination remains compatible with the development of PTG. The model of PTG proposed by Tedeschi and Calhoun (2006) states that PTG occurs once foundations of the assumptive world are rebuilt through the development of new cognitive processes. In order for this to occur, individuals need to reexamine or

repetitively think about their beliefs before and after the trauma. This cognitive process is viewed as synonymous with rumination (Cann et al., 2011). Rumination, as it relates to PTG, is thought to aid trauma survivors in finding meaning in an event and in their ability to notice positive changes in themselves as a result of trauma exposure. This process allows individuals to disengage from previously held beliefs, and embrace changes that allow for consideration of alternative beliefs and goals (Calhoun & Tedeschi, 1998).

Rumination has been described as a form of intrusive automatic memory when related to trauma exposure (Zetsche et al., 2009). Ruminative thoughts have also been found to be positively associated with changes in beliefs, goals, behaviors, and identity (Salsman, Segerstrom, Brechting, Carlson, & Andrykowski, 2009). The dichotomy in responses to ruminative thought patterns has led to a dual conceptualization of rumination consisting of *intrusive* and *deliberate* rumination (Cann et al., 2011). Intrusive rumination consists of thoughts that invade an individual's mind and generally involve a negative focus on trauma. In contrast, deliberate rumination aims to better understand the meaning of events and problem solving (Calhoun, Cann, & Tedeschi, 2010). This distinction explains how some components of this ruminative process are risk factors for distress, whereas others may be crucial for growth (Cann et al., 2011). While some level of both intrusive and deliberate rumination is assumed to be present in the immediate aftermath of trauma (Calhoun, Cann, Tedeschi, & McMillan, 2000), the persistence of intrusive or deliberate rumination has been theoretically proposed to dictate ongoing PTSS or PTG respectively. This theory has been supported in correlational studies in which intrusive rumination has been associated with ongoing distress, while deliberate rumination is uniquely related to the development of PTG, particularly with an increased passage of

time since initial trauma exposure (Taku et al., 2008). This distinction may help to explain the curvilinear function of PTSS and PTG.

The Role of Religiosity

Upon the disruption of an individual's assumptive world in the aftermath of trauma, more than merely thought processes are changed. This process oftentimes results in questions of meaning and belonging that result in individuals seeking answers in the religious or spiritual realm (Figley, 1989). In line with the definition of Smith, McCullough, and Poll (2003), religion/spirituality is defined as any motivation, attitude, belief, appraisal, practice, or behavior involving religious or spiritual content or processes. There is a vast literature on religion and mental health and the result of extensive examination of the relation between religious and personal beliefs and mental health outcomes indicates strong associations among these variables (Koenig, 2012). Although religious practices differ by culture, community, and individual, they often serve to provide a means of socialization in areas of moral behavior and offer emotional support for individuals across the globe (Hood, Spilka, Hunsberger, & Gorsuch, 2003; Shariff, 2015). An estimated 78% of Americans identify their religion as Christianity, with over 16% indicating no religious affiliation (Sherkat, 2014). As early as the 1990s, those lacking religious affiliation accounted for just 6% of the general population. This rapid decline is largely thought to be a byproduct of secularization (Schwadel, 2013). Even so, religion continues to serve as a strong coping strategy that enables individuals to make sense of suffering and promotes social norms that aid in positive mental health functioning.

Aspects of religious and spiritual behaviors and beliefs are consistently related with well-being. Religious and spiritual practices are traditional ways through which many people develop personal values and their own beliefs about human meaning and purpose. The role of spiritual and religious factors as it relates to PTSS and PTG has recently received increased attention in the extant literature. For instance, case study evidence suggests religious and spiritual beliefs can be experienced as helpful to people in recovering from stressful and traumatic life events (e.g., O'Reilly, 2004). In addition, a national survey of stress reactions in the U.S. after September 11th found that turning to religion was a coping strategy used by 90% of individuals surveyed (Schuster et al., 2001). Personal faith and religious communities have consistently been identified as primary coping mechanisms for people in the aftermath of traumatic events (Weaver, Koenig, & Ochberg, 1996). Meta-analytic studies suggest a buffering role of religiosity on the development of PTSS (see Ano & Vasconcelles, 2005; Schaefer, Blazer, & Koenig, 2008 for reviews). Longitudinal research has also documented the positive effects of religiosity on reduced PTSS up to a year following the initial trauma (Garcia, Paez, Reyes-Reyes, & Alvarez, 2017; Tix & Frazier, 1998). In addition to offering the social support of community, religion provides a means of addressing traumatic experience that can facilitate recovery following trauma exposure (Fallon, 1997; Pargament, 2001).

A meta-analysis conducted by Helgeson and colleagues (2006) identified religious coping as a factor associated with PTG. Researchers have suggested that an increase in religiousness tends to occur after experiencing a traumatic event (Park, Cohen, & Murch, 1996), which may serve as an avenue through which growth can be

facilitated. For many, rebuilding the assumptive world (Tedeschi & Calhoun, 2006) creates an enhanced sense of meaning in life and a greater existential awareness, which can lead to an enhanced spiritual or religious life. Even when removing the spirituality subscales of measures of PTG, Milam (2004) demonstrated a positive association between religious beliefs and PTG over time, suggesting this relationship is not merely an artifact of conceptual overlap. As such, religious affiliation has been shown to increase positive coping mechanisms such as seeking assistance from others or prayer (Abu-Raiya, Pargament, & Mahoney, 2011). In addition, positive religious coping, religious openness, readiness to face existential questions, religious participation, and intrinsic religiosity have independently been associated with PTG (Nelson, 2011). Religious beliefs may enable the production of a framework to aid in cognitive reappraisal that reduces the threat of a traumatic event, making adaptation to it more of a challenge, thereby revealing PTG that can be obtained through initial suffering (Brandstadter & Renner, 1990). This reappraisal process has been likened to forgiveness, with a study conducted by Schultz, Tallman, and Almaier (2010), demonstrating that perceived importance of religion and spirituality mediates the relation between forgiveness and PTG following interpersonal transgressions.

Although the relationship between religiosity and PTG is compelling, the use of religion is not always associated with positive outcomes. While positively transformative for some, for others, experiencing loss or trauma can be so devastating that their response is to feel abandoned by a higher power (Herman, 1997). Some individuals report experiencing greater cynicism and a loss of religious commitment following trauma (Schwartzberg, & Janoff-Bulman, 1991), while others report no change in their religious

beliefs (Overcash, Calhoun, Cann, & Tedeschi, 1996). Therefore, while religion may be associated with positive outcomes, it may have deleterious effects on mental health as well. To measure the extent to which individuals use religion to cope with stressful events, Pargament, Smith, Koenig, and Perez (1998) developed the Brief Religious COPE, which includes specific religious coping behaviors categorized as either positive (e.g., seeking spiritual support; benevolent religious reappraisals; religious forgiveness) or negative (e.g., demonic religious reappraisals; spiritual discontent; punitive religious reappraisals).

A recent longitudinal study of an adult sample exposed to highly stressful life events suggests that while positive religious coping is predictive of PTG, negative religious coping is associated with increased PTSS (Garcia et al., 2017). Additional longitudinal designs also support this relationship, with Harris et al. (2015) showing a relationship between negative religious coping and PTSS both immediately following and a year after trauma exposure. Positive religious coping has been associated with increased PTG both directly following (Shaw, Joseph, & Linley, 2005) and two years after the initial trauma (Pargament, Koenig, Tarakeshwar, & Hahn, 2004). This varied response based on the valence of religious coping may aid in our ability to predict individuals most likely to experience PTG or have a deleterious stress response in the aftermath of trauma.

The Role of Depression

In their two-component model of PTG, Zoellner and Maercker (2006) called for further examination of emotions as they relate to PTG due to their close relationship with disruption to an individual's assumptive world (Janoff-Bulman, 1989). Another potential mechanism through which the relationship between PTSS and PTG may be explained is

through depressive symptoms following trauma exposure. Although many studies have suggested a curvilinear relationship between PTSS and PTG, few studies have been conducted to examine the concurrent relationship between these constructs and other psychiatric symptoms, such as depression. The relationship between PTSS and depression is well established. The co-occurrence of major depressive disorder (MDD) and PTSD is quite high, with a lifetime prevalence of an individual experiencing both disorders estimated as high as 95% (Bleich, Koslowsky, Dolev, & Lerer, 1997). While these disorders often coalesce, there is general agreement that PTSS often precede the onset of depressed mood; with 78.4% of individuals from the National Comorbidity Survey indicating their affective problems followed their onset in PTSS (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Even so, PTSD and MDD have been found to share similar risk factors including event severity and childhood abuse (Breslau et al., 1998).

The comorbidity between PTSS and depressive symptoms is perhaps unsurprising due to their considerable symptom overlap, including anhedonia, concentration, and sleep problems (Franklin & Zimmerman, 2001). In a longitudinal design, Horesh and colleagues (2017) found that hyperarousal was particularly predictive of MDD over time. In addition to symptom expression, those suffering from PTSD and major depression have exhibited similar recovery rates (Shalev et al., 1998), suggesting that while these are independent responses to trauma, they may act in concert to increase overall distress and dysfunction. Despite the considerable similarity between the constructs, research supports the continued separation of PTSD and MDD as separate diagnostic markers in the context of trauma (Franklin & Zimmerman, 2001; O'Donnell, Creamer, & Pattison, 2004).

The relationship between symptoms of depression and PTG is less understood. In fact, findings have been discrepant in regard to research examining the relationship between PTG and depression. For example, some research has found no relationship between the constructs of depression and PTG in samples exposed to intimate partner violence (Cobb, Tedeschi, Calhoun, & Cann, 2006) and earthquake survivors (Sattler et al., 2006). In contrast, Palmer, Graca, & Occhietti (2016) demonstrated a negative relationship between depressive symptoms and PTG in a veteran population. Kleim and Ehlers (2009) elucidated a curvilinear function between depressive symptoms and PTG in a sample of adult assault survivors assessed closely after their index trauma. Similar to that evidenced by Butler and colleagues (2005), Bianchini and colleagues (2017) showed that a moderate level of depression predicts optimal PTG. While PTG has been associated with a host of positive outcomes (see Shakespeare-Finch and Lurie-Beck, 2014 for review), PTG has also been associated with negative affect, increased distress, and poorer life quality (Tomich & Helgeson, 2004), which individually and collectively may contribute to depressed mood. It is this apparent contradiction that has led many researchers to question the clinical utility of PTG, suggesting it may serve as a cognitive avoidance strategy (Wortman, 2004). To date, no study has examined the way in which depressive symptoms may impact the relationship between PTSS and PTG, however given the similarity of these relationships in the extant literature, depressive symptoms may serve as a predictive factor for how individuals may or may not experience PTG in the aftermath of trauma.

The Role of Social Support

Social support refers to the process “through which the social relationships promote health and well-being” (Cohen, Underwood, & Gottlieb, 2000, p. 4). Researchers have consistently and almost invariably demonstrated an inverse association between PTSS and social support (see Guay, Billette, & Marchand, 2006 for review). Meta-analytic research indicates that lack of social support is the strongest predictor of PTSS commensurate with a PTSD diagnosis (Brewin, Andrews, & Valentine, 2000). Research across populations including sexual assault victims (Bryant-Davis et al., 2015), military veterans (Jankowski et al., 2004), cancer patients (Zhao, Wu, & Xu, 2013), and natural disaster victims (Kaniasty & Norris, 2008) have suggested that social support, or lack thereof, is related to severity of PTSS. In line with Cohen and Wills’ (1985) stress buffering model, traumatic stress may aid in coping post-trauma and act as a barrier against extensive stress-related symptomatology. More recently, however, trauma researchers have begun to explore an alternative model wherein PTSS contribute to the decay of social support over time (Laffaye et al., 2008). This model suggests that PTSS (e.g., social withdrawal, numbing, excessive anger) negatively impact social support networks. Therefore, while social support may serve as a protective factor against the development of PTSS, it may effectively moderate the relationship between PTSS and other mental health outcomes, including PTG.

Tedeschi and Calhoun’s (2004) revised model of posttraumatic growth includes social support as a predictor of positive change in the aftermath of traumatic events. According to Schaefer and Moos (1998), social support may lead to personal growth by fostering successful adaptation to life crises through the use of positive coping behavior. A positive relationship between social support and PTG has been shown in a

variety of populations including cancer patients (Ekim & Ocakci, 2015), disaster victims (Cieslak et al., 2009), military veterans (Pietrzak et al., 2010), and victims of severe motor vehicle accidents (Sehgal, Sethi, & Vaneet, 2016). Park et al. (1996) presented a positive correlation between social support satisfaction and higher levels of PTG at six month follow up, suggesting social support may act as a process through which PTG can be obtained. Social cognitive theory is a useful framework for examining the effect of the social context on PTG. According to the social cognitive theory of posttraumatic recovery, a strong sense of coping efficacy strengthens adaptation in the face of adversity (Benight & Bandura, 2004).

In theory, supportive or unsupportive interactions may either facilitate or hinder cognitive processing and thus lead to different PTG outcomes. An 8-year longitudinal study of cancer survivors conducted by Schroevers and colleagues (2010) suggested that not all forms of social support are equal, with support received from family and friends (e.g., reassuring, comforting, problem-solving) serving as a unique predictor of subsequent PTG. In addition, Scignaro et al. (2010) found that cancer patients with caregivers who support them to have freedom to determine their own behavior were more likely to report higher levels of PTG. Collectively, these studies suggest support from close and trusted individuals may particularly impact the development of PTG. To date, limited research has examined the effects of social support on the relation between PTSS and PTG (for an exception see Bozo, Gundogdu, & Buyukasik-Colak, 2009), and no study has examined different types of social support as it relates to the PTSS-PTG relationship. The extant literature, however suggests that social support may effectively moderate the relationship between PTSS and PTG.

Moderating Role of PTG on the Relationship Between PTSS and Physical Health

Several researchers have raised critiques of PTG. Wortman (2004) discusses concerns about PTG being a defensive illusion used to avoid facing the reality of the traumatic event, which may impede processing necessary feelings for later positive adaptation. While Tedeschi and Calhoun (2006) view PTG as a genuine transformation of basic beliefs about the self and the world as a result of a cognitive adaptation in the aftermath of trauma, another perspective suggests PTG may have an illusory quality that may be maladaptive, hindering coping in the long term (Lahav, Solomon, & Levin, 2016; Maercker & Zoellner, 2004). Hobfoll and colleagues (2007) critique states that it is not enough for PTG to engender meaningful cognitions of change. Instead, an individual must carry these cognitions into meaningful actions. Examinations of the functional nature of cognitive outcomes are inherently difficult as these are based on perceptions. This has led to a general lack of clarity regarding the effects of PTG on psychological well-being and PTSS. A better understanding of the relationship between PTG and physical health complaints would aid in the classification of PTG as merely an illusory construct that serves as an avoidance strategy (McFarland & Alvaro, 2000), or as a constructive strategy that yields positive adjustment and well-being (Lahav et al., 2016).

Not surprisingly, PTSS has consistently been associated with poor physical health (Asnaani, Reddy, & Shea, 2014; see Pacella, Hruska, & Delahanty, 2013 for review). Physical health complaints associated with PTSS include but are not limited to chronic pain, headaches, stomach pain, nausea, constipation, and diarrhea (Litz, Keane, Fisher, Marx, & Monaco, 1992). A strong association exists between PTSS and somatic symptoms, which have been shown to negatively impact physical, psychological,

emotional well-being, and overall quality of life (Butler, Socherel, & Power, 2016; Gupta, 2013; Strasshofer et al., 2017). Epidemiological studies have shown that the majority of those with heightened levels of PTSS have experienced multiple trauma exposures, which can correlate with symptom severity, including somatic symptoms (Uddin et al., 2010).

As such, Hoge, Terhakopian, Castro, Messer, and Engel (2007) elucidated a relationship between PTSS and poor physical health in a sample of OIF veterans. This study found that those suffering from PTSD endorsed significantly more somatic symptoms than those without PTSD, suggesting increases in symptomatology result in more physical health concerns. Tagay, Schlegl, and Senf (2010) reported similar findings in a sample of women with eating disorders. Similarly, Gustafson and Sarwer (2004) found an association between childhood sexual abuse and high somatization in obese patients. Combat exposure has been associated with increased PTSS and decrements in physical health in older veterans (Schnurr & Spiro, 1999). Significantly higher rates of cardiovascular, respiratory, musculoskeletal, and neurological symptoms have been found in firefighters with PTSD than those without PTSD (McFarlane, Atchison, Rafalowicz, & Papay, 1994). Collectively, these studies suggest a strong link between distress following traumatic events and the development of a large variety of somatic complaints.

Poor perceived health among trauma survivors might not only be related to PTSS, but also to reports of PTG. In their meta-analysis, Helgeson and colleagues (2006) indicated that PTG was unrelated to reported subjective health. However, it is notable that the majority of included studies did not directly examine self-reports of somatic

symptoms or overall life quality, instead listing functional difficulties as indicators of poor health. Further, most studies in this meta-analysis included individuals whose index trauma was related to poor health (e.g., HIV infection; cancer), which makes somatic consequences associated with PTSS difficult to discern from those related to the underlying medical condition. In addition, as noted by Shakespeare-Finch and Lurie-Beck (2014), the review conducted by Helgeson et al. (2006) examined linear associations between PTSS and PTG, therefore the true relationship between PTG and subjective health may have been obscured.

To our knowledge, only one study has directly examined the process through PTSS, PTG, and physical health complaints relate. In an effort to further discern the relationships among these variables, Lahav and colleagues (2016) examined PTSS as a mediator of the relationship between PTG and perceived physical health in a sample of wives of Israeli ex-prisoners of war.

These researchers found a positive relationship between PTSS, PTG, and poor physical health, in support of the illusory avoidant conceptualization of PTG proposed by Zoellner and Maercker (2006). Further, this study demonstrated PTSS effectively mediated the relationship between PTG and somatic complaints, suggesting PTG predicts increases in PTSS, and is linked to poorer perceived health through the effects of PTSS.

Scrutiny of this study indicated some important limitations, however. First, the subjects in this study were not trauma-exposed themselves; therefore, they may have exhibited attenuated growth responses compared to those more directly exposed to trauma. Additionally, while PTG has been considered both a process and an outcome (Park, 2004), this study examined PTG as a predictor variable. Given the necessary

components for a mediation analysis (MacKinnon, Fairchild, & Fritz, 2007), the temporal precedence of a predictor variable that occurs only in response to the mediator (i.e., assuming PTG can occur prior to the traumatic stress it follows is conceptually flawed). Therefore, while Lahav and colleagues (2016) give insight into the relationships among PTSS, PTG, and physical health complaints, an examination of PTG as a moderator of the relationship between PTSS and physical health in a trauma-exposed sample would further elucidate the relationships among these constructs.

The Current Study

Purpose and Rationale

The main purpose of this research was to examine the relationship between PTSS and PTSD in a sample of trauma-exposed adults and the processes through which PTG can be facilitated or is inhibited in the aftermath of trauma. Specifically, we examined the levels and types of reported PTSS and PTG and sought to better understand the differential contributions that rumination, religiosity, depression, and social support play in reports of PTG and their explanatory power to account for the empirically supported curvilinear relationship between PTSS and PTG. A final goal was to examine the moderating effect of PTG on the relationship between PTSS and physical health complaints in order to further elucidate the constructive or illusory role of PTG.

Based on the theoretical framework of PTG and published research across adult populations, it was hypothesized that:

1. The relationship between PTSS and PTG will be best explained by a curvilinear relationship, with moderate PTSS predicting optimal PTG.

2. If the relationship between PTSS and PTG is curvilinear, deliberate and intrusive rumination will mediate the relationship between the positive and negative sides of the curve, respectively. If the relationship between PTSS and PTG is linear, ruminative thought patterns will mediate this relationship, such that increased rumination in the presence of heightened PTSS will result in PTG.
3. Positive religious coping will be positively associated with PTG, while negative religious coping will be positively associated with PTSS. Positive religious coping will mediate the left side of the curvilinear relationship, while negative religious coping will mediate the right side of the curvilinear relationship.
4. Depressive symptoms will mediate the curvilinear relationship between PTSS and PTG, with moderate depression predicting optimal PTG.
5. Perceived social support will be negatively associated with PTSS and positively associated with PTG, and effectively moderate the relationship between PTSS and PTG.
6. PTG will moderate the association between PTSS and somatic and physical health functioning, such that higher PTSS will be associated with poorer physical health symptoms.

Figure 1 presents a graphical representation of the curvilinear relationship between PTSS and PTG, using positive/negative religious coping (hypothesis #3) as a visual representation of the hypothesized mediation model. Using this model as a guide, the present research design examined relationships among these variables. In addition,

exploratory analyses were conducted to examine the effect of demographic variables (i.e., gender, age, ethnicity) as they relate to the relationship between PTSS and PTG.

Method

Participants

Participants were recruited from the University of Missouri-St. Louis (UMSL) human subject pool and were compensated with course credit for the completion of survey materials. Informed consent and data was collected via Qualtrics, an online survey software, as part of a larger study examining the effects of trauma exposure on physical health. All collection materials were marked with a unique subject ID number.

The inclusion criteria ensured that the participants 1) were over the age of 18, 2) were currently enrolled at the university where recruitment took place, and 3) had experienced at least one criterion-A traumatic event. The recruitment was visible to all students registered with the UMSL human subject pool. The announcement contained a brief description of the study eligibility requirements to participate, contact information, and a link to the study consent form and survey.

An initial sample of 632 students provided at least partial data for both the predictor and outcome variables. Fourteen participants failed to complete the survey beyond demographic information and were therefore excluded from the current study. Ten cases were missing more than 10% of data on the primary study variables. An additional 14 participants provided incorrect responses on $\geq 50\%$ of the four validity checks throughout the study and were therefore removed. An additional 22 individuals did not experience a criterion-A traumatic event and were therefore removed from subsequent analyses. Collectively, this resulted in a final sample of 572 participants.

Of the participants, 440 were women (76.9%) and 132 were men (23.1%). Three hundred and sixty-six identified their race as Caucasian (64%), 129 as African American (22.6%), 23 as Asian American, 21 as multi- or bi-racial (3.7%), 15 as Hispanic or Latino (2.6%), 3 as American Indians (0.5%), and 13 (2.3%) as “other.” The average age was 24 years ($SD = 7.21$) and ranged from 18 to 61 years. Participants reported experiencing or witnessing an average of 4.9 types of trauma (range 1 to 13). The most frequently experienced/witnessed events included transportation accident (78%), sudden unexpected death of a loved one (56%), and physical assault (50%).

Procedure

All procedures were approved by the Institutional Review Board at The University of Missouri-St. Louis (Approval Number: 649858-2). The approximate time for completion of the assessment battery was 45 minutes. Participants entered the study by following a link included in the recruitment announcement on the UMSL human subject pool website, which took them to the online survey, where they were initially presented with an information screen (see Appendix A).

Measures

Demographics. Demographic information on participant sex, race, age, education level, and income level were obtained.

Prior Trauma History. Trauma exposure was assessed using the Life Events Checklist-5 (LEC-5; Weathers et al., 2013; See Appendix B), a self-report measure comprised of 17 categories of traumatic stressors (e.g., transportation accidents, sexual assault, combat exposure, natural disaster, life-threatening illness). Participants indicated the degree of exposure with respect to each category of traumatic stressor: happened to

me, witnessed it, learned about it, part of my job, not sure, or does not apply. Participants who reported “happened to me” or “witnessed it” for any of the 17 categories were included in analyses. Previous versions of the measure have shown good reliability and validity across samples (Gray, Litz, Hsu, & Lombardo, 2004).

Posttraumatic Stress Symptoms. Posttraumatic stress symptoms were assessed using the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013; see Appendix C), which is a 20-item self-report measure that assesses the 20 DSM-5 symptoms of PTSD over the past week. The PCL-5 is scored using a 5-point Likert scale from 0 (*Not at all*) to 4 (*Extremely*). Scores range from 0-80 with higher scores indicating increased levels of distress. A PCL-5 cut-point of 33 is considered the clinical cutoff for likely presence of PTSD, with lower cut-points providing increased sensitivity at the risk of false-positives. DSM-5 symptom cluster severity scores can be obtained by summing the scores for the items within a given cluster, i.e., cluster B (items 1-5), cluster C (items 6-7), cluster D (items 8-14), and cluster E (items 15-20). The PCL-5 has demonstrated strong psychometric properties, with high internal consistency, test-retest reliability, and discriminant and convergent validity (Blevins, Weathers, Davis, Witte, & Domino, 2015). The PCL-5 displayed high internal consistency in the current sample (Cronbach’s alpha = 0.94)

Posttraumatic Growth. The Posttraumatic Growth Inventory (PTGI, Tedeschi & Calhoun, 1996; see Appendix D) is a widely used measure of perceptions of positive changes experienced by individuals following a traumatic event. This scale is a 21-item self-report measure representing five factors: changes in the way one relates to others (e.g., I am more willing to express my emotions), new possibilities (e.g., I developed new

interests), personal strength (e.g., I discovered I'm stronger than I thought I was), spiritual change (e.g., I have stronger religious faith) and appreciation for life (e.g., I have changed my priorities about what is important in life). Participants are requested to read each statement and respond using a six-point Likert scale ranging from 0 (*I did not experience this change as a result of my crisis*) to 5 (*I have experienced this change to a great degree as a result of my crisis*). There is no currently agreed upon clinical threshold score for the PTGI. Lower scores indicate low levels of PTG and higher scores indicate high levels of PTG.

The PTGI was standardized by Tedeschi and Calhoun (1996) using a sample of students ($n = 798$). Findings from a range of studies have supported the five-factor model outlined above (Brunet, McDonough, Hadd, Crocker, & Sabiston, 2010; Morris, Shakespeare-Finch, Rieck, & Newbery, 2005). The convergent and divergent validity of the scale has also been supported (Shakespeare-Finch & Enders, 2008; Weinrib, Rothrock, Johnsen, & Lutgendorf, 2006). Further research has indicated that the PTGI performs well on measures of internal consistency (Jaarsma, Pool, Sanderman, & Ranchor, 2006; Taku et al., 2008) and has appropriate test-retest reliability (Butler et al., 2005; Linley & Joseph, 2006; Salsman et al., 2009). The PTGI displayed high internal consistency (Cronbach's $\alpha = 0.96$)

Rumination. The Ruminative Thought Style Questionnaire (RTSQ; Brinker & Dozois, 2009; see Appendix E) is a 20-item measure assessing a single dimension of rumination over and above valence, temporal orientation of thought content, and the cognitive-affective context in which it occurs. The RTSQ consists of a series of statements, participants were asked to rate how well each item describes them on a seven-

point Likert scale ranging from 1 (*Not at all*) to 7 (*Very Well*). Scores range from 20-140 with higher scores indicating increased levels of rumination. A factor analysis conducted by Tanner, Voon, and Hasking (2013) found the RTSQ was best explained by four distinct factors; problem-focused thoughts (items 9,11,12,13,14), counterfactual thinking (items 5,6,7,8), repetitive thoughts (items 1,2,3,4), and anticipatory thoughts (items 17,18). In initial validation studies with 118 undergraduate students, the RTSQ demonstrated good convergent validity with other scales of rumination and depressed mood (Brinker & Dozois, 2009). In the current sample internal consistency was high (Cronbach's alpha = 0.97).

Religious Coping. Religious coping was assessed using The Brief RCOPE, an abbreviated 14-item measure of the RCOPE (Pargament, Koenig, & Perez, 2000) that measures religious coping with major life stressors. As the most commonly used measure of religious coping in the literature, it has helped contribute to the growth of knowledge about the roles religion serves in the process of dealing with crisis, trauma, and transition. The Brief RCOPE is scored on a 4-point Likert scale ranging from 1 (*Not at all*) to 4 (*A great deal*), and is divided into two subscales, each consisting of seven items. These subscales identify clusters of positive and negative religious coping methods (see Appendix F for the Brief RCOPE). The Brief RCOPE has demonstrated good internal consistency, concurrent, predictive, and incremental validity and has been validated across numerous religions and cultures (Pargament, Feuille, & Burdzy, 2011; current sample Cronbach's alpha = 0.92)

Depression. Symptoms of depression were assessed using the Beck Depression Inventory, Second Edition (BDI-II; Beck, Steer, & Brown, 1996), a 21-item self-report

instrument intended to assess the existence and severity of symptoms of depression as listed in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV; 1994). The BDI-II asks individuals to consider each statement as it relates to the way they have felt for the past two weeks. There is a four-point scale for each item ranging from 0 to 3. On two items (16 and 18) there are seven options to indicate either an increase or decrease in appetite and sleep. Total scores are used to designate depression severity in the minimal (0 to 13), mild (14-19), moderate (20-28), and severe (29-63) ranges. As the most widely used measure of depressive symptoms, the BDI-II has demonstrated high reliability and validity across populations (Wang & Gorenstein, 2013; Cronbach's $\alpha = 0.94$).

Social Support. Social support was assessed using the multidimensional scale of perceived social support (MSPSS; Zimet G., Dahlem, Zimet S., & Farley, 1988; see Appendix G), a 12-item scale designed to measure perceived social support from three sources: family (items 3,4,8,11), friends (6,7,9,12), and a significant other (1,2,5,10). The measure includes a 7-point Likert scale, with scores ranging from 7 to 84. Most investigations have revealed MSPSS to be a three-factor construct, which demonstrates good to excellent internal consistency and test-retest reliability (Pedersen, Spinder, Erdman, & Denollet, 2009; Zimet et al., 1988). The MSPSS displayed high internal consistency (Cronbach's $\alpha = 0.94$)

Physical Health Problems. Somatic symptoms were assessed using the somatic symptoms severity scale of the patient health questionnaire (PHQ-15; Kroenke, Spitzer, & Williams, 2002). The PHQ-15 is widely used as an open access screening instrument for somatization syndromes in different health care settings. The PHQ-15 assesses for the

presence of physical symptoms that account for more than 90% of physical complaints reported in outpatient settings (Kroenke, 2003) over the past 4 weeks and is scored on a 3-point Likert scale from 0 (*not bothered at all*) to 2 (*bothered a lot*). The PHQ-15 is a valid measure, which has been used in 40 studies so far in different health care settings (Kroenke, Spitzer, Williams, & Lowe, 2010). The PHQ-15 demonstrated good internal consistency (Cronbach's alpha = 0.80).

In addition, health-related quality of life was assessed using the Short Form-36 (SF-36; Ware & Sherbourne, 1992), a 36-item questionnaire which measures quality of life across eight domains, which are both physically and emotionally based. The eight domains that the SF-36 measures are as follows: physical functioning; role limitations due to physical health; role limitations due to emotional problems; energy/fatigue; emotional well-being; social functioning; pain; general health. A single item is also included that identifies perceived change in health, making the SF-36 a useful indicator for change in quality of life over time. Scores for each variable were summed and transformed into a Likert scale ranging from 0 (*worst*) to 100 (*best*; Jenkinson, Coulter, & Wright, 1993). The SF-36 has demonstrated high validity and reliability have across various studies (McHorney, Ware, Lu, & Sherbourne, 1994; McHorney, Ware, Rogers, Raczek, & Lu, 1992; Ware & Sherbourne, 1992). The SF-36 displayed high internal consistency in the current sample (Cronbach's alpha = 0.94).

Power Analysis

The number of required participants was calculated using G Power version 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), a power analysis software program. The most common effect size for power calculations of this type is Cohen's (1988) f^2 . Setting f^2 at

0.10: the small-medium range (Cohen, 1988; Faul et al., 2009), the significance level (α) at .01 (to account for multiple comparisons; Abdi, 2007) and the power level ($1-\beta$) at .80 calculated that 212 participants would be needed. In order to anticipate any sampling problems, it was estimated that 250 participants should be recruited.

In order to test hypothesis 2, the use of a linear hierarchical regression with effect size of .10 and power of .8 would require a minimum sample size of 144 participants. This same number of participants would be required to adequately test hypothesis 3, while 162 participants would be needed to assess hypothesis 4. In order to assess hypothesis 5, G Power (Faul et al., 2009) was used to calculate the a priori sample size estimate needed to conduct a linear multiple regression with effect size of .10 and power of .80. This analysis indicated that with 4 predictors (total social support; family, friend, significant other subscales), 250 participants would be required. Finally, in order to assess for hypothesis 6, a sample size of 212 would be required with two predictors in a linear multiple regression with effect size of .10 and power of .80. Overall, these analyses indicated a conservative estimate of 300 participants in order to account for any sampling problems.

Data Analysis

Data was analyzed using IBM Statistical Package for the Social Sciences 24 (SPSS-24). Data was first screened for normality, outliers, homogeneity of variance, multicollinearity, homoscedasticity, normal distribution of residuals, and linearity between variables. Univariate outliers for all study variables were assessed using Z-scores with a cutoff of three standard deviations from the mean. Results did not substantively differ with or without these outliers; therefore, the entire sample was

included in subsequent analyses. Linear and quadratic relations between PTSS and PTG were tested.

To test the first hypothesis, that PTSS and PTG are curvilinearly related, a hierarchical regression analysis used by Kleim and Ehlers (2007) was conducted. PCL-5 scores were mean-centered and then squared to create a quadratic stress term. A two-step hierarchical linear regression was then performed. In the first step, PTGI scores were regressed onto the linear PCL-5 effect. In the second step, PTGI scores were regressed onto the quadratic PCL-5 effect.

Independent samples t-tests were conducted to explore the relationships between PTSS and PTG and demographic variables (e.g., race; gender), with non-Hispanic Caucasians and African Americans serving as the two racial groups. Independent sample t-tests were then used to examine the factors of PTG (new possibilities, personal strength, spiritual change, relating to others and appreciation of life) and symptom clusters of PTSD (re-experiencing, avoidance, negative alterations in cognitions and mood; hyperarousal) as they relate to race and gender. These analyses were exploratory in nature; therefore, no formal hypotheses were made regarding specific expected findings. Alpha for all analyses was set to $p < .05$ (two-tailed).

Results

Descriptive Analyses

Mean scores and standard deviations for predictor and outcome variables and their subscales are provided in Table 1. Study variables were small-moderately correlated (see Table 2). Utilizing a clinical cut-off score of 28 on the PCL-5 (Blevins, Weathers, Davis, Witte, and Domino (2015), 189 participants (33%) met criteria for a probable

PTSD diagnosis. In addition, 149 participants, or approximately 26% of the sample met criteria for at least moderate depression (i.e., BDI-II score of 20 or greater), with 10% meeting criteria for severe depression (i.e., BDI-II score of 28 or greater). Approximately 18% of the sample had symptom elevations consistent with probable depression and PTSD diagnoses. There was a significant difference in PTSS based on gender, $t(570) = -2.59, p = .01$, with men ($n = 132$) endorsing lower levels of PTSS (PCL-5 $M = 19.77, SD = 15.11$) than women ($n = 440$; PCL-5 $M = 24.08, SD = 17.27$). There were no statistically significant differences in PTG based on gender ($p = .40$). In contrast, a significant difference in PTG emerged based on race (participants identifying as other races were not included in this analysis because of low sample sizes), $t(493) = 2.98, p < .01$, with African American participants ($n = 129$) endorsing higher levels of PTG ($M = 54.26, SD = 27.99$) than Caucasian participants ($n = 366; M = 46.02, SD = 26.60$). There were no statistically significant differences in PTSS based on race ($p = .71$). One-way ANOVAs indicated no statistically significant differences based on age for PTSS ($p = .94$) or PTG ($p = .18$).

Examination of the independent and dependent variable subscale scores on the PCL-5 indicated women experienced significantly higher re-experiencing ($M = 6.41, SD = 5.09$) and avoidance ($M = 3.37, SD = 2.43$) symptoms than men ($M = 4.51, SD = 4.13$; $M = 2.35, SD = 2.10$), but no other gender differences on the other subscales of the PCL-5. There were no gender-based differences on subscales of the PTGI. In contrast, there were no race-based differences on subscales of the PCL-5. For the PTGI, however, all subscales were significantly higher for African American participants compared to Caucasian participants ($p < .001$) except for the *relating to others* subscale in which there

was not a statistically significant difference between Caucasian and African American participants.

Relationship Between PTSS and PTG

Participants had a mean PCL-5 total score of $M = 23.09$, $SD = 16.88$, range = 0 – 74. The highest scores were found for negative alterations in cognitions and mood ($M = 7.39$, $SD = 6.31$) and hyperarousal ($M = 6.59$, $SD = 5.43$). Posttraumatic growth scores were moderate, with a mean PTGI total score of $M = 48.77$, $SD = 27.56$, range = 0 – 105. The highest scores for PTG were found for an increased ability to relate to others ($M = 15.77$, $SD = 9.82$) and sense of new possibilities ($M = 11.11$, $SD = 7.45$). Higher PTSS levels were associated with greater PTG ($r = .17$, $p < .001$). Relationships between PTSS and PTG based on trauma type can be found in Table 3. Results indicated significant positive associations between PTSS and PTG for those who endorsed exposure to natural disasters ($r = .16$, $p < .05$), transportation accidents ($r = .17$, $p < .01$), and life-threatening illness or injury ($r = .15$, $p < .05$).

A hierarchical linear regression examined whether the relationship between PTSS and PTG was better explained by a linear or quadratic function (See Figure 2). There was a significant quadratic effect of PTSS scores in the prediction of PTG, $\beta = -.15$, $R^2 = .04$, $p = .002$, suggesting a stronger curvilinear relationship between the constructs. The negative sign for the quadratic terms' partial correlation indicated that the shape of the relationship was such that moderate stress was associated with high PTG, whereas low and high PTSS was associated with lower reported PTG. Results demonstrated a stronger quadratic function for all PTGI subscales ($p < .05$). Analyses were run separately for men and women and for Caucasian and African American participants to examine model

differences based on gender and race. While females ($n = 440$) exhibited results similar to the overall sample with a stronger curvilinear function ($\beta = -.14$ $R^2 = .03$, $p = .02$), the quadratic term did not better predict PTG for men ($n = 132$) than the linear relationship ($\beta = -.17$ $R^2 = .08$, $p = .051$). While African American participants ($n = 129$) did not exhibit a linear association between PTSS and PTG, they demonstrated a significant curvilinear relationship ($\beta = -.24$ $R^2 = .05$, $p = .02$). In contrast, for Caucasian participants ($n = 366$) the curvilinear function was not significantly stronger than the linear relationship ($\beta = -.09$ $R^2 = .05$, $p = .15$).

In order to account for these potential varied relationships, it was initially considered prudent that subsequent analyses examining processes through which PTSS relates to PTG would examine both the linear and curvilinear relationship. PCL-5 scores were split into a low and high stress group to examine mediating and moderating effects of either side of the curvilinear relationship. In accordance with the guidelines suggested by Blevins and colleagues (2015) in their initial PCL-5 psychometric validation study, “low stress” was considered a PCL-5 score below 28, while the “high stress” group included individuals with a score ≥ 28 . This resulted in 367 participants for the low stress group, and 205 participants for the high stress group. However, correlations between PTSS and PTG for the high ($r = .02$, $p = .77$) and low ($r = .25$, $p < .001$) stress groups suggested that although there was a statistically significant curvilinear function between the constructs, the association between PTSS and PTG diminished with increased PTSS. Given the absence of a statistically significant relationship between PTSS and PTG in the high stress group, all subsequent analyses were run using the combined sample in order

to examine potential mediating and moderating variables of a linear PTSS-PTG relationship.

Mediating Role of Overall, Deliberate, and Intrusive Rumination

Hypothesis two, that rumination mediates the relationship between PTSS and PTG was tested in three steps. First, an overall rumination score was examined as a potential mediator of the relationship between PTSS and PTG. While rumination was significantly related to increased PTSS ($\beta = .89, p < .001$), it was not significantly related to PTG ($\beta = .09, p = .051$). According to the causal steps approach to mediation (Baron & Kenny, 1986), the overall rumination score therefore did not serve as a mediator between the predictor and outcome variables.

In the second and third steps, deliberate and intrusive rumination were examined as separate mediators of the relationship between PTSS and PTG. Deliberate and intrusive rumination were defined using subscales of the RTSQ (Brinker & Dozois, 2009). Deliberate rumination was assessed through the “problem focused rumination” subscale, while intrusive rumination was assessed through the “repetitive thoughts” subscale.

The mediating effect of rumination was tested via the product-of-coefficients approach, which operates through “PROCESS,” a tool that uses a bootstrapping procedure to estimate the indirect effect of a predictor on an outcome through mediators (Preacher & Hayes, 2008). This program also estimates the bias corrected confidence intervals (CIs) around the indirect effect; CIs not including zero indicate significance of the indirect effect. To compute the mediating effect, bootstrapping was conducted with 1000 samples with replacement. Similar to that which was found with the overall

rumination score, both deliberate ($\beta = .24, p < .001$) and intrusive ($\beta = .07, p < .001$) rumination were significantly related to PTSS, however neither deliberate ($\beta = .20, p = .19$) nor intrusive ($\beta = .58, p = .09$) rumination were associated with PTG. Therefore, both the overall rumination score and its subscales failed to mediate the relationship between PTSS and PTG.

Mediating Role of Positive and Negative Religious Coping

Hypothesis 3, regarding the potential mediating effect of positive and negative religious coping was tested in a similar manner, however in order to account for potential multicollinearity between religious coping and PTG, items related to spirituality on the PTGI (items 5, 18) were removed for this mediation analysis. For individuals who provided data on religious coping ($N = 130$), there was a non-significant relationship between PTSS and positive religious coping ($\beta = .02, p = .66$) and a non-significant relationship between negative religious coping and PTG ($\beta = .70, p = .20$). Therefore, it was found that religious coping did not effectively mediate the relationship between PTSS and PTG in the current study.

Mediating Role of Depressive Symptoms on the Relationship Between PTSS and PTG

Hypothesis 4 and its examination of the potential mediating role of depressive symptoms on the PTSS-PTG relationship ($N = 568$) was examined in the same fashion as the overall score in hypothesis 2 (see Figure 3). PTSS was significantly related to depressive symptoms ($\beta = .45, p < .001$) and PTG ($\beta = .26, p < .001$). In turn, depressive symptoms were significantly related to PTG ($\beta = -.65, p < .001$). The total effect between PTSS and PTG through depressive symptoms was significant ($\beta = .27, p < .001$)

The direct effect of PTSS on PTG controlling for depressive symptoms was significant ($\beta = .56, p < .001, r^2 = .07$) and depressive symptoms were found to partially mediate the relationship between PTSS and PTG ($\beta = -.29, SE = .05, 95\% \text{ CI } [-.39, -.18]$). Given that the relationship between PTSS and PTG was strengthened when depressive symptoms were added into the model rather than reduced as is expected in a mediation analysis, an exploratory analysis switching the predictor (PTSS) and mediator (depressive symptoms) variables was conducted in order to ascertain the true relationship amongst these variables.

When examining the mediating effect of PTSS on the relationship between depressive symptoms and PTG there was a significant relationship between depressive symptoms and PTSS ($\beta = .96, p < .001$). In turn, PTSS was significantly related to PTG ($\beta = .56, p < .001$). However, the direct relationship between depressive symptoms and PTG was not statistically significant ($\beta = -.11, p = .27$). The indirect pathway of depressive symptoms through PTSS on PTG was significant ($\beta = -.65, p < .001$) indicating a full mediation $F(2,565) = 20.78, p < .001; r^2 = .07, \beta = .53, 95\% \text{ CI: } [.37, .71]$ of PTSS on the depressive symptom-PTG relationship. Therefore, it can be reasonably concluded that the strength of the mediation effect of depressive symptoms on the relationship between PTSS and PTG was driven by the high correlation between depressive symptoms and PTSS ($r = .65$) and acted as an inconsistent mediator or *suppressor* of the PTSS-PTG relationship (MacKinnon, Krull, & Lockwood, 2000).

Moderating Role of Social Support on the Relationship Between PTSS and PTG

In order to test hypothesis 5, the relationship between perceived social support and PTSS and PTG, bivariate correlations were conducted among the variables and all

were significantly correlated ($p < .001$). The moderation analysis was also conducted using PROCESS, a tool for SPSS that uses the bootstrapping procedure to assess for the presence of moderation (Hayes, 2013). Results revealed a non-significant interaction term between PTSS and social support on PTG ($\beta = .04$, $SE = .05$, $p = .40$, 95% CI: $[-.05, .13]$, $\Delta r^2 = .001$) suggesting social support did not moderate the PTSS-PTG relationship in the current sample. The three types of social support (i.e., family, friends, significant other) were examined separately as moderators of this relationship. The non-significant results of these additional moderation analyses mirrored that of the total social support score, therefore they are not reported separately.

Moderating Role of Physical Health Functioning

To test hypothesis 6, the moderating role of PTG on the relation between PTSS and poor physical health, first a bivariate correlation was conducted among PTSS, PTG, the PHQ-15, and the SF-36 scales. The relationship between both somatic complaints (i.e., PHQ;15) and physical health functioning (i.e., SF-36 physical health component score) and PTG were not statistically significant ($p < .50$), however all other relationships between study variables were significant ($p < .001$). Two analyses were conducted in PROCESS (Hayes, 2013) to test for the presence of moderation.

The first consisted of PTSS as the predictor, PTG as the moderator, and the PHQ-15 total score as the outcome. Results revealed a non-significant interaction term between PTSS and PTG on somatic complaints ($\beta = -.0003$, $SE = .0004$, $p = .43$, 95% CI: $[-.001, .001]$, $\Delta r^2 = .001$) suggesting PTG did not moderate the PTSS-Somatic complaints relationship in the current sample. The second analysis was conducted with the SF-36 as the outcome variable in order to examine the moderating effect of PTG on PTSS in terms

of physical health functioning. Likewise, results indicated a non-significant interaction between PTSS and PTG on physical health functioning ($\beta = .003$, $SE = .002$, $p = .13$, 95% CI: $[-.001, .006]$, $\Delta r^2 = .01$), suggesting PTG did not moderate this relationship.

Discussion

Posttraumatic growth researchers have been equally intrigued and perplexed by the seemingly varied relationships between PTSS and PTG. With some studies supporting a positive relationship (Cadell et al., 2003; Taku et al., 2008), others a negative one (Frazier et al., 2001; Yi & Kim, 2014), and still others no relationship at all (Cordova et al., 2007; Windors et al., 2005), the way in which distress interacts with positive outcomes in the aftermath of trauma has appeared far from straightforward. As such, this study sought to clarify the relationship between PTSS and PTG in a sample of trauma-exposed college students and examine the potential mediating effects of rumination, religious coping, and depression in addition to the potential moderating effects of social support and outcome of physical health functioning on this relationship.

The Curvilinear Relationship Between PTSS and PTG and the Present Study

In general, there was weak support for the curvilinear relationship between PTSS and PTG in this sample. Specifically, the results indicated that the curvilinear function fit the data appropriately, however this was due to a non-significant relationship between PTSS and PTG at heightened levels of distress rather than a negative association as was initially hypothesized. The curvilinear model of the relationship between PTSS and PTG represents a modern viewpoint in the still developing field of PTG research (Butler and colleagues, 2005; Kleim & Ehlers, 2009). While somewhat in line with this, the practical significance of the findings from the present study are more consistent with conventional

thinking and previously published research on PTG. In particular, the relationship between PTSS and PTG was best depicted by an overall positive association. That is not to say that there was no support for the curvilinear relationship in this sample. The presence of a stronger quadratic association between PTSS and PTG over and beyond the linear effect suggests that the positive association between PTSS and PTG is reduced alongside increased PTSS severity.

There are a variety of possible reasons why a curvilinear relationship between PTSS and PTG was not more strongly supported by this study. First, the majority of PTG research has been conducted on specific trauma populations (Westphal & Bonanno, 2007), with samples exclusively consisting of cancer patients, natural disaster survivors, or assault victims.

In the current sample, PTG was most strongly associated with individuals experiencing/being exposed to physical assault ($r = .10, p = .02$), sudden violent death ($r = .12, p < .01$), and/or sudden unexpected death of someone close to the participant ($r = .13, p < .01$). In the present study, participants were asked to report on a very stressful life experience. This, unsurprisingly, resulted in a wide range of reported events. It is possible that having such a wide variance in identified index traumas influenced the overall scores, and could have resulted in the small, yet statistically significant, positive relationship between PTSS and PTG. This may be due to individual differences (e.g., over-/under-reporting), but could also be influenced by the nature of the events themselves. Therefore, it is possible that the curvilinear relationship would garner further support in a more specific, less varied, trauma population.

Second, it is possible that the curvilinear function would appear more prominently in a sample demonstrating higher levels of stress response. The weak curvilinear relationship between PTSS and PTG that was found in the current study suggests that, even in the present study sample, the nature of the relationship between the constructs begins to change with increased levels of PTSS. While approximately a third of the sample met criteria for probable PTSD our measurement tool for assessing PTSS lacks the clinical judgment and indices of clinically significant distress and functional impairment of the gold standard for PTSD assessment (i.e., CAPS-5; Weathers et al., 2013). Therefore, while the negative side of the curvilinear function has been found in samples of individuals with PTSD (e.g., Frazier and colleagues, 2001), it is possible that the current sample consisted of too few individuals with PTSD meeting full diagnostic criteria to elucidate the full curvilinear relationship.

Third, the results may have been impacted by the relatively young sample in the current study. All study participants were attending college at the time of data collection. Given that the present sample is almost exclusively young adults, with an average age of 24, the developmental aspects that influence their responses are likely different than those what would be found in a study with a wider range of adults. Young adulthood, and college in particular, is a period marked by exploration and growth. Tedeschi and Calhoun (2004) suggest that younger people may be more likely than older individuals to report growth due to a greater openness to learn from their experiences. They argue that older individuals may be more likely to have already gained important insights in their life prior to their index trauma and that their capacity for change is reduced in comparison. Therefore, we might have seen higher rates of PTG even at elevated levels

of distress given the developmental period of the sample, thus restricting our ability to demonstrate the full curvilinear relationship. While the current study demonstrated a small positive correlation between age and PTG ($r = .09, p = .02$), 88% of participants were between the ages of 18 and 30 years old, which does not rule out the possibility that the relationship between PTG and age changes throughout the lifespan.

Mediating and Moderating Variables of the Relationship Between PTSS and PTG

Thus far, research has provided few answers as to how distress relates to posttraumatic growth and meaning in life in trauma survivors. One of the primary aims of this research was to better understand factors that might preclude or facilitate the development of PTG in the aftermath of trauma exposure. In line with previous research (Ehlers et al., 1998; Michael et al., 2007) rumination and its subscales were significantly related to PTSS, however unlike previous research (Cann et al., 2011) they were not significantly related to PTG. Thus, rumination did not act as a mediator between PTSS and PTG. The effect of positive and negative religious coping acted in a similar manner, failing to meet the causal steps approach for mediation (Baron & Kenney, 1986).

Results confirmed that higher social support was associated with reduced PTSS and higher PTG at the bivariate level, consistent with previous studies (Guay et al., 2006; Tedeschi and Calhoun, 2004). However, contrary to our hypotheses, multivariate models suggested that social support neither broadly nor specifically (i.e., support from family, friends, or significant others) defined moderated the relationship between PTSS and PTG. This finding indicates that although social support is independently related to both PTSS and PTG, the relationship between PTSS and PTG remains consistent at varied levels of social support. Therefore, interventions targeting social support in the presence of trauma,

based on the results of the current study, may have little impact on the facilitation of PTG.

The finding that both somatic complaints and an index of physical health functioning were not significantly associated with PTG suggests modest support for the growing literature suggesting PTG may act as an *avoidant illusion* (Zoellner & Maercker, 2006) in the aftermath of trauma. While findings in the current study were not consistent with prior research (Lahav and colleagues, 2016) suggesting PTG is related to poor physical health, a non-significant relationship between PTG and physical health functioning suggests any positive changes as a result of trauma may be limited to cognitive and social domains. At the same time, the current study consisted of a relatively healthy sample with few reported somatic and other physical health concerns. Therefore, future research would benefit from further examination of the role of specific physical health concerns in a more highly symptomatic sample and their influence on the PTSS-PTG relationship.

In this study, depressive symptoms positively predicted PTSS and were negatively associated with PTG. The finding that symptoms of depression acted as a partial inconsistent mediator of the relationship between PTSS and PTG builds on the results of Palmer and colleagues (2016) and provides support for a more adaptive emotional component of PTG. From a statistical standpoint, multivariate analyses revealed that the strength of the positive association between PTSS and PTG was increased when depression was controlled for in the model. This finding suggests that depressive symptoms suppressed the positive association between PTSS and PTG, weakening the relationship between these constructs. Although subsequent analyses

suggested a primary role of PTSS as it relates to PTG, the influence of emotional reactions to trauma exposure as it relates to PTG preclusion or facilitation warrant further consideration.

Demographic Characteristics

The current study built on recent research (Strasshofer, Peterson, Beagley, & Galovski, 2017) suggesting there are subsets of individuals who report varied levels of growth, which are differentially related to psychological adjustment post-trauma. As such, in line with the findings of Brewin and colleagues (2000), women in the present study reported higher levels of PTSS than men, which evaluation of symptoms clusters suggests is driven by female participant's elevated re-experiencing and avoidance symptoms. This suggests that trauma memories may have been more intrusive and upsetting for female than male participants. In contrast to previous research (Jin, Xu, H. Liu, and D. Liu, 2014), there were no gender differences in reported PTG.

The opposing finding of racial differences in PTG but not PTSS suggest demographic factors may influence the relationship between PTSS and PTG in different ways. In support of this, the present study demonstrated varied relationships between PTSS and PTG based on race and gender. Individuals identifying as either African American or female demonstrated a curvilinear relationship beyond that of a linear effect, while those identifying as Caucasian or male had the relationship between PTSS and PTG best explained by a positive linear effect.

Previous research has demonstrated heightened PTG in minority populations (Tomich & Helgeson, 2004) which may be a result of differences in religiosity. Supporting this interpretation, African Americans in the current study demonstrated significantly higher

positive religious coping ($M = 20.23$, $SD = 7.72$) than Caucasian participants ($M = 12.79$, $SD = 6.96$), which correlated alongside their differences in PTG. This use of religious coping may aid in the ability of individuals to counteract the negative effects of trauma exposure. Taken together, these findings suggest potential differential mechanisms based on pertinent social and demographic factors. Future research would benefit from the exploration of intersecting identities as they relate to the relationship between PTSS and PTG in order to develop a classification system and interventions tailored to specific groups.

Limitations

Limitations of the study should be considered when interpreting the results. First, self-report instruments were used in the assessment of all variables of interest, which may be less accurate than a structured interview with a clinician. The use of the PTGI (Tedeschi & Calhoun, 1996) for the assessment of PTG may be a better indicator of perceived rather than actual growth after trauma (Zoellner & Maercker, 2006). In addition, the current study used a sample of convenience, which may not be fully representative of the general population. As such, self-selection and social desirability of participants may limit the generalizability of findings. However, in a meta-analytic review of trauma-focused research, Legerski and Bunnell (2010) found selection bias to be unrelated to PTSS severity. Tedeschi and Calhoun (1996) came to the same conclusion for PTG, allowing for greater confidence in the results of the current study.

While individuals reported being exposed to a myriad of traumatic events it is unclear whether or not they were responding to indices of PTSS and PTG with these events in mind. Despite having a large enough sample to examine differences based on

trauma type, participants were not asked to identify an index trauma in the current study. This is particularly problematic given that 90% of the total sample endorsed experiencing two or more traumatic events. Future research would benefit from an examination of whether the relationship between PTSS and PTG and associated mechanisms differ based on the type of trauma experienced.

All data were cross sectional in nature; therefore, it is impossible to make inferences about causality. It remains unclear whether growth is a predisposing factor or a consequence of trauma exposure. Although causal and temporal relationships were hypothesized through the statistical methods used, the results must be confirmed with longitudinal methodologies. Therefore, future research should examine the role of PTSS and PTG using a repeated-measures design to ascertain the effects of the proposed mechanisms on PTG over time after trauma exposure. The study of the relationship between PTSS and PTG within college samples with varied trauma exposure is relatively new and requires further exploration.

Conclusion

These limitations notwithstanding, the results of the current study further clarify the relationship between PTSS and PTG in a sample of trauma-exposed university students. Specifically, further support was provided for a positive association between PTSS and PTG, suggesting that these seemingly disparate constructs are not on opposite ends of the same spectrum, but instead coexist. However, a curvilinear model between distress and growth demonstrated greater explanatory power for women and African American participants. Thus, the relationship between PTSS and PTG appears to vary based, in part, on social and demographic factors.

Additional support was provided for the conceptualization of PTG as an adaptive illusion given a general lack of significant association between PTG and indices of physical health. At the same time, the finding that depressive symptoms served as an inconsistent mediator of the relationship between PTSS and PTG suggests that symptoms of depression may impede the development of PTG in the aftermath of trauma. Given the high comorbidity between PTSD and major depressive disorder (Flory & Yehuda, 2015), interventions targeting overlapping symptoms may aid in the facilitation of PTG. Thus, although previous research has questioned the clinical utility of PTG, our findings suggest PTG may serve to engender greater affective well-being.

The current study demonstrated the ability of individuals to experience growth in their lives along with distress associated with trauma exposure, suggesting a deft balance of recovery and strengths-based approaches may result in optimal clinical outcomes. Future studies should seek to replicate these findings utilizing longitudinal designs in order to examine the effects of potential mechanisms of the PTSS-PTG relationship over time. Overall, this study supports the continued examination of processes through which PTG is precluded and maintained in order for the development of targeted interventions to combat the negative effects of trauma exposure.

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Appendix A

Informed Consent for Participation in Research Activities
Trauma and Somatic Symptoms

HSC Approval Number 649858-2

Principal Investigator Steven E. Bruce, Ph.D. PI's Phone Number 314-516-7204

Why am I being asked to participate?

You are invited to participate in a research study on the effects of trauma experiences and physical symptoms. This study is conducted by Dr. Steven Bruce and Dr. Kamila White in the Department of Psychological Sciences at the University of Missouri-St. Louis. We ask that you read this form and ask any questions you may have before agreeing to be in the research. Your participation in this research is voluntary. Your decision whether to participate will not affect your current or future relations with the University of Missouri-St. Louis or the Department of Psychological Sciences. If you decide to participate, you are free to withdraw at any time without affecting these relationships.

What is the purpose of this research?

The purpose of this research is to study trauma experiences, psychological factors, and physical symptoms.

What procedures are involved?

If you agree to participate in this research, you can expect:

Ø You will complete an online survey consisting of several questionnaires regarding possible traumatic experiences, anxiety, and physical symptoms as well as demographic information.

Ø This online survey will take approximately 60-90 minutes to complete.

Approximately 500 subjects may be involved in this research at the University of Missouri-St. Louis.

If you agree to participate in this research, after reading this document, please select "I agree" to proceed to the next page where you will complete the online survey. If you do not wish to participate in this research, you may select "I do not agree" or simply close your internet browser.

What are the potential risks and discomforts?

While the risk of participating in this study are minimal, we recognize that answering certain questions may be potentially uncomfortable. If at any point in time you wish to leave questions blank or to discontinue the survey and withdrawal from the project, that is completely acceptable. Additionally, if you have any questions about your participation in the study or the study itself, you are welcome to contact the principal investigators to discuss them in confidence. If you do experience distress, you may contact the principal investigator, Dr. Steven Bruce (314-516-7204; bruce@umsl.edu) who is a licensed clinical psychologist. Should you desire immediate assistance, you may call the national crisis hotline at 1-800-273-8255 (available 24 hours a day, 7 days a week). Additionally, upon completion of the survey, you will be provided with two counseling referral numbers if needed (the Center for Trauma Recovery's; 314-516-6738 as well as the Community Psychological Services, 314-516-5824).

Are there benefits to taking part in the research?

There are no direct benefits to you for participating in this research.

What about privacy and confidentiality?

The only people who will have knowledge of your participation in this study are members of the research team. No information provided by you during the research will be disclosed to others without your written permission unless it is necessary to protect your rights or welfare, or if it is required by law.

When the results of the research are published or discussed at conferences, no information will be included that could potentially reveal the identity of any participants. Any information that is obtained in connection with this study, and that can be identified with you, will remain confidential and will be disclosed only with your permission or as required by law.

If you choose to receive research credit for your participation, you will be asked to provide a name and e-mail address to ensure proper distribution of course credit. Distribution of credit will occur immediately after the principal investigator has been informed of the participant's survey completion. Once credit has been awarded, participant names and e-mail addresses will be separated from survey responses. Data and identifying information will be kept in separate password protected documents, and names will be stored in alphabetical order to ensure responses and identifying information cannot be linked. Names and e-mail addresses will be kept on file for one year. Additionally, your survey responses will be combined with 500 other participants' responses. Survey responses will be coded with a randomly assigned identification number that is in no way linked to your identity. The primary investigators will have sole access to the data files.

What are the costs for participating in this research?

There are no costs associated with participation in this research study.

Will I be paid for my participation in this research?

You will not be paid for participating, but you may choose to receive credits for participating in the Psychological Human Subjects Pool if allowed by your instructor.

Can I withdraw or be removed from the study?

You can choose whether to be in this study. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You also may refuse to answer any questions you do not want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. If you decide to end your participation in the study, please complete the withdrawal letter found at <http://www.umsl.edu/services/ora/IRB.html>, or you may request that the Investigator send you a copy of the letter.

Who should I contact if I have questions?

The researcher(s) conducting this study are Dr. Steven Bruce and Dr. Kamila White. You may ask any questions you have now. If you have questions later, you may contact the researcher(s) at 314-516-7204.

What are my rights as a research subject?

If you have any questions about your rights as a research subject, you may call the Chairperson of the Institutional Review Board at (314) 516-5897.

What if I am a UMSL student?

You may choose not to participate or to stop your participation in this research study at any time. This decision will not affect your class standing or grades at UMSL. The investigator also may end your participation in the research. If this happens, your class standing will not be affected.

What if I am a UMSL employee?

Your participation in this research is, in no way, part of your university duties, and your refusal to participate will not in any way affect your employment with the university or the benefits, privileges, or opportunities associated with your employment at UM-SL. You will not be offered or receive any special consideration if you participate in this research.

Remember: *Your participation in this research is voluntary. Your decision whether to participate will not affect your current or future relations with the University. If you decide to participate, you are free to withdraw at any time without affecting that relationship.*

Please print off and keep a copy of this form for your records.

After reading this consent form, do you agree to participate in this study?

- Yes, I have read and understand this form, and voluntarily agree to participate in this research study.
- No, I will not participate at this time.

Appendix B: LEC-5:

Listed below are a number of difficult or stressful things that sometimes happen to people. For each event, check one or more of the boxes to the right to indicate that (a) it *happened to you personally*, (b) you *witnessed it* happen to someone else, (c) you *learned about its happening to someone close to you*, (d) you're *not sure* if it fits, or (e) it *doesn't apply* to you.

Be sure to consider your *entire life* (growing up as well as adulthood) as you go through the list of events.

Event	Happened to me	Witnessed it	Learned about it	Not sure	Doesn't apply
1. Natural disaster (for example, flood, hurricane, tornado, earthquake)					
2. Fire or explosion					
3. Transportation accident (for example, car accident, boat accident, train wreck, plane crash)					
4. Serious accident at work, home, or during recreational activity					
5. Exposure to toxic substance (for example, dangerous chemicals, radiation)					
6. Physical assault (for example, being shot; stabbed; threatened with a knife, gun, bomb)					
7. Assault with a weapon (for example, being shot, stabbed, threatened with a knife, gun, bomb)					
8. Sexual assault (rape, attempted rape, made to perform any type of sexual act through force or threat of harm)					
9. Other unwanted or uncomfortable sexual experience					
10. Combat or exposure to a war-zone (in the military or as a civilian)					
11. Captivity (for example, being kidnapped, abducted, held hostage, prisoner of war)					
12. Life-threatening illness or injury					
13. Severe human suffering					
14. Sudden violent death (for example, homicide, suicide)					
15. Sudden, unexpected death of someone close to you					
16. Causing serious injury, harm, or death you caused to someone else					
17. Any other very stressful event or experience					

Appendix C: PCL-5: Monthly

<i>In the past week, how much were you bothered by:</i>	<i>Not at all</i>	<i>A little bit</i>	<i>Moderately</i>	<i>Quite a bit</i>	<i>Extremely</i>
1. Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2. Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3. Suddenly feeling or acting as if the stressful experience were actually happening again (<i>as if you were actually back there reliving it</i>)?	0	1	2	3	4
4. Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5. Having strong physical reactions when something reminded you of the stressful experience (<i>for example, heart pounding, trouble breathing, sweating</i>)?	0	1	2	3	4
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
7. Avoiding external reminders of the stressful experience (<i>for example, people, places, conversations, activities, objects, or situations</i>)?	0	1	2	3	4
8. Trouble remembering important parts of the stressful experience?	0	1	2	3	4
9. Having strong negative beliefs about yourself, other people, or the world (<i>for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous</i>)?	0	1	2	3	4
10. Blaming yourself or someone else for the stressful experience or what happened after it?	0	1	2	3	4
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	0	1	2	3	4
12. Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13. Feeling distant or cut off from other people?	0	1	2	3	4
14. Trouble experiencing positive feelings (<i>for example, being unable to feel happiness or have loving feelings for people close to you</i>)?	0	1	2	3	4
15. Irritable behavior, angry outbursts, or acting aggressively?	0	1	2	3	4
16. Taking too many risks or doing things that could cause you harm?	0	1	2	3	4
17. Being “superalert” or watchful or on guard?	0	1	2	3	4
18. Feeling jumpy or easily startled?	0	1	2	3	4
19. Having difficulty concentrating?	0	1	2	3	4

20. Trouble falling or staying asleep?	0	1	2	3	4
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Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

Appendix D: Posttraumatic Growth Inventory

Listed below are 21 areas that are sometimes reported to have changed after traumatic events. Please mark the appropriate box beside each description indicating how much you feel you have experienced change in the area described.

The 0 to 5 scale is as follows:

0 = I did not experience this change as a result of my crisis

1 = I experienced this change to a very small degree

2 = a small degree

3 = a moderate degree

4 = a great degree

5 = a very great degree as a result of my crisis

1. I changed my priorities about what is important in life. (V)
2. I have a greater appreciation for the value of my own life. (V)
3. I developed new interests. (II)
4. I have a greater feeling of self-reliance. (III)
5. I have a better understanding of spiritual matters. (IV)
6. I more clearly see that I can count on people in times of trouble. (I)
7. I established a new path for my life. (II)
8. I have a greater sense of closeness with others. (I)
9. I am more willing to express my emotions. (I)
10. I know better that I can handle difficulties. (III)
11. I am able to do better things with my life. (II)
12. I am better able to accept the way things work out. (III)
13. I can better appreciate each day. (V)
14. New opportunities are available which wouldn't have been otherwise. (II)
15. I have more compassion for others. (I)
16. I put more effort into my relationships. (I)
17. I am more likely to try to change things which need changing. (II)
18. I have a stronger religious faith. (IV)
19. I discovered that I'm stronger than I thought I was. (III)
20. I learned a great deal about how wonderful people are. (I)
21. I better accept needing others. (I)

Appendix E: Ruminative Thought Style Questionnaire

For each of the items below, please rate how well the item describes you.

1. I find that my mind often goes over things again and again.
2. When I have a problem, it will gnaw on my mind for a long time.
3. I find that some thoughts come to mind over and over throughout the day.
4. I can't stop thinking about some things.
5. When I am anticipating an interaction, I will imagine every possible scenario and conversation.
6. I tend to replay past events as I would have liked them to happen
7. I find myself daydreaming about things I wish I had done.
8. When I feel I have had a bad interaction with someone, I tend to imagine various scenarios where I would have acted differently.
9. When trying to solve a complicated problem, I find that I just keep coming back to the beginning without ever finding a solution.
10. If there is an important event coming up, I think about it so much that I work myself up.
11. I have never been able to distract myself from unwanted thoughts.
12. Even if I think about a problem for hours, I still have a hard time coming to a clear understanding.
13. It is very difficult for me to come to a clear conclusion about some problems, no matter how much I think about it.
14. Sometimes I realize I have been sitting and thinking about something for hours.
15. When I am trying to work out a problem, it is like I have a long debate in my mind where I keep going over different points,
16. I like to sit and reminisce about pleasant events from the past.
17. When I am looking forward to an exciting event, thoughts of it interfere with what I am working on.
18. Sometimes even during a conversation, I find unrelated thoughts popping into my head
19. When I have an important conversation coming up, I tend to go over it in my mind again and again.
20. If I have an important event coming up, I can't stop thinking about it.

Appendix F: The Brief RCOPE

The following items deal with ways you coped with a significant trauma or negative event in your life. There are many ways to try to deal with problems. These items ask what part religion played in what you did to cope with this negative event. Obviously different people deal with things in different ways, but we are interested in how you tried to deal with it. Each item says something about a particular way of coping. We want to know to what extent you did what the item says. *How much or how frequently*. Don't answer on the basis of what worked or not – just whether or not you did it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

- 1 = Not at all
- 2 = Somewhat
- 3 = Quite a bit
- 4 = A great deal

1. Looked for a stronger connection with God.
2. Sought God's love and care.
3. Sought help from God in letting go of my anger.
4. Tried to put my plans into action together with God.
5. Tried to see how God might be trying to strengthen me in this situation.
6. Asked forgiveness for my sins.
7. Focused on religion to stop worrying about my problems.
8. Wondered whether God had abandoned me.
9. Felt punished by God for my lack of devotion.
10. Wondered what I did for God to punish me.
11. Questioned God's love for me.
12. Wondered whether my church had abandoned me.
13. Decided the devil made this happen.
14. Questioned the power of God.

Appendix G: Multidimensional Scale of Perceived Social Support

Instructions: We are interested in how you feel about the following statements. Read each statement

carefully. Indicate how you feel about each statement.

Circle the "1" if you Very Strongly Disagree

Circle the "2" if you Strongly Disagree

Circle the "3" if you Mildly Disagree

Circle the "4" if you are Neutral

Circle the "5" if you Mildly Agree

Circle the "6" if you Strongly Agree

Circle the "7" if you Very Strongly Agree

1. There is a special person who is around when I am in need.
2. There is a special person with whom I can share joys and sorrows.
3. My family really tries to help me.
4. I get the emotional help & support I need from my family.
5. I have a special person who is a real source of comfort to me.
6. My friends really try to help me.
7. I can count on my friends when things go wrong.
8. I can talk about my problems with my family.
9. I have friends with whom I can share my joys and sorrows.
10. There is a special person in my life who cares about my feelings.
11. My family is willing to help me make decisions.
12. I can talk about my problems with my friends.

Table 1.

Descriptive Statistics for Predictor and Outcome Variables and their Subscales (N = 572).

	M	SD	Min	Max
1. Posttraumatic Stress Symptoms	23.09	16.88	0	74
2. Re-experiencing Symptoms	5.97	4.94	0	20
3. Avoidance Symptoms	3.13	2.39	0	8
4. Negative Alterations in Cognition and Mood	7.39	6.31	0	27
5. Hyperarousal	6.59	5.43	0	24
6. Posttraumatic Growth	48.77	27.56	0	105
7. New Possibilities	11.11	7.45	0	25
8. Relating to Others	15.77	9.82	0	35
9. Personal Strength	10.17	5.69	0	20
10. Spiritual Change	3.94	3.38	0	10
11. Appreciation of Life	7.78	4.44	0	15

Table 2.

Correlations among Key Study Variables

	1	2	3	4	5	6	7
1. PTSS (n = 572)	-						
2. PTG (n = 572)	.168*	-					
3. Rumination (n = 544)	.506**	.163**	-				
4. Positive Religious Coping (n = 661)	.039	.384**	-.015	-			
5. Depressive Symptoms (n = 568)	.654**	-.047	.559**	-.057	-		
6. Social Support (n = 557)	-.284**	.199**	-.104*	.197*	-.353**	-	
7. Physical Health Dysfunction (n = 425)	.564**	.029	.405**	-.012	.553**	-.218**	-

* Correlation is significant at the .05 level (2-tailed)
** Correlation is significant at the .01 level (2-tailed)

Table 3.

Relationship Between Trauma Type and Predictor and Outcome Variables.

Trauma Type	Number Experienced	Association between PTSS and PTG
Natural Disaster	227	.16*
Fire or Explosion	144	.11
Transportation Accident	446	.17**
Serious accident at work, home, or during recreational activity	213	.11
Exposure to toxic substance	51	.27
Physical assault	284	.07
Assault with a weapon	79	.01
Sexual assault	130	.01
Other unwanted or uncomfortable sexual experience	221	.05
Combat or exposure to a war-zone	23	-.13
Captivity	4	.89
Life-threatening illness or injury	208	.15*
Severe human suffering	92	-.08
Sudden violent death	98	-.01
Sudden, unexpected death of someone close to you	318	.10
Causing serious injury, harm, or death you caused to someone else	37	.10
Any other very stressful event or experience	251	.12

*

Correlation is significant at the .05 level (2-tailed)

** Correlation is significant at the .01 level (2-tailed)

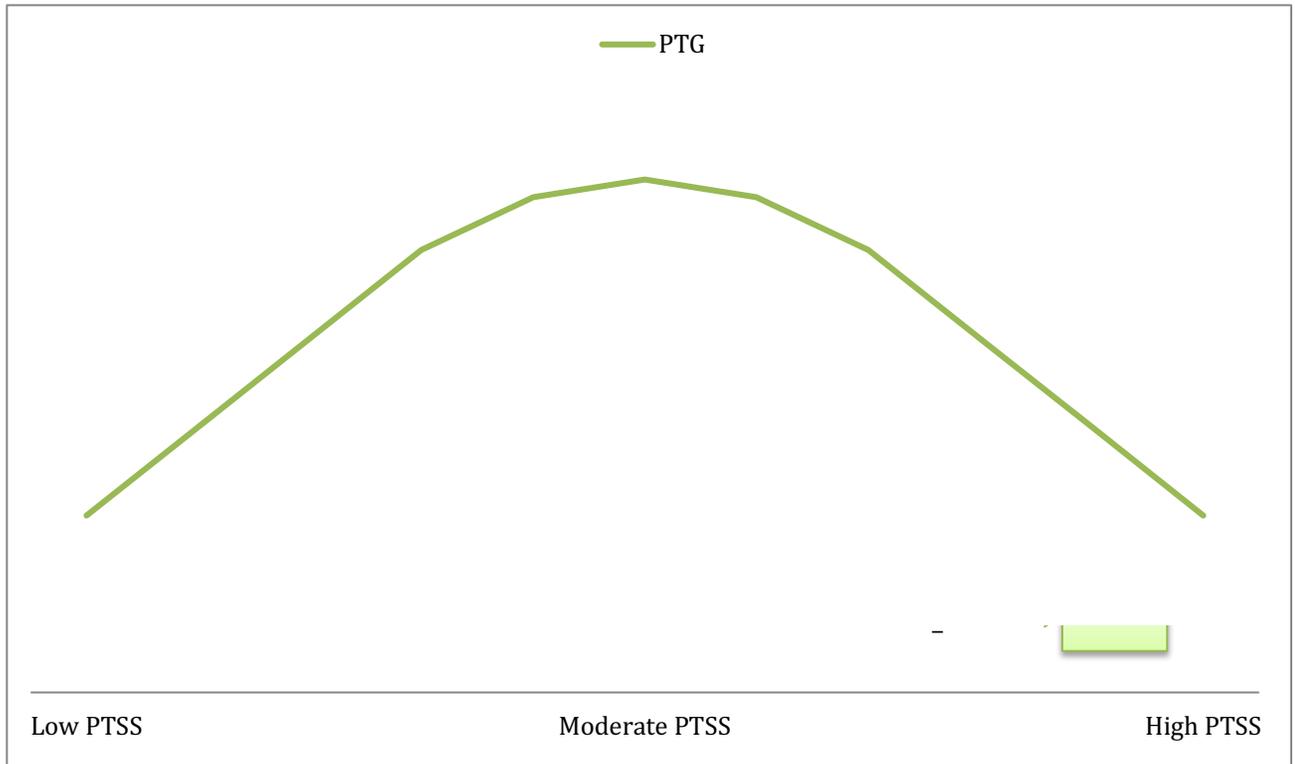


Figure 1. The hypothesized curvilinear relationship between posttraumatic stress symptoms (PTSS) and posttraumatic growth (PTG) with an illustration of the hypothesized role of positive religious coping (PRC) and negative religious coping (NRC) as a differential mediator on different sides of the curve.

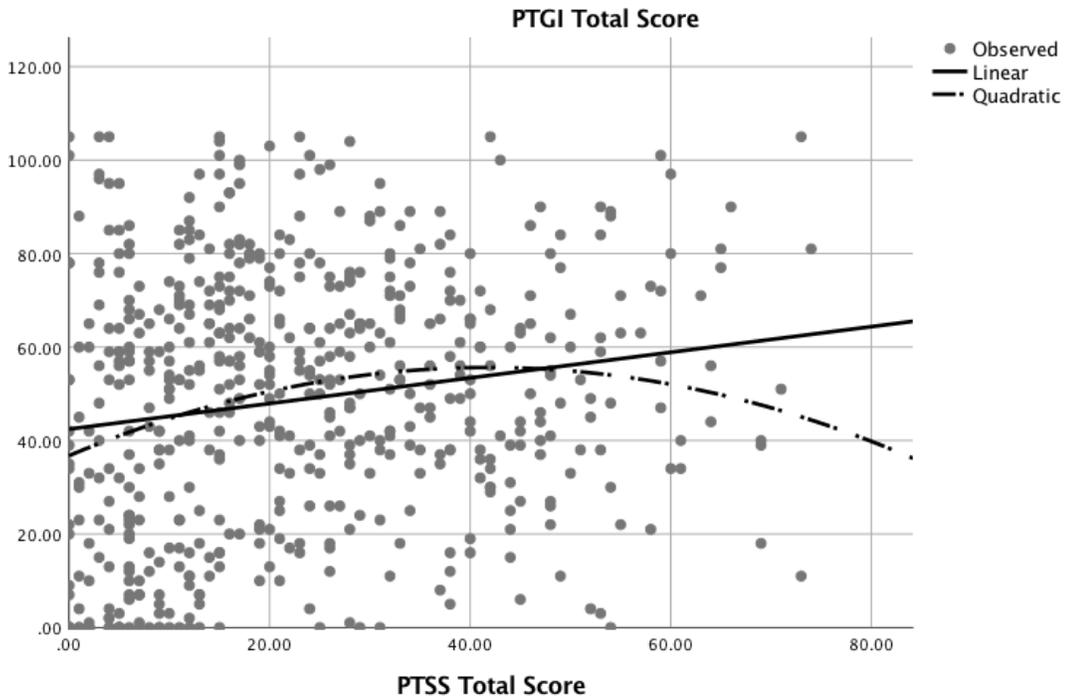


Figure 2. Linear and curvilinear representations of the relationship between PTSS and PTG. Results demonstrated a stronger curvilinear relationship beyond that of the linear effect.

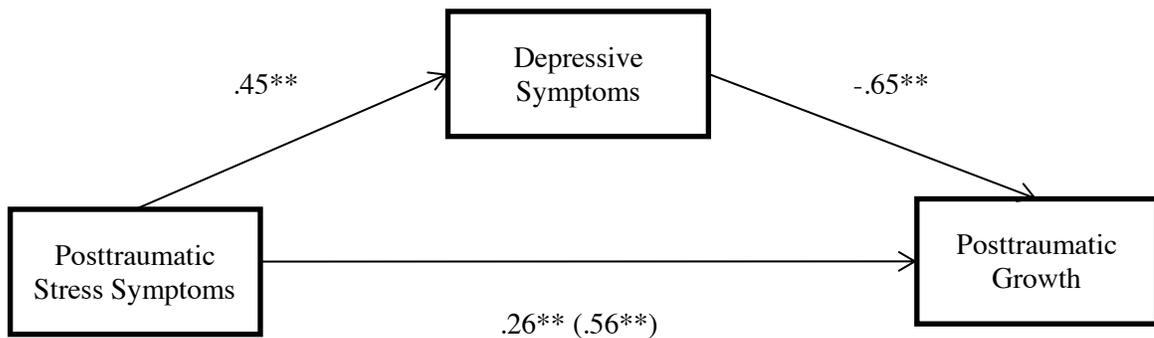


Figure 3. Standardized regression coefficients for the relationship between PTSS and PTG as mediated by depressive symptoms. The standardized regression coefficient between PTSS and PTG, controlling for depressive symptoms, is in parentheses.

** $p < .001$.