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# The Role Of Memory, Personality, And Thought Processes In Posttraumatic Stress Disorder

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**THE ROLE OF MEMORY, PERSONALITY AND THOUGHT PROCESSES IN POSTTRAUMATIC STRESS DISORDER**

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# CHAPTER 1 – GENERAL INTRODUCTION

Posttraumatic stress disorder (PTSD) is a pervasive mental disorder with an international lifetime prevalence rate of 2.1% (Somers, Goldner, Waraich, & Hsu, 2006). Using probability sampling methods, Kessler, Sonnega, Bromet, Hughes, and Nelson (1995) examined 8,000 individuals in 48 states and found that this disorder is even more prevalent in the U.S. (lifetime prevalence of 7.8%). Individuals suffering from PTSD experience a range of symptoms including, but not limited to, intrusive recall of the event, sleep disturbance, emotional numbing, an exaggerated startle response, physical reactions to reminders of the event, and a loss of interest in previously enjoyable activities (APA, 2000). Given the high prevalence rates in the U.S. and the impact of this disorder on an individual's daily life, it is important to explore why one individual may be more likely than another to succumb to this pervasive disorder following similar experiences.

## Competing Theories of PTSD

While multiple theories surrounding PTSD have been proposed, Rubin, Berntsen, and Bohni (2008) have described two competing categories of theories for the disorder, those in which special mechanisms are used to represent a traumatic event in memory and the autobiographical memory model in which the traumatic event is represented via basic mechanisms. Theories housed as special mechanisms models, particularly those from an information-processing perspective, posit that traumatic events are processed differently from other events, through special mechanisms (Brewin & Holmes, 2003). These special mechanisms prevent full integration of the memory, thus leaving the individual with a raw, unprocessed memory for the event (Horowitz, 1976). From a behaviorism standpoint, the special mechanisms approach hypothesized that the traumatic event causes a fear response for neutral stimuli that

were experienced in conjunction with the trauma (Keane, Zimering, & Caddell, 1985). This fear response is resilient to extinction due to the individual's tendency to block out the memory for the event, which prevents the needed exposure for extinction to occur (Keane, et al., 1985). The autobiographical memory model, on the other hand, posits that no special mechanisms are needed to process trauma events (Rubin, Berntsen, & Bohni, 2008). Instead, this model suggests that traumatic events are represented within memory through the same basic mechanisms as other events, and that it actually may be problematic if the memory is too integrated into the individual's schemata (Rubin, Boals, & Berntsen, 2008). In what follows, I preview the issues identified by autobiographical memory theory that are relevant to the studies that comprise this dissertation.

**Fragmentation versus Integration**

Traditional theories of PTSD, those taking the special mechanisms approach, assume that the trauma event is poorly integrated into the individual's schemata (Horowitz, 1976). This is thought to result in a fragmented memory for the event and a reduced ability to voluntarily recall the event (Rubin, Boals, & Berntsen, 2008). This is even made apparent in the diagnostic evaluation of the disorder, particularly in one of the Cluster C symptoms (trouble remembering important parts of the event; APA, 2000). The autobiographical memory model of PTSD challenges the idea of a fragmented memory for the traumatic event, and instead predicts that the memory for the traumatic event is highly integrated into the individual's schemata (Rubin, Boals, & Berntsen, 2008). According to Berntsen and Rubin (2006), this high level of integration will cause the traumatic event to become highly accessible and salient, eventually causing the event to become an anchoring event, thus causing the individual to overestimate the likelihood that similar events will occur in the future. The autobiographical memory model of PTSD, therefore,

predicts that symptom levels will co-vary with the availability of the memory for the event (Rubin, Berntsen, & Bohni, 2008).

Some research suggests that integration may actually be responsible for PTSD outcomes as opposed to fragmentation. For instance, event centralization has been shown to be correlated with the degree to which individuals experience PTSD symptoms, (Rubin, Boals, & Berntsen, 2008; Berntsen & Rubin, 2006). Event centralization has also been shown to predict PTSD symptom scores (Berntsen & Rubin, 2007), even after accounting for personality variables and other pathology (Fitzgerald, Berntsen, and Broadbridge, under review). Furthermore, Porter and Birt (2001) have shown evidence that trauma memories actually contain more details than positive memories.

**The Event versus the Memory**

Special mechanisms theories of PTSD also seem to put an undue emphasis on the event itself as a cause of the disorder, assuming a subsequent static and accurate memory as opposed to a changing and potentially flawed memory for the event (Rubin, Berntsen, & Bohni, 2008). A view of memory that flies in the face of modern research and theory (Addis, Wong, & Schacter, 2007; Fitzgerald & Broadbridge, 2013; Foster, Huthwaite, Yesberg, Garry, & Loftus, 2012; Rubin, 2006; Schacter, Addis, & Buckner, 2007; Stark, Okado, & Loftus, 2010) is a particularly troublesome view of PTSD for a few reasons. First, the *DSM-IV-TR* specifies that at least one month must pass between the event and diagnosis of PTSD, which means that the event itself is presumed to directly impact the onset of the disorder, however does not immediately precede the disorder. Second, it is well known that memory is constructive and error prone in many ways, which leads to problems with collecting retrospective data regarding the event if the event is assumed to be the cause of the disorder (Rubin, Berntsen, & Bohni, 2008). Third, this focus on

the event itself leaves no room for clinicians to consider the impact of the individual's interpretation of the event on symptomology. This is particularly salient when examining the event-related criteria of the disorder (discussed below). The autobiographical memory model suggests that a greater weight be given not only to the memory for the event, but also the changes in that memory over time (Rubin, Berntsen, & Bohni, 2008). It is suggested that, because the memory for the event is not static, the course of PTSD over time proceeds dynamically as that memory changes.

**Event-related criteria.** Following the special mechanisms approach, the *DSM-IV-TR* defines specific criteria which a traumatic event must meet for an individual to subsequently be diagnosed with PTSD. These criteria, referred to as the A1 and A2 criteria, require that (1) "the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (APA, 2000, p. 467) and (2) "the person's response involved intense fear, helplessness, or horror" (APA, 2000, p. 467). These restrictions do not take into account individual differences in responses to events of differing severity. For instance, Broadbridge and colleagues (2012) examined the relationship between exposure to specific types of trauma and mental health outcomes in samples of Iraqi refugees and Arab immigrants. When predicting both PTSD and depression symptoms, they found that refugees were more impacted by events occurring directly to themselves whereas immigrants were more impacted by events happening to other individuals. Furthermore, in the same sample Arnetz and colleagues (under review) show that although refugees experience significantly more overall trauma, immigrants have higher levels of PTSD and depression symptoms. Combined, these results suggest that something other than the events themselves is exerting an influence on mental health outcomes. Additionally, these criteria

neither recognize the ability of prolonged stressful events to induce PTSD symptoms, nor account for the emotional numbing that often occurs in response to trauma (Roemer, Orsillo, Borkovec, & Litz, 1998). The autobiographical memory model of PTSD suggests that it is not necessary that these criteria be met in order for PTSD symptoms to be present. In fact, this model has drawn attention to the variety of events related to PTSD symptoms, and it focuses on the memories for such events.

Some research suggests that events which do not meet the event-related criteria of PTSD diagnosis can produce similar levels of PTSD symptomology as can events meeting these criteria. When compared to individuals with low PTSD symptom scores, individuals with high PTSD symptom scores did not have an increased likelihood of exposure to an A1 event (Berntsen & Rubin, 2006; Rubin, Boals, & Berntsen, 2008). Additionally, Berntsen and Rubin (2007) found no difference in the correlation between event centralization and PTSD symptom scores when comparing individuals meeting versus not meeting the A1 criterion. Research has also shown that the A1 is not a significant predictor of PTSD symptom scores (Broadbridge & Fitzgerald, 2010), nor is it correlated significantly with the specific symptom clusters (Berntsen & Rubin, 2006). Furthermore, the lack of differences seen across these studies cannot be attributed to scales that differentially measure symptoms across the two groups, as strong evidence exists for measurement invariance across individuals meeting the A1 criterion and those not meeting this criterion (Broadbridge & Fitzgerald, 2010).

Research suggests that the A2 criterion may be similarly inefficient in PTSD diagnosis. For example, Roemer and colleagues (1998) found that of the three A2 emotions (fear, helplessness, and horror) only one, helplessness, was significantly related to the other PTSD symptom clusters. Furthermore, only helplessness and emotional numbing emerged as significant

predictors of total PTSD symptom scores (Roemer et al., 1998). Berntsen and Rubin (2006) examined whether exposure to the A2 emotions was related to PTSD symptoms levels in college undergraduates and found that the A2 emotions were not predictive of high-low PTSD symptom group membership, nor were the emotions significantly related to any of the symptom clusters of PTSD. In a follow-up study these same authors asked participants to indicate their dominant emotion in response to the event (Berntsen & Rubin, 2007). They found that the A2 emotions (fear, horror, and helplessness) were not the most frequently experienced emotions in response traumatic or stressful events, and no emotion categories, including the most frequently reported (sadness), were predictive of total PTSD symptom scores (Berntsen & Rubin, 2007). Results such as these provide support for the autobiographical memory model of PTSD by suggesting that the characteristics of the event, and the individual's immediate response to it, are not the most impactful variables. Researchers may benefit from examining other variables, such as individual differences, cognition, and emotion, which may have a more consistent impact on mental health outcomes following exposure to traumatic or stressful events.

**Negative Affect**

As discussed above, the autobiographical memory model of PTSD places the cause of PTSD symptoms on the memory for the event rather than on the event itself, and argues that it is the integration of this memory within the life story that is the precipitating factor for the disorder (Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). Berntsen, Willert, and Rubin (2003) have argued that when the memory of a traumatic event is integrated into one's life story, the event becomes a reference point for the prediction and interpretation of future events. Berntsen and Rubin (2006) further argue that using this negative memory as a reference point for

other memories can cause the individual to interpret positive events as negative. This reaction may be more prevalent in those already predisposed to negative affect.

**Neuroticism and PTSD.** Neuroticism is characterized by a general affinity for negative affect (Costa, Terracciano, & McCrae, 2001), and individuals scoring high on Neuroticism are slower at recalling positive events and are able to recall a greater number of negative events than those scoring low on Neuroticism (Martin, 1985). Neuroticism has frequently been measured in relation to PTSD, and across studies these two variables have been shown to be highly correlated (Rubin, Berntsen, & Bohni, 2008). Lauterbach and Vrana (2001) argue that Neuroticism may impact PTSD symptom levels by magnifying the impact of the event. Similarly, Rubin, Boals, and Berntsen (2008) argue that high levels of Neuroticism increase the likelihood that the individual will focus on the negative aspects of life events. In line with this argument, Teasdale and Green (2004) have shown that Neuroticism was the only factor of personality found to significantly predict rumination, whereas reflection, constructive self-focused thought, was not predicted by Neuroticism. This suggests that it is not simply a focus on the self that is tied to Neuroticism, but rather it is the focus on the negative aspects of the self or an event that is tied to Neuroticism. Based on such findings and interpretations, Rubin, Berntsen, and Bohni (2008) have incorporated Neuroticism into the autobiographical memory model of PTSD arguing that the increased negative affect inherent to individuals high in Neuroticism should cause the traumatic event to be more available in memory.

**Depression, rumination and PTSD.** Schillaci and colleagues (2009) discuss that comorbidity is a large problem in maintaining the ability to differentially diagnose mental disorders in clinical practice. In particular, they focus on the high rate of comorbidity between depression and PTSD due to the similarity of many symptoms of these two disorders, such as

loss of interest, detachment from others, restricted affect range, and guilt. In a clinical sample of veterans, Litz and colleagues (1997) found that comorbidity of depression and PTSD predicted the presence of the emotional numbing symptoms of PTSD. Furthermore, Litz and colleagues (1997) found that these emotional numbing symptoms could not be completely accounted for by comorbid depression diagnosis. The comorbidity of these two disorders, therefore, may be more complicated than just a set of similar symptoms. For instance, Kleim and Ehlers (2008) have shown that history of depression was significantly related to the development of PTSD in assault victims. In a five year longitudinal study, Breslau, Davis, Peterson, and Schultz (2000) report that young adults who had been diagnosed with major depression were more likely to be exposed to a traumatic event, and in those who had experienced a traumatic event, previous depression diagnosis increased the risk of developing PTSD following that event. In addition to the overlap in symptoms of PTSD and depression, the comorbidity of PTSD and depression may be due in part to previous episodes of depression contributing to the emergence of PTSD symptoms following exposure to a traumatic event.

Some research has shown the A2 criterion to be a significant predictor of PTSD symptom scores, however this relationship appears to be mediated by event centralization (Broadbridge & Fitzgerald, 2010) suggesting that this may be due to thought processes related to negative affect, particularly rumination, which the individual is engaging in rather than the emotions themselves. In line with this interpretation, Ehring, Fuchs, and Klasener (2009) experimentally induced rumination and found that, relative to a distraction control group, individuals engaging in a rumination task show increases in intrusive memories and negative affect. Furthermore, Bennett and Wells (2010) have found rumination to be a significant predictor of PTSD symptoms in student nurses and midwives who had experienced distressing events during their training. The

high comorbidity of depression and PTSD (Schillaci et al., 2009; Kessler et al., 1995) may therefore be due in part to the relationship between rumination and PTSD symptom levels.

## Overview of the Proposed Studies

The present studies sought to examine the integration of stressful/traumatic events into the life story in three ways. First, these studies examined the potential role of event centralization as an additional factor of PTSD symptoms. Second, event centralization was examined in conjunction with many other predictors of PTSD symptoms and posttraumatic growth. While event centralization has consistently been shown to predict PTSD symptom levels, PTSD symptoms are not fully accounted for by event centralization (i.e., there are individuals who score high on event centralization and low on PTSD symptoms; Fitzgerald et al., under review). Therefore, these studies evaluated the characteristics, including variables related to negative affect, memory processes, and personality, of such individuals who deviate from the autobiographical memory model of PTSD. Finally, the present studies sought to expand the centrality of events scale (CES) to include the examination of both positive and negative event interpretation.

# CHAPTER 2 – EVENT CENTRALIZATION: AN ADDITIONAL FACTOR IN POSTTRAUMATIC STRESS DISORDER

## Specific Background

Rubin, Berntsen, and Bohni (2008) outlined two competing theories of posttraumatic stress disorder (PTSD). The prominent theory of PTSD argues that traumatic events are processed via special mechanisms (Brewin & Holmes, 2003) that prevent the full integration of the event into memory, subsequently leading to the onset of PTSD symptoms (Horowitz, 1976). The competing model, the autobiographical memory (AM) model of PTSD, denies the existence of such special mechanisms and argues instead that the traumatic event is represented through the same basic mechanisms as other events (Rubin, Berntsen, & Bohni, 2008). The AM model further posits that a high level of integration of the event into one's life story is what leads to the onset of PTSD (Berntsen & Rubin, 2006, 2007; Rubin Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). Berntsen and Rubin (2006) refer to this integration as event centralization and have developed the centrality of events scale (CES) to measure this construct. This scale examines the extent to which an event has become central to the individual's identity, is a reference point from which they judge future events, and is regarded as a turning point in the individual's life. The CES has been shown to correlate with depressive symptoms and PTSD symptoms but not with dissociation, suggesting that scores on this measure are valid. The present study takes a further step in the evolution of autobiographical memory approach. By employing factor analytic techniques, we evaluated the hypothesis that event centralization can be considered an additional factor in PTSD.

**Fragmentation Models**

Many traditional accounts of PTSD, as well as some recent accounts, indicate that PTSD symptoms are caused by a fragmented trauma memory that has not been appropriately integrated into the individual's schemata (Horowitz, 1976; Ehlers & Clark, 2000; Chemotob, Roitblat, Hamada, Carlson, & Twentyman, 1988; Keane et al., 1985). While such theories propose different mechanisms for the lack of integration, the underlying assumption of a fragmented memory is the same. For instance, Keane and colleagues (1985) assert that PTSD symptoms arise because extinction of the fear response associated with the trauma is not possible. This extinction failure occurs because the individual attempts to avoid recalling the event, thereby preventing appropriate integration of that event into the individual's schemata.

Support for fragmented memory models of PTSD comes from research examining the individual's recall of the traumatic event. For instance, van der Kolk and Fisler (1995) retrospectively examined trauma victims' memories for their traumatic events. They found that most individuals reported initially recalling the event only through sensory modalities as opposed to through language. Most often, this recall occurred in images, and no participant reported initially having the ability to form a narrative about the event. In another study, Tromp, Koss, Figueredo, and Tharan (1995) examined individuals' self-ratings of memory characteristics for rape memories and unpleasant memories. They found that differences in memory characteristic ratings across memory types were driven by differences in memory clarity, and individuals' self-ratings of memory clarity were lower for rape memories than for other unpleasant memories. These differences suggest that memory for a traumatic event is less coherent than memory for a general unpleasant event; however, neither of these studies examined the relationship between

memory characteristics and PTSD symptom levels. Therefore, it is unclear, based on these studies, whether the fragmentation of trauma memories actually influences PTSD symptoms.

Some studies have examined levels of coherence for a memory of a traumatic event in comparison to PTSD symptom levels. Results from such studies are mixed. For instance, Amir, Stafford, Freshman, and Foa (1998) found that the degree of reading ease of individuals' trauma narratives two weeks after the event was negatively correlated with levels of PTSD symptoms twelve weeks after the event. This result suggests that less coherent narratives are predictive of higher levels of PTSD symptoms. Rubin (2011), however, examined narratives and self-ratings of memories for traumatic events in an undergraduate sample, some of whom met diagnostic criteria for PTSD. He found that the coherence of traumatic memory narratives did not differ by PTSD diagnosis. Furthermore, the memories did not differ across PTSD diagnosis in the use of different categories of words, such as emotional, insight, negative, and positive words (Rubin, 2011). Similarly, Fitzgerald, Broadbridge, Berntsen, and Soucie (2009) examined memory characteristics in relation to PTSD symptoms. Like Rubin (2011), Fitzgerald and colleagues (2009) found no significant effect of PTSD symptoms on memory coherence. Together, these results suggest that memory coherence, or lack thereof, is not influential in PTSD diagnosis.

While evidence for the fragmented memory model of PSTD has been mixed, Ehlers and Clark (2000) have argued for a cognitive model of PTSD centered on the idea of memory fragmentation. They assert that the trauma memory lacks contextual integration and is poorly elaborated. Furthermore, they argue that this lack of integration interacts with negative appraisals that the individual makes about the event, thereby causing the recall of the event to be negatively biased. These negative appraisals threaten the individual's view of the self and of the world (Ehlers & Clark, 2000). Support for this model has been mixed. For instance, Lancaster,

Rodriguez, and Weston (2011) found that event centralization was a significant predictor of each PTSD symptom cluster, whereas negative cognitions about the self was the only negative cognition subscale that significantly predicted all three symptom clusters. Negative cognitions about the world did predict arousal (cluster D) symptoms, but self-blame was not a significant predictor of any symptom cluster (Lancaster et al., 2011). These results suggest that while negative appraisals of the traumatic event may impact PTSD symptoms, such an impact appears to be related to event centralization rather than fragmentation.

**Event Centralization and PTSD**

The autobiographical memory model of PTSD argues that individuals with PTSD have a highly integrated memory for a trauma event (Rubin, Boals, & Berntsen, 2008; Rubin, Berntsen, & Bohni, 2008). In fact, this model actually predicts that symptom levels will vary positively with levels of integration of the memory (Rubin, Boals, & Berntsen, 2008; Rubin, Berntsen, & Bohni, 2008; Berntsen & Rubin, 2006). The autobiographical memory model of PTSD has sparked a great deal of interest in the role of event centralization in PTSD, and recent studies examining this relationship have generally found support for the autobiographical memory model.

Some studies have been conducted using nonclinical samples varying in age. For instance, Robinaugh and McNally (2010) examined event centralization and PTSD symptoms for events that produced shame or guilt in a nonclinical sample of young adults. They found that event centralization and PTSD symptoms were correlated for such events, and that this correlation was stronger than the correlation between event centralization and depression. In a sample of middle-age adult survivors of childhood sexual abuse, event centralization was also found to be positively correlated with PTSD symptom levels (Robinaugh & McNally, 2011).

Furthermore, event centralization was found to uniquely account for more variance in PTSD symptoms than any other predictor (depression, dissociation, intelligence, age, and self-esteem were included) of PTSD in this sample (Robinaugh & McNally, 2011). Berntsen, Rubin, and Siegler (2011) examined the relationship between PTSD symptoms and centrality of both a positive and a negative event in a large sample of older adults. While participants centralized their positive event to a greater degree than their negative event, centralization of the negative event, but not of the positive event, was a significant predictor of PTSD symptoms after controlling for a number of other predictors of PTSD.

Event centralization has also been shown to be related to PTSD symptoms in clinical samples and samples of combat veterans. In one study, Brown, Antonius, Kramer, Root, and Hirst (2010) found that levels of event centralization were significantly higher in combat veterans with probable PTSD when compared to combat veterans without PTSD. Furthermore, event centralization positively correlated with PTSD symptom levels to a similar degree in both groups of combat veterans after controlling for depression and dissociation, suggesting that this correlation holds across symptom levels. Rubin, Dennis, and Beckham (2011) compared individuals who met all diagnostic criteria for PTSD (as evidenced by the Clinician Administered PTSD Scale) to those who did not meet diagnostic criteria. Individuals with PTSD diagnoses scored significantly higher on the CES than individuals without PTSD, even though the majority of the non-PTSD individuals reported traumas meeting the A criteria (Rubin et al., 2011). Combined, the studies discussed above present a strong argument for the integration of trauma memories in individuals with PTSD.

**Factor Structure of PTSD Symptom Measures**

In practice, PTSD symptoms have previously been grouped into three clusters, intrusive recollection (cluster B), avoidance/numbing (cluster C), and hyper-arousal (cluster D; APA, 2000). Multiple factor analytic studies have shown that this grouping may not be the best way to conceptualize these symptoms (King, Leskin, King, & Weathers, 1998; Simms, Watson, & Doebbeling, 2002; Buckley, Blanchard, & Hickling, 1998; Foa, Riggs, & Gershuny, 1995). For instance, King and colleagues (1998) have provided support for a four-factor numbing model (re-experiencing, effortful avoidance, emotional numbing, and hyperarousal), which essentially divides the cluster C symptoms into two factors, avoidance and numbing. King and colleagues work was grounded in the theoretical work of Litz (1992) and followed the exploratory work of Foa and colleagues (1995), which concluded that numbing represented a distinct factor of PTSD symptoms. Simms and colleagues (2002) have shown support for a four-factor dysphoria model of PTSD symptoms in which three items from King and colleagues' hyperarousal factor are added to the numbing factor. These items were moved on the basis of results of previous factor analyses that resulted in a split of the hyperarousal symptoms (Buckley et al., 1998). Simms and colleagues argue that this factor represents dysphoria; however, the reasoning for this description of the factor is unclear.

Several studies have compared these two models in a variety of samples. In a meta-analysis of such studies, Yufik and Simms (2010) concluded that the dysphoria model (Simms et al., 2002) fit slightly better than the numbing model (King et al., 1998); however, some research has shown that the fit of the numbing model is better when the participants are asked to respond to items in reference to their trauma history in general as opposed to responding in reference to a specific event (Elhai et al., 2009). The numbing model, introduced by King and colleagues

(1995), is also more firmly grounded in theory than the other models described here. The proposed study therefore will use this model as a baseline theoretical model of PTSD symptoms.

## Specific Aims

### PTSD Symptom Clusters

Prior research has shown that event centralization is moderately correlated with PTSD (Berntsen & Rubin, 2006; Berntsen & Rubin, 2007; Broadbridge & Fitzgerald, 2010). Very few individuals who score low on event centralization subsequently score high on PTSD symptoms (Fitzgerald et al., under review). The proposed study seeks to examine event centralization as an additional factor of PTSD through use of a randomly split sample, allowing for both exploratory and confirmatory factor analysis strategies to be used. Event centralization is expected to represent a distinct factor that correlates with each of the factors of the PTSD checklist (PCL) as modeled by King and colleagues (1998).

### Replication in a Discrete Sample

Given some of the critiques of using split sample procedures, the confirmatory factor analysis described above will be repeated on an independent sample of college undergraduates. Similar results are expected across the two samples.

## Methods

### Participants and Procedures

Over the course of four semesters, 3445 undergraduates responded to a set of online surveys that included a measure of event centralization and a measure of PTSD symptoms (described below). This sample was randomly split in order to conduct both exploratory and confirmatory factor analyses (EFA/CFA). A second, independent sample of 541 undergraduate students was recruited to replicate the CFA from the first sample. Data from this secondary

sample were also collected using online survey methods; participants received course credit for participating. The three subsamples did not differ significantly in terms of age ($M$ = 21.84, $SD$ = 5.99; $F(2,3963) = 0.58$, $p = .56$), gender (70% female; $\chi^2(2, N = 3980) = 4.59$, $p = .10$), or marital status ($\chi^2(6, N = 3944) = 3.38$, $p = .76$). The three subsamples were each ethnically diverse, but they did differ significantly in the distribution of ethnicity across the samples ($\chi^2(8, N = 3930) = 57.63$, $p < .001$). These differences were due to a greater number of Arab Americans and fewer African Americans in the independent sample.

**Measures**

Participants provided basic sociodemographic information including gender, age, ethnicity, and marital status. Participants were then asked to complete two questionnaires, the PCL and the CES. The PCL (Appendix A) is a 17-item self report measure of PTSD symptom severity (Adkins, Weathers, McDevitt-Murphy, & Daniels, 2008). Participants responding to this measure are asked to indicate the degree to which they have experienced each of the cluster B, C, and D symptoms of PTSD in the past month on a likert-type scale ranging from 1 (not at all) – 5 (extremely). Scores from this scale had good internal consistency in the present samples ($\alpha$ = .93 - .94) and good test-retest reliability in prior research ($r$ = 0.87; Adkins et al., 2008). Scores from this scale have also shown convergent validity with the Davidson Trauma Scale ($r$ = 0.74) and the Clinician Administered PTSD Scale ($r$ = 0.65; Adkins et al., 2008). As discussed above, the CES (Appendix B) is a 7-item self-report measure assessing the degree to which an individual has centralized a stressful event within his/her life story (Berntsen & Rubin, 2006). Items are rated on a 5-point likert-type scale ranging from totally agree to totally disagree. Scores from this scale exhibited high internal consistency across the samples ($\alpha$ = .89 –.92) and have previously

been shown to be predictive of PTSD symptoms but not of depression symptoms (Berntsen & Rubin, 2006).

**Data Analysis**

There were two factor analytic procedures conducted on independent samples. First, exploratory factor analysis (EFA) using maximum likelihood extraction with oblique rotation (the components are assumed to be correlated) was conducted on the combined data from the PCL and CES measures using the first half of the main sample for this study. The second analysis compared three nested CFA models using structural equation modeling with maximum likelihood estimation in LISREL 8.80 (Jöreskog & Sörbom, 1993). The first model was a one-factor model in which all items loaded on one PTSD factor. The second model was based on the EFA results from the first sample, and the third model assessed the four-factor model of PTSD symptoms proposed by King and colleagues (1998) with the addition of a separate event centralization factor. Consistent with practice in CFA studies, the fit of these models was assessed using absolute and incremental fit indices. For absolute fit indices, chi square values were expected to be significant for each of the tested models (indicating poor fit), because when large samples are used, the chi-square test is known to err in favor of rejecting the null hypothesis (Bentler & Bonett, 1980). For the model based on the exploratory analyses and the model based on the King and colleagues factor structure, root mean square error of approximation (RMSEA) values below 0.08 (indicating moderate to good fit; Browne & Cudeck; 1992; Rigdon, 1996) were expected. The one-factor model was not expected to fit well and therefore the RMSEA value for this model was expected to be greater than 0.08. Comparative Fit Index (CFI) and Non-normed Fit Index (NNFI) were used to assess the incremental fit of the models. These fit indices assess fit based on improvement from a null model (Millsap, 2002),

and values below 0.90 indicate poor fit (Bentler, 1990; Hoyle, 1995, p. 164). Incremental indices are expected to indicate good fit of the multi-factor models, but not the unidimensional model. These three models were also compared using chi-square difference tests (Little, 1997).

In the independent sample, the model supported by the CFA comparisons above was examined. The model fit was assessed, and parameter values, including factor loadings and factor correlations, were inspected for similarity with those from the previous sample. The model was expected to fit well in the new sample, and the parameter values were expected to be similar across the two samples. Following assessment of the CFA model, SEM was used to assess a higher order model in which each of the factors is represented as an indicator of one overall PTSD factor. Just as the CFA models can be compared to each other, comparisons between CFA models with and without a higher order factor can be examined. In this case, the comparison examines whether there is a reduction in fit when parameters are constrained, as is the case with each possible pathway that is not being estimated in this higher order model. Nested model comparisons were conducted using the chi-square difference test to determine whether the difference between the models was significant (Little, 1997); however, the basic CFA model (without the higher order factor) will always represent a better fit to the data, given that it is a saturated model. In a saturated model, all pathways between latent constructs are estimated (Williams & O'Boyle, 2011). In the basic CFA model examined here, saturation is achieved by estimating the correlations between all latent constructs without inferring direction as one would when examining a structural model.

## Results

### Exploratory Factor Analysis

The rotated solution for the EFA revealed three factors with eigenvalues greater than 1.0. These three factors accounted for 53% of the variance in the items. Of these three factors, two factors contained items from the PCL and the third factor contained all of the CES items. The two PCL factors represented the intrusion/avoidance items and the numbing/hyperarousal items. With the exception of one item, all factor loadings were greater than 0.40 (see Appendix I). While exploratory factor analysis attempts to obtain factors that account for independent sources of variance (Tabachnick & Fidell, 2007), these three factors were significantly correlated with one another (see Appendix J). The two factors representing symptoms of PTSD measured by the PCL were correlated with each other to a greater degree than either of these factors with the CES factor.

### Confirmatory Factor Analyses

Three nested CFA models (see Appendix AF) were compared in the present study. The 1-factor model, which contained all of the items of both the PCL and the CES, did not represent an adequate fit of the data, while the 3-factor and 5-factor models did (see Appendix K). The 5-factor model represented the best fit of the data and was a significantly better fit than the 3-factor model, which was structured from the EFA above. Additionally, the 5-factor model showed a meaningful increase in fit as evidenced by the decrease in RMSEA, and increase in CFI and NNFI. All items loaded well on the appropriate constructs in this 5-factor model (see Appendix L), and the factor loadings were all significant. The factors were also all significantly correlated (see Appendix M). While the 5-factor model is less parsimonious than the 3-factor model, the 5-

factor model provides a better fit to the data and is rooted in theory, making it the better model in the present study.

**Replication.** As the 5-factor model best represented the data in the main sample, it was this mode that was replicated in an independent sample. The model fit as well in the new sample (Appendix K) as it did in the main sample. All factor loadings and correlations were significant and were comparable to these parameters in the main sample (see Appendices L & M). Taken together, we have not only confirmed that the 5-factor model provide a better fit than the 3-factor model, but also replicated that support in an independent sample recruited and tested in a different context.

**Higher Order Model**

Due to the fact that in every multi-factor model consisted of factors that were significantly correlated to a moderate/high degree, and that the AM model suggests that event centralization is critical to the development of PTSD, a higher order model was conducted using the factors from the best fitting model above (i.e. the 5-factor model). As can be seen in Appendix K, the higher order model represented a significantly worse fit than the 5-factor model; however, there was no practical change in fit as evidenced by the RMSEA, CFI, and NNFI values. A higher order model is more parsimonious than a multi-factor CFA model; therefore, this lack of practical change in fit suggests that the higher order model better represents the data. As before, all factor loadings were significant. These loadings can be seen in Appendix N, and the loadings for the higher order factor can be seen in Appendix AG.

## Discussion

The main goal of the present study was to examine event centralization as an additional factor of PTSD via factor analytic techniques. Exploratory factor analysis supported a 3-factor

model of PTSD symptoms, with event centralization representing one of these three factors; however, confirmatory factor analyses suggested that a 5-factor model better represented the data when compared to either the 1-factor model or to the 3-factor model. Finally, analysis of a higher order model suggested that the four symptom groups in conjunction with event centralization together make up a higher order PTSD symptom construct.

These results demonstrate that event centralization should be considered as an additional factor of PTSD, as multiple-factor models in the present study consistently produced high correlations between event centralization and other PTSD symptom factors. Additionally, the higher order model fit the data well and did not show a meaningful decrease in fit from the 5-factor model, suggesting that these five factors are better represented by a single PTSD symptom factor. One may question this conclusion given that the one-factor model did not fit the data well; however, the lack of fit in this model may have been due to the large number of indicators. When a large number of indicators is specified to load onto the same latent construct, model fit has been shown to decrease (Hagtvet & Nasser, 2004). The higher order model overcomes this shortcoming of modeling a large number of items onto a single factor, while essentially modeling the constructs as measures of this same single PTSD factor.

These findings are in opposition to traditional theories of PTSD, which suggest that memories for traumatic events are fragmented. Such theories often posit that this fragmented memory is poorly integrated into the individual's schemata and sense of self (Horowitz, 1976; Ehlers & Clark, 2000). Studies examining fragmentation models of PTSD often examine the characteristics of the trauma memories (Tromp et al., 1995; van der Kolk & Fisler, 1995), but those studies fail to examine the relationship between the memory characteristics and PTSD symptoms, making it unclear whether those individuals who have memories that lack clarity and

narrative form are the same individuals who experience high levels of PTSD symptoms following the event. Additionally, researchers examining the relationship between narrative coherence and PTSD symptoms have shown mixed results (Amir et al., 1998; Rubin, 2011). Indeed, recent studies suggest that while memory coherence is not influential in PSTD symptom outcomes (Rubin, 2011; Fitzgerald et al., 2009), event centralization is predictive of each diagnostic cluster of PSTD symptoms (Lancaster et al., 2011). In line with these more recent studies, the present study suggests that individuals with more symptoms also have highly integrated memories for their traumatic or stressful events, rather than fragmented memories.

The results of this study also provide support for an expanded version of the conceptualization of PTSD symptom groups proposed by King and colleagues (1998). The four PTSD symptom factors proposed by King and colleagues were supported by the good fit of the 5-factor model. The present study adds to the King and colleague model by including event centralization in the conceptualization of PTSD. This addition allowed for the conceptualization of PTSD symptoms as a single, higher order, construct. King and colleagues (1998) have previously examined a higher order model of PTSD and concluded that this model did not fit as well as the 4-factor model that was used as the basis for the 5-factor model in the present study. With the addition of event centralization in the present study, the higher order model fit well (see Appendix AG), which provides further support for the inclusion of event centralization in the conceptualization of PTSD. Proponents of the AM model suggest that PTSD symptom levels are dependent on the integration of the memory for the traumatic or stressful event (Berntsen & Rubin, 2006; Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). The present study, therefore, supports the AM model by suggesting that PTSD becomes a cohesive, unidimensional construct only with the addition of event centralization to the model.

**Implications for Clinical Practice**

The finding that PTSD is best conceptualized using a higher order model that includes event centralization has implications for clinical practice. First, this finding indicates that use of the CES as an additional diagnostic instrument for assessing PTSD may allow for more accurate and consistent diagnosis of the disorder. Second, the findings of this study provide strong support for the AM model of PTSD, which could have an impact on the methods used to treat the disorder. For instance, instead of using techniques that increase the integration of the memory, techniques that reduce integration may be more successful.

**Limitations**

While the results of the present study do support the AM model of PTSD, there are some limitations. First, the present study used a non-clinical sample of college undergraduates. Future work should therefore examine the utility of using event centralization within the conceptualization of PTSD. Similar results in a clinical sample would enhance the findings of the present study and provide further support for the AM model of PTSD. Second, the present study did not examine the details of the particular events that were experienced by the participants. It may be the case that the individuals in the present study did not experience events that were stressful enough to warrant an examination of PTSD; however, the likelihood of this is low. Fitzgerald, Berntsen, and Broadbridge (under review) have found that 33% of college student participants indicated having experienced events severe enough to meet the event criteria of PTSD as outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*, APA, 2000). Furthermore, 37-39% of the participants in the three samples used in the present study indicated having met these criteria.

## Conclusion

According to the AM model of PTSD, centralization of a traumatic or stressful event is critical to the development of PTSD symptoms (Berntsen & Rubin, 2006; Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). This model aids our understanding of the mechanisms by which PTSD develops following a traumatic experience. In line with this theoretical model, the present study supports the conceptualization of PTSD as including event centralization. This conceptualization could improve diagnosis and treatment of the disorder.

# CHAPTER 3 – THE ROLE OF PERSONALITY AND EVENT CENTRALIZATION IN POSTTRAUMATIC STRESS DISORDER: A COMPARISON OF POSITIVE AND NEGATIVE THOUGHT PROCESSES

## Specific Background

Prominent theories of posttraumatic stress disorder (PTSD) argue that the symptoms of this disorder result from a lack of proper integration of the event into memory, thus leaving the individual with a fragmented or incomplete memory (Horowitz, 1976; Ehlers & Clark, 2000; Chemotob, Roitblat, Hamada, Carlson, & Twentyman, 1988; Keane, Zimering, & Caddell, 1985). According to Keane and colleagues (1985), this fragmented memory is caused by the individual's attempts to avoid recall of the event; such avoidance is associated with a failure to extinguish the fear response associated with the event. A competing theory of PTSD, the autobiographical memory (AM) model, argues just the opposite. According to the AM model of PTSD, individuals who have highly integrated memories for a traumatic or stressful event are more likely to develop PTSD because the memory for the event becomes an anchor by which other events are judged (Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). Rather than becoming fragmented, the memory actually occupies a central role in the representation of the self (Berntsen & Rubin, 2006, 2007). Thus, each of these theories is able to explain two of the cells in the 2x2 matrix exemplifying the crossover between PTSD symptom levels and levels of event centralization (see Appendix O).

Research has shown that individuals do occupy each of the four cells in Appendix O; however, cells A and D are far more frequent (Fitzgerald, Berntsen, & Broadbridge, under review). In line with the AM model of PTSD, Neuroticism was higher in those falling into cell A (high PTSD and high event centralization). Fitzgerald and colleagues have also examined the

individuals falling into the cells not predicted by the AM model of PTSD (cells B and C). Outcomes in these individuals can be partially explained by their symptom profiles. For instance, individuals who express high levels of PTSD symptoms but low levels of event centralization (cell B) show more attempts at avoidance, evidenced by their high levels of avoidance and numbing symptoms (Fitzgerald et al., under review). Those authors hypothesize that this pattern is due to the counterproductive nature of avoidance. While avoidance may seem like a functional way to cope with the event, it is actually maladaptive. Indeed, research has shown avoidant coping mechanisms to be related to increased levels of PTSD (Pineles et al., 2011). On the other hand, the pattern of low levels of PTSD symptoms but high levels of event centralization is a challenge for AM theorists. Given their high levels of Agreeableness and Conscientiousness and low levels of Neuroticism, Fitzgerald and colleagues hypothesize that these individuals may be more likely to focus on the positive consequences of the event. The more positive or reflective nature of these individuals' thoughts may be what leads to lower symptoms despite high levels of event centralization.

The proposed study seeks to examine the role of a number of variables, such as individual differences, negative thought processes, coping strategies, and posttraumatic growth, in determining where a given individual falls in this 2x2 matrix. In this way, the proposed study builds on the work of Fitzgerald and colleagues by examining the potential predictors of the positive outcome (low PTSD).

**The Role of Individual Differences in PTSD**

Many studies have suggested a link between the big five factors of personality, particularly Neuroticism, and PTSD. For instance, Zhang, Liu, Zhu, Shi, and Cheng (2010) found that high levels of Extraversion were related to lower levels of hyperarousal symptoms,

whereas high levels of Neuroticism were related to increased levels of all PTSD symptoms. Nightingale and Williams (2000) have suggested that Openness, Extraversion, and Agreeableness are linked to PTSD outcomes through their relationship with attitudes toward emotional expression. Research on the relationship between spousal loss and negative mental health outcomes has suggested a protective role of Extraversion and Conscientiousness (Pai & Carr, 2010). Fitzgerald and colleagues (under review) have also examined personality in relation to PTSD. These authors found that Agreeableness and Conscientiousness were protective factors, while Neuroticism was a risk factor for PTSD, and Extraversion appeared unrelated to either PTSD symptoms or event centralization. Combined, the results of such studies highlight the importance of examining personality characteristics in relation to PTSD. In particular, an understanding of why some individuals develop PTSD and others do not develop the disorder following exposure to a traumatic event could be gained by examining the role of personality.

**Neuroticism and other negative thought processes.** The majority of work examining the relationship between personality factors and PTSD has focused on the role of Neuroticism. Neuroticism has consistently been shown to be a risk factor for PTSD both in prospective (Frazier et al., 2011) and retrospective studies (Fitzgerald et al., under review; Lauterbach & Vrana, 2001; Rubin, Berntsen, & Bohni, 2008; Zhang et al., 2010). Due to the robust effect of Neuroticism on PTSD, Rubin, Boals, and Berntsen (2008) have incorporated Neuroticism into the AM model of PTSD. They, as well as Lauterbach & Vrana (2001), have argued that Neuroticism acts a magnifier by increasing the likelihood of a negatively focused memory for the traumatic event. Therefore, the AM model of PTSD predicts that those high in Neuroticism will be more likely to report high levels of PTSD symptoms (Rubin, Boals, & Berntsen, 2008).

Rumination, the behavioral and cognitive focus on negative emotional states (Nolen-Hoeksema, 1991), has been shown to be higher in individuals with PTSD than those with depression but not a history of trauma (Birrer & Michael, 2011). Furthermore, such rumination in individuals with PTSD has been linked to intrusive memories of the traumatic event (Birrer & Michael, 2011). Research also suggests that event specific rumination is related to all three clusters of PTSD symptoms (Chan, Ho, Tedeschi, & Leung, 2011). Furthermore, some researchers have suggested that the relationship between Neuroticism and PTSD may be mediated by rumination (Fitzgerald et al., under review; Teasdale & Green, 2004). Indeed, elevated Neuroticism has been related to increased levels of rumination (Teasdale & Green, 2004; Hervas & Vazquez, 2011). Cross-sectional research has also suggested a mediating role of rumination in the relationship between Neuroticism and PTSD symptoms (Muris, Roelofs, Rassin, Franken, & Mayer, 2005), as well as between Neuroticism and general anxiety (Roelofs, Huibers, Peeters, & Arntz, 2008). It is important to note that because of the cross-sectional nature of these studies, the mediation effects should be interpreted with caution, as the direction of the causal pathways cannot be verified without longitudinal analyses.

Neuroticism and rumination may also affect the way in which individuals attempt to cope with their traumatic or stressful events. For instance, Carver, Scheier, and Weintraub (1989) have identified coping strategies that lack functional utility, such as denial, behavioral disengagement, mental disengagement, and a focus on venting emotions. These nonfunctional coping strategies have been related to increased distress (Carver et al., 1993). Individuals who frequently engage in negative thought processes may be more likely to attempt to cope in these nonfunctional ways, thereby leading to poorer outcomes.

**The Role of Memory in PTSD**

Numerous studies have linked memory characteristics, particularly event centralization, to PTSD. For instance, some studies have linked phenomenological properties of memory to PTSD symptom levels. Fitzgerald and colleagues (under review) found that high levels of PTSD were associated with higher levels of recollection, rehearsal, and emotional intensity. Similarly, Broadbridge and Fitzgerald (in preparation) found that those having experienced the A2 emotions of fear, helplessness, or horror reported higher levels of belief in their memories for their stressful event and experienced those memories with higher levels of emotional intensity.

The strongest support for the AM model of PTSD comes from the relationship between PTSD and event centralization. Event centralization has been shown to correlate positively with PTSD symptom levels in a variety of samples (Berntsen & Rubin, 2006; Berntsen, Rubin, & Siegler, 2011; Broadbridge, Arnetz, Arnetz, Jamil, & Fitzgerald, 2013; Brown, Antonius, Kramer, Root, & Hirst, 2010; Robinaugh & McNally, 2011; Robinaugh & McNally, 2010; Rubin, Dennis, & Beckham, 2011). Proponents of the AM model of PTSD assume that this relationship is a result of the memory for the event anchoring the interpretation of other memories in a negative way (Berntsen & Rubin, 2006; 2007). Research suggests that this anchoring is not always negative though. For instance, Boals and Schuettler (2011) have shown event centralization to be positively correlated with posttraumatic growth in addition to PTSD symptoms. This result suggests that the results of event centralization are not always entirely negative. As noted above, some individuals show high levels of event centralization and low levels of PTSD symptoms (Fitzgerald et al., under review). Researchers therefore need to identify variables that may lead to positive outcomes.

**Posttraumatic Growth and Coping**

While it is important to know the variables that increase the risk of developing PTSD following a traumatic event, it is also imperative that the predictors of positive mental health be examined. Posttraumatic growth following trauma exposure is considered to be a favorable outcome (Gerber et al., 2011). The experience of personal growth following a traumatic or stressful experience may be what leads individuals to fall into cell C (high centralization but low PTSD symptoms; Appendix O). While such individuals centralize the event, they do not show high levels of PTSD symptoms, suggesting that they may have found a better way of thinking of their event. Indeed, Boals and Schuettler (2011) have shown a positive relationship between event centralization and posttraumatic growth.

Research has also indicated that posttraumatic growth is positively related to PTSD symptoms (Boals & Schuettler, 2011; Dekel, Ein-Dor, & Solomon, 2012; Levine, Laufer, Hamama-Raz, Stein, & Solomon, 2008; Nishi, Matsuoka, & Kim, 2010; Hall et al., 2010). Longitudinal work suggests that this positive relationship may be due to PTSD leading to posttraumatic growth (Dekel et al., 2012). Therefore, some individuals initially exhibiting psychological distress following a traumatic event may find a way to provide meaning for their trauma that constructively leads them to exhibit less distress. One possible explanation for this is through varied coping methods.

Lazarus and Folkman (1984) discuss the idea that individuals vary in their reactions to and interpretations of various life events. Individual differences in cognitive appraisal and coping are at the heart of Lazarus and Folkman's theory of stress. First, they argue that the individual will cognitively examine the situation and determine the degree to which it threatens the individual's well-being. Second, the individual determines strategies that he or she may employ

in dealing with the demands of the situation (Lazarus & Folkman, 1984). Folkman & Lazarus (1986) elaborate on two different methods of coping individuals can use to confront such demands: emotion-focused and problem-focused coping. Emotion-focused coping includes the methods the individual uses to internally cope with the situation, mainly those aimed at emotion regulation, whereas in problem-focused coping, the individual attempts to confront and overcome the external cause of the distress (Folkman & Lazarus, 1986).

Recent research indicates that these two methods of coping are still thought to play a role in individuals' responses to stressful situations. For instance, Lilly and Graham-Bermann (2010) have shown that emotion-focused coping moderates the relationship between violence exposure and PTSD symptoms, such that PTSD symptoms increase to a lesser extent with increased levels of violence exposure when emotion-focused coping levels are high. Similarly, Schuettler and Boals (2011) have shown problem-focused coping to positively predict posttraumatic growth, while avoidant coping, a less functional form of coping, was more predictive of PTSD symptoms.

## Specific Aims

### Relationship between Neuroticism, Event Centralization and PTSD

First, this study sought to replicate previous work linking Neuroticism to PTSD symptom levels, but not to event centralization levels.

### Joint Mediation Approach to Predicting Adaptive and Maladaptive Outcomes

Given satisfaction of the first specific aim, the present study is designed to expand our understanding of the relationship among these three variables. Event centralization and PTSD symptomology are correlated in many recent studies (i.e. Berntsen & Rubin, 2006, 2007; Broadbridge & Fitzgerald, 2010). Neuroticism has also been shown to predict PTSD symptom

levels, but not event centralization (Fitzgerald et al., under review). Therefore, this study also sought to test a structural model of one possible explanation for this series of relationships.

**Positive versus negative thought processes.** One possible explanation for individuals expressing high levels of event centralization but low levels of PTSD symptoms could stem from the thought processes that these individuals are using when recalling the event. For instance, compare an individual who thinks about a stressful event frequently and primarily focuses on a series of good consequences that he or she believes came out of that bad experience to another individual who may think about all of the negative features of the event, as well as the negative consequences of the aftermath of the event. These individuals would likely exhibit different outcomes following the event. The present study explored such differences in thought processes by assessing posttraumatic growth, general ruminative tendencies, and event related rumination in relation to PTSD symptom levels, personality variables, and event centralization.

**Coping strategies.** In an attempt to account for behavioral variables in addition to cognitive and emotional variables, the present study assessed emotion-focused and problem-focused coping strategies (Lazarus & Folkman, 1984). Both of these methods of coping have been shown to be related to better outcomes following violence exposure and traumatic events (Lilly & Graham-Bermann, 2010; Schuettler & Boals, 2011). In the present study, these coping methods were hypothesized to mediate the relationship between personality variables and both PTSD symptoms and posttraumatic growth.

## Methods

### Participants and Procedures

Five hundred seventy six undergraduate students participated in the present study via the SONA research participation system. Participants were compensated with 1 credit of research

participation. All questionnaires were completed online, as this medium provides the greatest degree of privacy while responding to the questionnaires. In two previous studies of PTSD in which data were collected online, the distributions of scores were similar to those studies in which data were collected using paper and pencil measures. To ensure quality data, all participants who completed the survey in 20 minutes or less were deleted from the analyses. In addition, the reliability of scores from each measure was evaluated in the current sample. The resulting sample consisted of 541 participants (74% female) ranging in age from 18 to 62 years of age ($M$ = 22.07, $SD$ = 5.99).

**Measures**

Participants were first asked to provide sociodemographic information including age, gender, marital status, and ethnicity. Next, participants were asked to complete scales measuring general ruminative tendencies, coping strategies, and personality traits. Each participant then provided a brief (1-2 sentences) description of his or her most stressful/traumatic experience. Finally, participants responded to scales measuring event centralization, PTSD symptoms, posttraumatic growth, and event related rumination. These scales were completed in relation to the stressful event that the participants described.

**PTSD symptoms.** The PCL (Appendix A) was used to assess the frequency of PTSD symptoms over the past month. The PCL is a 17-item self-report measure designed to screen for PTSD symptoms in general populations. Scores from this measure had high internal consistency ($\alpha$ = .94) in the present sample and have shown convergent validity with other PTSD measures (Adkins et al., 2008).

**Event centralization.** The CES (Appendix B; Berntsen & Rubin, 2006) was used to examine the degree to which participants have centralized the event into their life story. Both the

long form (20 items) and the short form (7 items) of the CES had high internal consistency ($\alpha$ = .95 & $\alpha$ = .89, respectively) in the present sample.

**Rumination.** General and event-related rumination were assessed in this study. General ruminative and reflective tendencies were measured using the 24-item self-report rumination-reflection questionnaire (RRQ; Appendix C; Trapnell & Campbell, 1999). The two subscales of this measure exhibited high internal consistency ($\alpha_{ruminative}$ = .91 & $\alpha_{reflective}$ = .85). In prior studies, the subscales were weakly correlated (Trapnell & Campbell, 1999). Intrusive and deliberate event-related rumination were assessed using the event-related rumination inventory (ERRI; Appendix D). This measure consists of ten items for each subscale, and scores for each subscale had high internal consistency ($\alpha_{intrusive}$ = .95 & $\alpha_{deliberate}$ = .91) in this sample, and have shown discriminant validity in prior work (Cann et al., 2011). Neither subscale of the ERRI was related to a general need for cognition, and both subscales were rarely related to specific coping styles (Cann et al., 2011). The subscale scores also show convergent validity through relationships with general rumination measures and self-analysis (Cann et al., 2011).

**Personality.** The big five personality factors (Agreeableness, Conscientiousness, Openness to Experience, Neuroticism, and Extraversion) were measured using the International Personality Item Pool (IPIP; Goldberg, 1992). Each of the factors is assessed using 20 self-report items and scores for each factor showed high internal consistency ($\alpha$ = .86 – .92). IPIP scales (Appendix E) have also been shown to correlate well ($r$ = .73) with other measures of personality (Goldberg et al., 2006).

**Posttraumatic growth.** The PTGI (Appendix F), a 21-item self-report measure, was used to measure posttraumatic growth. Items of the PTGI are rated on a six point Likert type scale ranging from 0 (I did not experience this change following my stressful/traumatic experience) to

5 (I experienced this change a great deal following my stressful/traumatic experience). Scores from the PTGI exhibited high internal consistency ($\alpha$ = .94) in the present sample and test-retest reliability in prior research ($r$ = .71; Tedeschi & Calhoun, 1996).

**Coping.** Two types of coping (emotion-focused and problem-focused) were assessed in the present study. These coping methods were measured using the COPE inventory (Appendix G; Carver et al., 1989). Each subscale was measured using 20 self-report items, and both problem-focused coping ($\alpha$ = .85) and emotion-focused coping ($\alpha$ = .83) subscale scores showed adequate internal consistency in the present sample. The scores from this scale exhibit a strong theory-based factor structure and convergent and discriminant validity when assessed in relation to personality qualities (Carver et al., 1989).

**Data Analysis**

The first specific aim was to replicate the relationships between Neuroticism, event centralization, and PTSD. It was hypothesized that both Neuroticism and event centralization would be predictive of PTSD symptoms, but that these constructs would not be significantly related to one another. This hypothesis was examined by comparing two nested latent variable models. In both models (Appendix AH), the structural pathways from both Neuroticism and event centralization to PTSD symptoms were estimated; however, in the first model (Appendix AHa), the correlation between Neuroticism and event centralization was estimated as well. When comparing nested models, model fit is expected to decrease as additional restraints are placed on the model (Byrne, Shavelson, & Muthen, 1989); therefore, a significant difference in the fit of the two models would suggest that Neuroticism and event centralization are correlated. These constructs were not expected to be correlated, so no significant differences were expected between the two models.

The second specific aim was to explore the relationships between Neuroticism, event centralization, and PTSD symptoms in the context of additional variables. To accomplish this aim, a latent variable joint mediation model incorporating the predictors of posttraumatic growth and PTSD symptoms was examined. This model can be seen in Appendix AI. In order to examine this joint mediation model further, the specific indirect effects were calculated using the product of coefficients test (Sobel, 1987; Sobel, 1982; Holbert & Stephenson, 2003).

## Results

### Neuroticism and Event Centralization

In order to examine the association between Neuroticism and event centralization in predicting PTSD symptoms, two nested models were compared (Appendix AH). Due to concerns about the number of items in each of the scales (Hagtvet & Nasser, 2004), items were partially aggregated using the a priori questionnaire construction method (Williams & O'Boyle, 2008). CFA supported the partially aggregated factors (see Appendices P & Q). The parcels loaded well on the appropriate latent constructs, and overall this CFA model fit the data well.

While both structural models fit the data well, the nested model comparison revealed that the model in which the correlation between Neuroticism and event centralization was estimated fit the data significantly better than the model in which this correlation was constrained to zero (Appendix P). In addition to the significant difference in model fit, there was a practical difference in fit across the two models (RMSEA or CFI change $\geq$ .01; Widaman, 1985). As can be seen in Appendix AH, all pathways were significant in each of the models.

### Joint Mediation Model

The second aim was examined through the analysis of a latent variable joint mediation model. As with the model comparison described above, many of the latent constructs were

measured using a large number of items. Having too many items can cause problems with model estimation (Hagtvet & Nasser, 2004) that were resolved in this study through partial aggregation procedures (Williams & O'Boyle, 2008).

A CFA model was analyzed for these partially aggregated latent constructs to ensure that the model was appropriate at the measurement level and to provide a baseline for comparison for the joint mediation model. The model fit well ($\chi^2(552) = 1208.72$, $p < .001$; RMSEA = .05; CFI = .98) and all parameter estimates were appropriate for the constructs (see Appendices R & S). The joint mediation model also fit the data well ($\chi^2(604) = 1595.56$, $p < .001$; RMSEA = .06; CFI = .97), although the fit was significantly worse than the CFA model ($\Delta\chi^2(52) = 386.84$, $p < .001$). This decrease in fit was expected due to the large number of constraints placed on the structural model compared to the measurement model.

In the joint mediation model, many direct pathways were significant (see Appendix AI). Of particular interest are the relationships involving rumination. Neuroticism was predictive of all forms of rumination, but only deliberate and intrusive rumination were predictive of event centralization. Surprisingly, A2 emotions were not predictive of event centralization. Additionally, problem-focused coping was not predictive of either PTSD symptoms or posttraumatic growth, while emotion-focused coping led to increased growth but was not related to PTSD symptoms. Personality factors, rumination types, coping methods, and outcomes were allowed to correlate in this model as well (see Appendix T). PTSD symptoms and posttraumatic growth were not significantly correlated in the model, but personality factors, rumination types, and coping methods were. The specifics of this model are discussed below (see Discussion).

As detailed in Appendix U, most of the hypothesized indirect effects in the joint mediation model were significant. Appendix V decomposes these indirect effects into specific

indirect effects and the percent of the respective total indirect effects. Deliberate rumination was the strongest mediator of the relationship between Neuroticism and event centralization, accounting for more than half of the indirect effect. Intrusive rumination was also a significant mediator of this relationship, while general rumination was not. Deliberate rumination, when paired with event centralization, was a stronger mediator of the relationship between Neuroticism and PTSD symptoms than intrusive rumination (also paired with event centralization). Combined, these results suggest that event-related rumination, not general rumination, is associated with poorer outcomes, which is likely due to event-related rumination leading to event centralization, a known correlate of PTSD symptoms.

Finally, emotion-focused coping seems to be the strongest mediator of the relationships between Agreeableness, Conscientiousness, and reflection with posttraumatic growth. Problem-focused coping, on the other hand, was not a significant mediator of these relationships. These results suggest that emotion regulation following a trauma or highly stressful event is more helpful than attempting to resolve the external causes of that trauma or highly stressful event. Problem-focused coping may be more difficult given the lack of predictability and control that is likely associated with many such events.

## Discussion

The present study aimed to (1) replicate the relationships among Neuroticism, event centralization, and PTSD symptoms and (2) expand prior work by examining a joint mediation model that accounts for both adaptive and maladaptive outcomes (i.e. PTSD symptoms and posttraumatic growth) within a single, theoretically-based model. Nested model comparison revealed that Neuroticism and event centralization were not independent predictors of PTSD symptoms, but rather were correlated predictors. Furthermore, the joint mediation model

suggested that event-related rumination was a key variable through which the effect of Neuroticism on event centralization and PTSD symptoms was occurring. Additionally, emotion-focused coping seemed to stem from reflective tendencies and was a key variable in the prediction of posttraumatic growth.

In line with previous research (Lauterbach & Vrana, 2001; Rubin, Berntsen, & Bohni, 2008; Zhang et al., 2010), the present study found a strong association between Neuroticism and PTSD symptoms. Neuroticism and event centralization were shown to be correlated predictors of PTSD symptoms in the present study. This result is in contrast to prior work suggesting that Neuroticism and event centralization are independent (Fitzgerald et al., under review). One explanation for the difference across these two studies is that Fitzgerald and colleagues dichotomized event centralization, whereas the present study used the continuous scale score. Use of the continuous measure could have increased the variance, making the effect easier to find. The correlation between Neuroticism and event centralization makes sense in light of the joint mediation model, which suggests that higher levels of Neuroticism lead to increased rumination. When this rumination is focused on the traumatic/stressful experience, elevated rumination leads to an increase in event centralization, and subsequently increased PTSD symptoms. Furthermore, the indirect effects of Neuroticism on event centralization and Neuroticism on PTSD symptoms were due solely to event-related rumination, both deliberate and intrusive. The link between Neuroticism and event centralization, therefore, seems to be due to increased event-related rumination.

**Joint Mediation Model**

The second aim of this study was to examine adaptive (posttraumatic growth) and maladaptive (PTSD symptom) outcomes that result from trauma experiences within the same

model. This model begins with personality traits, which are assumed by many to be stable throughout adulthood (Specht, Egloff, & Schmukle, 2011), and uses those traits to predict cognitions, specifically rumination and reflection. These cognitions are then modeled to predict event centralization and coping strategies, which in turn predict adaptive and maladaptive outcomes, posttraumatic growth and PTSD symptoms respectively. This model is the first in the literature to incorporate stable traits of the individual, cognitive and emotional variables, as well as behavioral variables in the prediction of both PTSD symptoms and posttraumatic growth. Many studies have looked at these variables in isolation (Berntsen & Rubin, 2006,2007; Birrer & Michael, 2011; Boals & Schuettler, 2011; Chan et al., 2011; Lauterbach & Vrana, 2001; Zhang et al., 2010; among others), but this study is the first to examine them within the same model.

The model fit the data well and sheds light on the mechanisms through which these outcomes occur. Understanding the factors that lead to more favorable outcomes could lead to the development of better prevention programs for individuals exposed to traumatic events. While there are many direct and indirect pathways in the model, I will highlight only those that were significant and which aid in the understanding of the outcomes. Neuroticism was a significant predictor of all forms of rumination and exerted both direct and indirect effects on PTSD symptoms. The relationship between PTSD symptoms and Neuroticism is in agreement with prior research in this area (Fitzgerald et al., under review; Lauterbach & Vrana, 2001; see also Rubin, Berntsen, & Bohni, 2008 for a review). The strongest specific indirect effect went from Neuroticism through deliberate rumination and event centralization to PTSD symptoms. This result suggests that the tendency toward negative affect (Neuroticism) may lead individuals to purposefully ruminate on a negative event, thereby causing that event to become central to the individual's identity; however, due to the cross-sectional nature of the data reported here one

must be careful when trying to infer causal relationships. Longitudinal work should be conducted in the future to increase confidence in these directional pathways.

Event-related rumination, but not general ruminative tendencies, was indirectly predictive of PTSD symptoms. This result supports prior research that has suggested that event-related rumination is linked to increases in PTSD symptoms (Birrer & Michael, 2011; Chan et al., 2011). As with the indirect paths from Neuroticism to PTSD symptoms, the indirect path from deliberate rumination to PTSD symptoms was stronger than the indirect path from intrusive rumination to PTSD symptoms. This result suggests that deliberately thinking about the negative event enhances the process of centralization more so than intrusive rumination, which could help to explain those individuals who fall into the HiPTSD-LoCES cell of Appendix O. Fitzgerald and colleagues (under review) found that the individuals in that cell scored higher on the avoidant symptoms of PTSD than individuals in other cells. Such attempts at avoidance may result in more intrusive rumination, thereby leading to PTSD symptoms without causing centralization of the event.

Event centralization was also a significant predictor of posttraumatic growth. This relationship seems linked to Neuroticism and event-related rumination just as the relationship between event centralization and PTSD symptoms. If there are cases in which the individual is thinking about the event, but not doing so in a negative way, the individual could centralize the event without that centralization leading to the typical maladaptive outcome, PTSD symptoms, but rather to the adaptive outcome, posttraumatic growth. While speculative, these individuals may be the individuals falling into the LoPTSD-HiCES cell of Appendix O. Future research should examine this possibility.

The bottom half of the model in Appendix AI also showed some interesting results. Agreeableness and Conscientiousness were both predictive of reflective tendencies, albeit in different directions. Higher levels of Conscientiousness were associated with lower levels of reflection, while higher levels of Agreeableness were associated with higher levels of reflection. This pattern is challenging to interpret given that these two traits are positively correlated; however, the lack of control that is characteristic of trauma may disrupt established patterns of adaptation in individuals high in Conscientiousness.

Reflective tendencies were predictive of both problem-focused and emotion-focused coping methods; however, only emotion-focused coping was predictive of posttraumatic growth. Furthermore, neither type of coping was predictive of PTSD symptoms. These results suggest that both emotion-focused and problem-focused coping may stem from a tendency to reflect on a problem, but only emotion-focused coping is helping the individual reach the adaptive outcome, posttraumatic growth. Prior work has shown mixed results regarding emotion-focused coping methods. In one study, emotion-focused coping was related to decreases in PTSD symptoms (Lilly & Graham-Bermann, 2010), while in another study emotion-focused coping was not related to either PTSD symptoms or posttraumatic growth (Schuettler & Boals, 2011). There are several possible explanations for these discrepancies. First, it could be that coping methods are too diverse across individuals for the effects to be consistent. Second, the measurement of coping methods may require the development of more specific scales than are currently available. Clearly, however, that issue is outside of the scope of the present study. Finally, the samples or the trauma events reported may vary across studies in ways that are not readily apparent, but could be producing conflicting results.

**Limitations**

The present study suggests that cognition and emotion are important factors leading to the centralization of traumatic/stressful events and subsequently leading to PTSD symptoms; however, some limitations of this study are notable. First, the data analyzed here are cross-sectional, and therefore any discussions of sequential patterns or causal relationships are purely speculative. Future research should longitudinally examine the relationships shown here to determine the causal sequence leading from personality characteristics to PTSD symptoms and posttraumatic growth. Second, the present study used a convenience sample of undergraduate students. Although there are benefits of studying these issues in large samples, examination of the relationships between personality factors, rumination, event centralization, and coping methods with PTSD symptoms and posttraumatic growth should be replicated using clinical samples. Information from such individuals would provide a better indication of the mechanisms through which an individual develops PTSD.

**Conclusion**

This study is the first to examine both adaptive and maladaptive outcomes within the same theoretical model. The understanding gained by the present study could have implications for improving treatment of PTSD. The most salient variables contributing to increased frequency of PTSD symptoms were Neuroticism, event-related rumination, and event centralization. Those individuals with PTSD diagnosis may therefore benefit from cognitive therapy focused on redirecting their thoughts about the event to be more positive. Helping the individual see the ways in which the event has helped them to grow as a person may help them to reach positive resolution.

# CHAPTER 4 – IS THE CENTRALIZATION OF POTENTIALLY TRAUMATIC EVENTS ALWAYS NEGATIVE?: AN EXPANSION OF THE CENTRALITY OF EVENTS SCALE CONCEPTUALIZATION AND MEASUREMENT

## Specific Background

Common theories of posttraumatic stress disorder (PTSD) argue that the symptoms of the disorder are caused by poor integration of the event in memory causing fragmented recall of the event (Horowitz, 1976; Ehlers & Clark, 2000; Chemotob, Roitblat, Hamada, Carlson, & Twentyman, 1988; Keane, Zimmering, & Caddell, 1985). Recently, the autobiographical memory (AM) model of PTSD has questioned this assumption of poor memory integration (Rubin, Boals, & Berntsen, 2008; Rubin, Berntsen, & Bohni, 2008; Berntsen & Rubin, 2006). Instead, proponents of the AM model of PTSD argue that the symptoms of the disorder are a result of an overly integrated trauma event memory (Rubin, Boals, & Berntsen, 2008). Berntsen and Rubin (2006) argue that high levels of integration will increase the accessibility of the event in memory, thereby creating an anchoring event from which the individual will predict future events. Thus, the individual will overestimate the future occurrence of negative events.

### The Role of Event Centralization in PTSD

Event centralization has repeatedly been shown to be positively correlated with PTSD symptom levels in nonclinical samples (Berntsen & Rubin, 2006; Robinaugh & McNally, 2011; Robinaugh & McNally, 2010; Berntsen, Rubin, & Siegler, 2011), clinical samples (Rubin, Dennis, & Beckham, 2011), and samples of combat veterans (Brown, Antonius, Kramer, Root, & Hirst, 2010). This relationship results from the event becoming an anchor for the perception, evaluation, and memory for other events that the individual experiences, thereby causing positive events to be interpreted in a negative way (Berntsen & Rubin, 2006). While this negative

anchoring may be the case for some individuals, others may experience growth from their traumatic event, and this growth may be caused by centralization leading to positive resolution instead of a negative anchor. Indeed, Boals and Schuettler (2011) found that the correlation between event centralization and posttraumatic growth is positive, just as it is between event centralization and PTSD symptoms. Furthermore, the relationship with posttraumatic growth was stronger when levels of PTSD symptoms were low, suggesting that there may be a difference in trauma related outcomes dependent on the type of event centralization (positive vs. negative) in which one is engaging.

Individuals who centralize a traumatic event as a means of obtaining positive resolution will likely deviate from the predicted pattern of event centralization and PTSD, thereby obtaining high centralization scores but low symptom scores. Indeed, research has shown that such deviations do occur (Fitzgerald, Berntsen, & Broadbridge, under review). Additionally, such work has examined individual differences between those individuals who met the predicted pattern and those who did not (Fitzgerald et al., under review); however, the wording of items in the CES (discussed in more detail below) makes it difficult to distinguish between individuals who are centralizing an event positively and those who are centralizing an event negatively. The proposed study, therefore, seeks to expand the CES to include two sets of items: positive and negative in valence.

Research suggests that some individuals eventually reach a positive perspective regarding their traumatic experience. For instance, Schuettler and Boals (2011) examined multiple relationships among known predictors of PTSD symptoms and posttraumatic growth. They found that event centralization was a strong *positive* predictor of both PTSD symptoms and posttraumatic growth. Positive trauma perspectives were predictive of higher levels of

posttraumatic growth but were not predictive of PTSD symptoms, whereas negative trauma perspectives were a predictor of higher levels of PTSD symptoms and were not a significant predictor of posttraumatic growth (Schuettler & Boals, 2011). Combined, these results suggest that the consequences of event centralization, as traditionally measured, may not always be negative. Instead, the way in which the event is thought about may impact the outcome of such centralization.

**Limitations of Current Measures of Event Centralization**

The AM model of PTSD focuses on event centralization as a maladaptive response to a trauma (Berntsen & Rubin, 2006, 2007; Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). This maladaptive response causes the individual to link positive or neutral events to the trauma event, thus causing a negative interpretation of the positive or neutral events (Berntsen & Rubin, 2006, 2007). The current measure of event centralization (the centrality of events scale; CES), however, ask the individual to rate statements such as the following: (1) I feel that this event has become part of my identity. (2) This event permanently changed my life. (3) This event was a turning point in my life. Such statements make no reference to emotional valence or developmental direction. For instance, when an individual responds affirmatively to the turning point item, then that person might believe that the event changed their life for either the better or for the worse. Although Berntsen and Rubin (2006) developed the concept of centralization from the more neutral concept of the life narrative (Fitzgerald, 1988), the assumption to date has been that, in the case of trauma, the direction will be negative; however, research to date has not explicitly tested this assumption.

Prior research has suggested a complex relationship among personality factors, PTSD symptoms, and event centralization. For instance, Fitzgerald and colleagues (under review)

found that individuals who centralized their stressful events but reported low levels of PTSD symptoms scored higher on Agreeableness and Conscientiousness than those who centralized the event but reported high levels of PTSD symptoms. In contrast, the latter group, high PTSD symptoms and high event centralization, scored higher on Neuroticism than the former group. This pattern may result from different levels of emotional response or from a focus on the positive aspects of the event as opposed to the negative aspects of the event in those who reported lower symptoms. In fact, Fitzgerald and colleagues (under review) report that the relationship between high centralization and high PTSD symptoms appears much more common among those who report experiencing an A2 emotion (fear, helplessness, or horror) in response to the traumatic event. Conversely, research examining posttraumatic growth suggests that some individuals may reach positive resolution following exposure to a traumatic event (Schuettler & Boals, 2011). The proposed study seeks to expand the CES to include both positively and negatively valenced items as a way to clarify the current ambiguities in the literature. The result would be a two-factor scale that looks at both ends of the emotional spectrum.

## Specific Aims

### Expansion of the CES

This study sought to expand the CES to include emotionally valenced items in an attempt to better understand why some individuals who centralize a stressful event report high levels of PTSD symptoms while others who centralize such an event report low levels of symptoms.

### Event Centralization and PTSD Symptoms

Next, the study sought to examine the relationship between these two new factors of the CES and PTSD symptoms. Positively valenced event centralization was expected to correlate

negatively with PTSD symptom levels, whereas negatively valenced event centralization was expected to correlate positively with PTSD symptom levels.

**Individual Differences**

Finally, the two factors of the CES were examined as mediators of the relationship between personality and PTSD symptoms. In particular, positively valenced event centralization was expected to mediate the relationships of Agreeableness and Conscientiousness with PTSD symptoms, while negatively valenced event centralization was expected to mediate the relationship between Neuroticism and PTSD symptoms.

## Methods

**Item Creation**

The current items of the CES were examined to determine which items could yield ambiguous responses. These items were then reworded to be more specific in terms of emotional valence. The modified scale can be seen in Appendix H.

**Pilot Study**

These newly created items were pilot tested on a sample of 29 undergraduate students. Participants were asked to complete the expanded version of the scale. Analyses of these data revealed that the internal consistency of scores for each valenced scale ($\alpha_{positive}$ = .77; $\alpha_{negative}$ = .88) was similar in magnitude to that of scores for the original scale ($\alpha_{original}$ = .88; Berntsen & Rubin, 2006).

**Participants and Procedures**

Four hundred undergraduate students participated in the main study. Each participant was asked to complete a series of questionnaires online using the SONA research participation system and was compensated with ½ credit of research participation.

**Measures**

Participants were first asked about sociodemographic variables including age, gender, ethnicity, and marital status. Participants were then asked to complete the International Personality Item Pool (IPIP; Appendix E), which uses 20 self-report items to assess each of the big five factors of personality (Conscientiousness, Openness to Experience, Neuroticism, Agreeableness, and Extraversion). Scores for each of these five subscales had adequate internal consistency ($\alpha$ = .87 - .92) in the present study and have shown moderate correlations ($r$ = .48-.68) with other measures of personality (Goldberg, 1992). PTSD symptoms were assessed using the PTSD checklist (PCL; Adkins, Weathers, McDevitt-Murphy, & Daniels, 2008). This 17-item self-report measure (Appendix A) assesses the frequency of symptoms over the past month using likert-type (1-5) scaling. Scores from this measure had high internal consistency ($\alpha$ = .92) in this sample and have shown convergent validity in prior samples (Adkins et al., 2008). Finally, participants completed the modified version of the CES (see Appendix H). This 16-item self-report measure uses two modified versions (one positively valenced and one negatively valenced) of each the seven items of the CES (Berntsen & Rubin, 2006) and maintains the questions regarding the A1 and A2 criteria of PTSD.

**Data Analysis**

Data from the expanded CES were analyzed using exploratory factor analysis (EFA) with maximum likelihood extraction and oblique rotation in order to determine whether these new items load on separate factors. Oblique rotation was used due to the expectation of correlated factors (Tabachnick & Fidell, 2007). Next, a multiple regression analysis was conducted using these two CES factors as predictors of PTSD symptoms. Negatively valenced event

centralization was expected to positively predict PTSD symptoms, and positively valenced event centralization was expected to predict PTSD symptoms in the opposite direction.

Finally, positive and negative event centralization were assessed as mediators of the relationship between personality variables and PTSD symptoms. Two nested mediation models, one full mediation model and one partial mediation model, were compared using structural equation modeling (SEM) with maximum likelihood estimation in LISREL 8.80 (Jöreskog & Sörbom, 1993) to examine these relationships. These models can be seen in Appendix AJ.

**Partial aggregation procedures.** For each subscale of the IPIP, as well as the PCL, the large number of parameters that result from a sufficiently large item pool raises concerns about estimation of model fit (Hagtvet & Nasser, 2004). Furthermore, with more items, the likelihood of an item loading on multiple factors increases, as does the likelihood that the uniqueness terms are correlated (Williams & O'Boyle, 2008). Use of partial aggregation can alleviate some of these problems, and parcels can actually perform better than items due to their statistical properties. For instance, parcels tend to be more normally distributed than items, preventing violations of normality in the statistical analyses (Williams & O'Boyle, 2008), and items tend to be less reliable than parcels because as test length increases so does reliability (Coffman & MacCallum, 2005). Therefore, each of these variables was partially aggregated (see Appendices W & X) using the a priori questionnaire construction method described by Williams and O'Boyle (2008).

**Model fit.** The fit of each of the models was assessed using absolute and incremental fit indices. Absolute fit indices included the minimum fit function chi-square and the root mean square error of approximation (RMSEA). Minimum fit function chi square values were expected to be significant (indicating poor fit) due to the large sample size (Bentler & Bonett, 1980),

however RMSEA values below .08 (indicating moderate to good fit; Browne & Cudeck; 1992; Rigdon, 1996) were expected. Values greater than .90 were expected for incremental indices, including the comparative fit index (CFI) and the non-normed fit index (NNFI). Such values indicate moderate to good model fit (Bentler, 1990; Hoyle, 1995, p. 164).

When nested models are compared, decreases in practical fit are conceptualized as CFI and RMSEA changes of 0.01 or greater (Widaman, 1985). A significance test can also be conducted on change in chi-square; however, this test can be overly sensitive to change when a large number of constraints are placed on a given model (Little, 1997). In comparing nested models, a more restrictive model is expected to show decreases in fit when compared to the less restrictive model (Byrne, Shavelson, & Muthen, 1989). Therefore, a significant difference in the fit of the two models (partial mediation vs. full mediation) would suggest that partial mediation better represents the data, whereas the absence of a significant difference would indicate that the full mediation is a better model. In addition to comparing model fit, the strength of the indirect pathways from the personality variables to PTSD symptoms through event centralization were considered when determining which model better represented the data (Lau & Cheung, 2012).

## Results

### Exploratory Factor Analysis

As expected, the modified CES items loaded on two factors, which accounted for 58% of the variance in the items. As can be seen in Appendix Y, one factor represented negative event centralization and the other represented positive event centralization. Items loaded above .70 on the appropriate constructs, and no factor showed shared variance greater than .15. As hypothesized, the two factors also correlated negatively with one another ($r$ = -.44, $p$ < .001). Additionally, the negative event centralization factor was significantly correlated with PTSD

symptoms ($r$ = .56, $p$ < .001), while the positive event centralization factor was not ($r$ = -.08, $p$ = .11).

**Multiple Regression**

A hierarchical stepwise regression was conducted to examine the relationship between positive event centralization, negative event centralization, and PTSD symptoms after controlling for the A2 emotional response, current age, and gender. The results of this regression analysis can be seen in Appendix Z. Those participants who were younger, had experienced an A2 emotional reaction, and negatively centralized their trauma reported significantly higher PTSD symptom levels. With negative event centralization in the model, positive event centralization significantly predicted PTSD as well; however, positive event centralization accounted for much less of the variance in PTSD symptoms than did negative event centralization (3.6% vs. 29%, respectively). This result again suggests that there is a difference in the way people are centralizing their stressful experiences and that a negative approach is more detrimental than a positive approach. Note that the bivariate correlation between positive event centralization and PTSD symptoms was essentially zero, but in the multiple regression analysis the regression weight was positive and significant indicating that classical suppression is occurring (Darmawan & Keeves, 2006). The implication of this suppression is discussed in more detail in the discussion section.

**Mediation Models**

Prior to comparing the two nested mediation models, a CFI was conducted to ensure that the measurement properties of the constructs were adequate, particularly due to the partial aggregation procedures that were used for the five personality facets and the PCL. The measurement model showed adequate fit, as can be seen in Appendix AA. The factor loadings

were all significant and were above .75, as can be seen in Appendix AB. The correlations between the factors can be seen in Appendix AC. Most of the variables were significantly correlated; however, some variables that were expected to correlate. For example, Agreeableness and Conscientiousness did not correlate significantly with positive event centralization.

Next, the two nested mediation models were compared, and as can be seen in Appendix AA, both models fit the data well. The partial mediation model represented a significantly better fit than the full mediation model. Only one fit index, NNFI, indicated a practical change in fit. The standardized pathways for the two models can be seen in Appendix AJ. The predicted pathways from Neuroticism to negative event centralization and from negative event centralization to PTSD symptoms were significant in both models; however, the pathways from Agreeableness and Conscientiousness to positive event centralization were not significant in either model. Likewise, in the partial mediation model, the path from Neuroticism to PTSD symptoms was significant while the paths from Agreeableness and Conscientiousness to PTSD symptoms were not significant. Although this outcome was not as hypothesized, it was not totally unexpected, given the correlations in the CFA model. The correlations between the personality factors remained unchanged in the mediation models.

Finally, the indirect effects were examined in both models. In both models the only significant indirect effect was the effect of Neuroticism on PTSD symptoms (see Appendix AD); however, this effect was stronger in the full mediation model than in the partial mediation model. The increased strength of this relationship in the full mediation model is to be expected, as the direct pathway from Neuroticism to PTSD symptoms was significant in the partial mediation model. Contrary to the researcher's prediction, Agreeableness and Conscientiousness did not

have significant indirect effects on PTSD symptoms. Together, these results suggest that the partial mediation model better represents the data than the full mediation model.

## Discussion

The present study aimed to (1) expand the Centrality of Events Scale to include valence, (2) examine the differential effects of positive versus negative event centralization on PTSD symptoms, and (3) examine the relationships between personality variables, positive and negative event centralization, and PTSD symptoms. Exploratory factor analysis supported the conceptual differentiation of the CES to include positively and negatively valenced item components. A two-factor model of event centralization emerged in which all positively valenced items loaded on a positive event centralization factor and all negatively valenced items loaded on a negative event centralization factor. Multiple regression analysis suggested that both positive and negative event centralization are predictive of PTSD symptoms; however, the effect of negative event centralization on PTSD symptoms was much stronger than the effect of positive event centralization. Furthermore, nested model comparisons revealed that negative event centralization partially mediates the effect of Neuroticism on PTSD symptoms, but that Agreeableness and Conscientiousness were related neither to positive event centralization nor to PTSD symptoms.

These results demonstrate the differential effects of centralizing an event in a positive way and centralizing the event negatively. Prior research and theory concerning the association between event centralization and PTSD symptoms has argued that centralization of a traumatic event causes the individual to interpret positive events in a negative light because the traumatic event has become an anchoring event (Berntsen & Rubin, 2006, 2007; Rubin Berntsen & Bohni, 2008). The present study indicates that centralization is a more nuanced process. The effect of

event centralization on PTSD symptoms seems to be influenced by the valence of that centralization. Studies based on the assumption that event centralization is a maladaptive response have found a robust association between event centralization and PTSD symptoms (Berntsen et al., 2011; Berntsen & Rubin, 2006; Brown et al., 2010; Robinaugh & McNally, 2010, 2011; Rubin et al., 2011); however, the magnitudes of this association were weaker in those studies with nonclinical samples than was the association between negative event centralization and PTSD symptoms in the present study. For instance, Berntsen and Rubin (2006) reported that correlations between event centralization and PTSD symptom clusters ranged from .28 - .35. Likewise, Rubin and colleagues (2011) report a correlation between event centralization and PTSD symptoms of .39, whereas in the present study the correlation between negative event centralization and PTSD symptoms was .56. Even in a sample from the same educational institution, which would arguably be the most similar to the present sample, the correlation between PTSD and event centralization was only .44 (Study 2 of this document). This difference suggests that measuring event centralization without taking valence into account is less informative than when including valence within the measure of event centralization.

The negative correlation between positive and negative event centralization further supports the idea that individuals do not always centralize stressful or traumatic events in a negative way, which is consistent with research showing a positive correlation between posttraumatic growth and event centralization (Boals & Schuettler, 2011). This positive association may be due to some individuals focusing on positive resolution following a traumatic experience. Attempting to work through the trauma to find meaning for the experience would result in centralization of the event. Indeed, prior research has suggested that a positive perspective in the aftermath of a trauma can lead to posttraumatic growth, whereas a negative

perspective is associated with increased PTSD symptoms (Schuettler & Boals, 2011). Future longitudinal research could aid assessment of this possibility.

It was hypothesized that high levels of positive event centralization would be associated with low levels of PTSD symptoms, whereas negative event centralization was predicted to have the opposite effect on PTSD symptoms. Paradoxically, the multiple regression analysis revealed that increases in both negative and positive event centralization were significantly associated with increases in PTSD symptoms. Negative event centralization was a much stronger predictor of PTSD symptoms than was positive event centralization. This result is in agreement with the AM model of PTSD, which views event centralization as a maladaptive response to trauma (Berntsen & Rubin, 2006, 2007; Rubin Berntsen & Bohni, 2008). The direction of the association between PTSD symptoms and positive event centralization, however, does not seem to fit with this assumption. Three possible explanations for this result are discussed below.

First, it may be that valence does not matter, that is, any type of event centralization results in higher PTSD symptoms. Given the difference in the magnitude of the effects of positive versus negative event centralization, and the fact that the bivariate correlation between positive event centralization and PTSD symptoms was essentially zero, this explanation is unlikely. Second, it may be that those who centralize the event negatively are worse off because they are focusing so much on the negative aspect of the event, whereas those who centralize the event positively are attempting to work through the experience and find meaning in it. These individuals may have a spike in PTSD symptoms for a time, but later they have more adaptively incorporated the experience. Indeed, the initial increase in symptoms for these individuals may be why some studies have shown a positive association between PTSD symptoms and posttraumatic growth, even though posttraumatic growth is seen as a more adaptive outcome

(Boals & Schuettler, 2011). Support for this explanation comes from recent longitudinal research on soldiers before, during, and after deployment. Berntsen and colleagues (2012) have shown that such soldiers show variation in their outcomes over time, following six different trajectories. This variation occurs in spite of similar patterns of current and recent trauma and stress exposure. Their results challenge the widespread belief that the cause of PTSD is the immediately preceding traumatic event, suggesting instead that preceding factors (e.g. neuroticism, childhood violence exposure, etc.) may be more impactful than previously thought (Berntsen et al., 2012). Some individuals may therefore be predisposed to think about certain aspects of an event, or to think about events in various ways, making some individuals more likely than others to experience negative outcomes.

Finally, positive event centralization may have no association with PTSD symptoms, but is emerging as a predictor of PTSD due to the association between positive and negative event centralization. In this case, positive event centralization is a *suppressor* variable that is accounting for some portion of negative event centralization that is not associated with PTSD symptoms. For instance, the scales may have shared error variance that is related to the item wording, which is virtually identical across the two subscales. It may also be that some individuals are just more likely to reflect on events that they have experienced, and the two subscales may share variance linked to this tendency toward reflection. This suppression explanation is the most likely explanation for the results of the present study as, statistically, classical suppression was shown to be occurring in this regression.

The third aim of this study was to examine positive and negative event centralization as mediators of the relationship between personality variables and PTSD symptoms. Personality variables have frequently been shown to correlate with PTSD symptoms. Of the five personality

factors, Neuroticism has shown the most robust effects on PTSD symptoms (see Rubin, Berntsen, & Bohni, 2008). In addition, Fitzgerald and colleagues (under review) have shown that event centralization mediates this effect. In the present study, this result was replicated with negative event centralization, and the modification indices did not indicate that adding a pathway to positive event centralization from Neuroticism would increase the fit of the model.

Prior research has also shown that those high in Agreeableness and Conscientiousness are less likely to develop PTSD symptoms, even if they centralize their traumatic experience (Fitzgerald et al., under review). Therefore, positive event centralization was examined as a mediator of the relationship between these personality variables and PTSD symptoms; however, in this study, Agreeableness and Conscientiousness were not significantly associated with PTSD symptoms. As with the multiple regression analysis, high levels of positive event centralization were associated with higher levels of PTSD symptoms, and it is likely that positive event centralization is acting as a suppressor variable in the path model, just as it did in the regression.

While the partial mediation model did represent a significantly better fit of the data, modification indices did not indicate that additional pathways between personality variables and other model variables would substantially increase the fit of the model. Furthermore, prior research and theory did not suggest any changes to the model. Future research could benefit from exploring positive and negative event centralization in conjunction with other correlates of PTSD symptoms.

**Limitations**

While the results of this study suggest that it is important to account for valence when examining event centralization, there are some limitations. First, the present study used a convenience sample of undergraduate students as participants. Results could differ in clinical

samples that would arguably show higher levels of distress. Therefore, future research should examine the association between PTSD symptoms and positive/negative event centralization in such samples. It is likely these associations would replicate in clinical samples, given that the mean symptom levels were fairly high in this sample, and 33% of participants reported having experienced an event meeting the clinical criteria for a trauma as outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (APA, 2000).

Second, because the main goal of this study was the expansion of the CES, the number of variables in the study was limited preventing the researcher from examining other associations that may have impacted the relationship between positive event centralization, negative event centralization, and PTSD symptoms. For instance, some researchers have posited that event centralization may be caused by excessive rumination (Broadbridge & Fitzgerald, in preparation). This rumination could account for why positive event centralization is acting as a suppressor in the present study. It may be that positive event centralization is removing error variance in negative event centralization that is due to an individual's tendency to think through problems, via either reflection or rumination, more frequently than other individuals. Future studies should therefore examine other variables that may explain these results.

## Conclusion

The results of this study support that valence is an important concept to consider when examining event centralization, particularly in relation PTSD symptoms, as negative event centralization was a stronger predictor of PTSD symptoms than was positive event centralization. Negative event centralization was also associated with more personality variables that have been linked to PTSD. These results support the assumption that event centralization is a maladaptive response to trauma (Berntsen & Rubin, 2006, 2007; Rubin, Berntsen, & Bohni,

2008), but that it is more maladaptive when the centralization is explicitly focused on the negative aspects and outcomes of the event.

## CHAPTER 5 – GENERAL DISCUSSION

The series of studies presented here examined the AM model of PTSD (Rubin, Berntsen, & Bohni, 2008). This theory emphasizes the integration of a traumatic or stressful experience into the individual's memory system and self-concept, termed event centralization (Berntsen & Rubin, 2006). In particular, the present series of studies examined event centralization as an additional factor of PTSD symptoms, examined event centralization as a mediator of the relationship between rumination and PTSD symptoms, and modified an event centralization scale to include valence. Combined, the results of the present studies strongly support the theorized role of event centralization in the development of PTSD and complement current research examining PTSD from this perspective. In Study One, nested model comparisons suggested that a higher order model including PTSD symptoms and event centralization factors fit the data better than a model in which these latent factors were simply correlated with one another. In Study Two, event-related rumination was a significant mediator of the relationship between event centralization and PTSD symptoms as well as the relationship between Neuroticism and PTSD symptoms. Finally, Study Three suggested that negative event centralization was a stronger predictor of PTSD symptoms than was positive event centralization.

This series of studies adds to the current research and theory in three important ways. First, the incorporation of event centralization into the conceptualization of PTSD has implications for clinical diagnosis and treatment. Use of event centralization measures may improve the accuracy and consistency of diagnosis. Furthermore, knowledge of the associations between event centralization and PTSD symptoms could improve treatment of the disorder. For instance, if an individual has centralized the traumatic event and is exhibiting symptoms of

PTSD, then that individual's treatment plan should focus on modifying the perception of the event. If, on the other hand, the individual is exhibiting symptoms of the disorder without having centralized the event, then treatment may take a different course. While cases of low centralization and high PTSD are relatively rare, such cases have been identified in every study of these variables to date; knowledge of the negative effects of event centralization should still be taken into account when developing treatments for these individuals. Research suggests that regardless of whether an individual has centralized a traumatic experience, high levels of neuroticism are associated with increased PTSD symptom frequency; therefore, one possibility for modifying treatment in these individuals would be to focus on reducing negative affect. Future research should examine these patterns using clinical samples and should assess rates of misdiagnosis when using the combined measure. Once replicated in clinical populations, researchers should focus on testing modified treatment options that take event centralization into account.

Second, the examination of both adaptive and maladaptive outcomes following traumatic/stressful experiences has shed light on the mechanisms through which individuals respond to such experiences. As with prior research, Neuroticism was a key predictor of PTSD symptoms. Neuroticism also predicted rumination, suggesting that the tendency toward negative affect leads to negatively focused cognition. When this rumination was directed at the traumatic or stressful event, event centralization resulted and led to PTSD symptoms. Due to the large number of studies supporting the relationships of neuroticism (Fitzgerald et al., under review; Frazier et al., 2011; Lauterbach & Vrana, 2001 Rubin, Berntsen, and Bohni, 2008;Zhang et al., 2010) and event centralization (Berntsen & Rubin, 2006, 2007; Berntsen et al., 2011; Broadbridge et al., 2013; Broadbridge & Fitzgerald, in preparation; Brown et al., 2010;

Fitzgerald et al., under review; Robinaugh & McNally, 2011; Robinaugh & McNally, 2010; Rubin et al., 2011) with PTSD symptoms, it is likely that these results would replicate in clinical populations and longitudinal studies. Agreeableness, on the other hand, seemed to have a protective effect on the individual's response. Those high in agreeableness report more frequent reflection, and that reflection led to more effective coping and posttraumatic growth. This set of relationships suggests that negatively focused individuals are at an increased risk for developing PTSD. The specific link between emotion-focused coping and posttraumatic growth provides further supporting evidence. Emotion-focused coping is aimed at emotion regulation (Lazarus & Folkman, 1986). Individuals who are engaging in this type of coping may be less negatively focused, and they therefore are more likely to experience posttraumatic growth instead of PTSD symptoms. It may also be the case that individuals who initially report PTSD symptoms, but who reflect on the event in an attempt to find meaning or grow from the experience, eventually reach a state of posttraumatic growth. This may be why some studies find a positive correlation between posttraumatic growth and PTSD symptoms (Boals & Schuettler, 2011; Dekel et al., 2012; Levine et al., 2008; Nishi et al., 2010; Hall et al., 2010).

These results have implications for both prevention and treatment of PTSD. Future research should focus on creating prevention programs for individuals exposed to trauma. Personality traits are thought to remain stable throughout most of adulthood (Specht, Egloff, & Schmukle, 2011), suggesting that the individual is more likely to be impacted at a different point in the model. Prevention programs could, therefore, center on cognitive training in a group setting that helps individuals focus their thoughts more positively and teaches them emotion-focused coping strategies. For those with the strong tendency toward negative affect (high in Neuroticism), this focus could help them to take control of this tendency by adjusting their

thoughts and actions toward positivity and emotion regulation. Prevention programs could reduce costs by preventing the need for future individual psychological treatment. Furthermore, prevention programs would ward off the distress and impairment in daily functioning caused by PTSD.

Finally, the conceptual differentiation of positive and negative event centralization could aid understanding of individual variations in responding to various life experiences. Negative event centralization and positive event centralization were both positive predictors of PTSD symptoms; however, negative event centralization was a much strong predictor than positive event centralization, and negative event centralization significantly mediated the effect of Neuroticism on PTSD symptoms. The strength of the relationship between negative event centralization and PTSD symptoms, as well as the association of Neuroticism, complements the conclusions from the joint mediation model above. Combined, these results strengthen the argument that it is this negative focus on the event that is playing a vital role in PTSD symptom outcomes. These results strengthen the arguments of the AM model of PTSD by explicitly testing the assumption that event centralization causes the event to become a *negative* anchor. While it seems possible that some individuals centralize their event in a more positive way, it is negative centralization that leads to the maladaptive outcomes. It would be interesting to see if positive event centralization is predictive of posttraumatic growth, as this relationship would also complement the results of the joint mediation model. Finding the positive side of experiencing a traumatic/stressful event may be a much more adaptive way of adjusting after that experience, and may in fact lead the individual to growth. Future research should examine this possibility by examining valence-specific event centralization as a predictor of both PTSD symptoms and posttraumatic growth. Such an examination would also benefit from longitudinal prospective

methods that examine personality characteristics at baseline, followed by an examination of valence-specific event centralization, rumination, and coping methods after the experience of a trauma. This type of examination would allow for the inference of causal relationships and would provide a more in depth understanding of the mechanisms of PTSD.

In conclusion, many individuals are exposed to trauma at some point in their life, but only a small percent of those individuals develop PTSD. The present studies highlight the role of event centralization and negativity, either in a general sense or specifically related to the event, in the prediction of PTSD symptom outcomes. Study two further highlights the protective effects of emotional regulation. Future research should focus on continuing this work by examining individuals prospectively over time, perhaps in groups of individuals more likely to experience traumatic events such as those in the armed forces.

## APPENDIX A

**PTSD Checklist (PCL)**

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each item carefully in terms of your most stressful or traumatic event in your life. Then, circle one of the responses to the right to indicate how much you have been bothered by that problem **in the past month**.

1. Repeated, disturbing memories, thoughts, or images of the stressful experience?
2. Repeated, disturbing dreams of the stressful experience?
3. Suddenly acting or feeling as if the stressful experience were happening again (as if you were reliving it)?
4. Feeling very upset when something reminded you of the stressful experience?
5. Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience?
6. Avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it?
7. Avoiding activities or situations because they reminded you of the stressful experience?
8. Trouble remembering important parts of the stressful experience?
9. Loss of interest in activities that you used to enjoy?
10. Feeling distant or cut off from other people?
11. Feeling emotionally numb or being unable to have loving feelings for those close to you?
12. Feeling as if your future somehow will be cut short?
13. Trouble falling or staying asleep?
14. Feeling irritable or having angry outbursts?
15. Having difficulty concentrating?
16. Being "superalert" or watchful or on guard?
17. Feeling jumpy or easily startled?

## APPENDIX B

**Centrality of Events Scale (CES)**

Please think back upon the most stressful or traumatic event in your life and answer the following questions in an honest and sincere way.

1. I feel that this event has become a part of my identity.
2. This event has become a reference point for the way I understand myself and the world.
3. I feel that this event has become a central part of my life story.
4. I feel that this event has colored the way I think and feel about other experiences.
5. This event has permanently changed my life.
6. I often think about the effects this event will have on my future.
7. This event was a turning point in my life.
8. In the most stressful or traumatic event that you used to answer questions 1 to 7, did you experience, witness, or were you confronted with an event that involved actual or threatened death or serious injury, or threat to your physical integrity or that of others.
9. In the most stressful or traumatic event that you used to answer questions 1 to 7, did you response involve intense fear, helplessness, or horror.

## APPENDIX C

**Rumination-Reflection Questionnaire (RRQ)**

For each of the following statements, please indicate your level of agreement or disagreement by circling one of the scale categories to the right of each statement. Use the scale as shown below.

1. My attention is often focused on aspects of myself I wish I'd stop thinking about.
2. I always seem to be rehashing in my mind recent things I've said or done.
3. Sometimes it is hard for me to shut off thoughts about myself.
4. Long after an argument or disagreement is over with, my thoughts keep going back to what happened.
5. I tend to ruminate or dwell over things that happen to me for a really long time afterward.
6. I don't waste time rethinking things that are over and done with.
7. Often I'm playing back over in my mind how I acted in a past situation.
8. I often find myself reevaluating something I've done.
9. I never ruminate or dwell on myself for very long.
10. It is easy for me to put unwanted thoughts out of my mind.
11. I often reflect on episodes in my life that I should no longer concern myself with.
12. I spend a great deal of time thinking back over my embarrassing or disappointing moments.
13. Philosophical or abstract thinking doesn't appeal to me that much.
14. I'm not really a meditative type of person.
15. I love exploring my "inner" self.
16. My attitudes and feelings about things fascinate me.
17. I don't really care for introspective or self-reflective thinking.
18. I love analyzing why I do things.
19. People often say I'm a "deep," introspective type of person.
20. I don't care much for self-analysis.
21. I'm very self-inquisitive by nature.
22. I love to meditate on the nature and meaning of things.
23. I often love to look at my life in philosophical ways.
24. Contemplating myself isn't my idea of fun.

## APPENDIX D

**Event-Related Rumination Inventory (ERRI)**

After an experience like the one you reported, people sometimes, but not always, find themselves having thoughts about their experience even though they don't try to think about it. Indicate for the following items how often, if at all, you had the experiences described during the weeks immediately after the event.

1. I thought about the event when I did not mean to.
2. Thoughts about the event came to mind and I could not stop thinking about them.
3. Thoughts about the event distracted me or kept me from being able to concentrate.
4. I could not keep images or thoughts about the event from entering my mind.
5. Thoughts, memories or images of the event came to mind even when I did not want them to.
6. Thoughts about the event caused me to relive my experience.
7. Reminders of the event brought back thoughts about my experience.
8. I found myself automatically thinking about what had happened.
9. Other things kept leading me to think about my experience.
10. I tried not to think about the event, but could not keep the thoughts from my mind.

After an experience like the one you reported, people sometimes, but not always, deliberately and intentionally spend time thinking about their experience. Indicate for the following items how often, if at all, you deliberately spent time thinking about the issues indicated during the weeks immediately after the event.

11. I thought about whether I could find meaning from my experience.
12. I thought about whether changes in my life have come from dealing with my experience.
13. I forced myself to think about my feelings about my experience.
14. I thought about whether I have learned anything as a result of my experience.
15. I thought about whether the experience has changed my beliefs about the world.
16. I thought about what the experience might mean for my future.
17. I thought about whether my relationships with others have changed following my experience.
18. I forced myself to deal with my feelings about the event.
19. I deliberately thought about the event and how it had affected me.
20. I thought about the event and tried to understand what happened.

## APPENDIX E

**International Personality Item Pool (IPIP)**

On the following pages, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes ***you***. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then mark the number that corresponds to the number on the following scale.

1. Am the life of the party.
2. Insult people.
3. Am always prepared.
4. Get stressed out easily.
5. Have a rich vocabulary.
6. Often feel uncomfortable around others.
7. Am interested in people.
8. Leave my belongings around.
9. Am relaxed most of the time.
10. Have difficulty understanding abstract ideas.
11. Feel comfortable around people.
12. Am not interested in other people's problems.
13. Pay attention to details.
14. Worry about things.
15. Have a vivid imagination.
16. Keep in the background.
17. Sympathize with others' feelings.
18. Make a mess of things.
19. Seldom feel blue.
20. Am not interested in abstract ideas.
21. Start conversations.
22. Feel little concern for others.
23. Get chores done right away.
24. Am easily disturbed.
25. Have excellent ideas.
26. Have little to say.
27. Have a soft heart.
28. Often forget to put things back in their proper place.
29. Am not easily bothered by things.
30. Do not have a good imagination.
31. Talk to a lot of different people at parties.
32. Am not really interested in others.
33. Like order.
34. Get upset easily.

35. Am quick to understand things.
36. Don't like to draw attention to myself.
37. Take time out for others.
38. Shirk my duties.
39. Rarely get irritated.
40. Try to avoid complex people.
41. Don't mind being the center of attention.
42. Am hard to get to know.
43. Follow a schedule.
44. Change my mood a lot.
45. Use difficult words.
46. Am quiet around strangers.
47. Feel others' emotions.
48. Neglect my duties.
49. Seldom get mad.
50. Have difficulty imagining things.
51. Make friends easily.
52. Am indifferent to the feelings of others.
53. Am exacting in my work.
54. Have frequent mood swings.
55. Spend time reflecting on things.
56. Find it difficult to approach others.
57. Make people feel at ease.
58. Waste my time.
59. Get irritated easily.
60. Avoid difficult reading material.
61. Take charge.
62. Inquire about others' well-being.
63. Do things according to a plan.
64. Often feel blue.
65. Am full of ideas.
66. Don't talk a lot.
67. Know how to comfort others.
68. Do things in a half-way manner.
69. Get angry easily.
70. Will not probe deeply into a subject.
71. Know how to captivate people.
72. Love children.
73. Continue until everything is perfect.
74. Panic easily.
75. Carry the conversation to a higher level.
76. Bottle up my feelings.
77. Am on good terms with nearly everyone.
78. Find it difficult to get down to work.
79. Feel threatened easily.
80. Catch on to things quickly.

81. Feel at ease with people.
82. Have a good word for everyone.
83. Make plans and stick to them.
84. Get overwhelmed by emotions.
85. Can handle a lot of information.
86. Am a very private person.
87. Show my gratitude.
88. Leave a mess in my room.
89. Take offense easily.
90. Am good at many things.
91. Wait for others to lead the way.
92. Think of others first.
93. Love order and regularity.
94. Get caught up in my problems.
95. Love to read challenging material.
96. Am skilled in handling social situations.
97. Love to help others.
98. Like to tidy up.
99. Grumble about things.
100. Love to think up new ways of doing things.

## APPENDIX F

**Posttraumatic Growth Inventory (PTGI)**

Please indicate, for each of the statements below, the degree to which this change occurred in your life as a result of your stressful/traumatic experience using the provided scale.

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

## APPENDIX G

### COPE Inventory

We are interested in how people respond when they confront difficult or stressful events in their lives. There are lots of ways to try to deal with stress. This questionnaire asks you to indicate what you generally do and feel, when you experience stressful events. Obviously, different events bring out somewhat different responses, but think about what you usually do when you are under a lot of stress. Please use the following scale to indicate the degree to which you do each of the following things when you are under stress.

1. I get upset and let my emotions out.
2. I feel a lot of emotional distress and I find myself expressing those feelings a lot.
3. I try to find comfort in my religion.
4. I say to myself "this isn't real."
5. I daydream about things other than this.
6. I make sure not to make matters worse by acting too soon.
7. I think hard about what steps to take.
8. I try to come up with a strategy about what to do.
9. I try hard to prevent other things from interfering with my efforts at dealing with this.
10. I seek God's help.
11. I focus on dealing with this problem, and if necessary let other things slide a little.
12. I get sympathy and understanding from someone.
13. I act as though it hasn't even happened.
14. I look for something good in what is happening.
15. I force myself to wait for the right time to do something.
16. I pretend that it hasn't really happened.
17. I take direct action to get around the problem.
18. I accept the reality of the fact that it happened.
19. I let my feelings out.
20. I ask people who have had similar experiences what they did.
21. I go to movies or watch TV, to think about it less.
22. I learn something from the experience.
23. I keep myself from getting distracted by other thoughts or activities.
24. I restrain myself from doing anything too quickly.
25. I concentrate my efforts on doing something about it.
26. I get used to the idea that it happened.
27. I just give up trying to reach my goal.
28. I discuss my feelings with someone.
29. I give up the attempt to get what I want.
30. I reduce the amount of effort I'm putting into solving the problem.
31. I turn to work or other substitute activities to take my mind off things.
32. I talk to someone to find out more about the situation.
33. I admit to myself that I can't deal with it, and quit trying.
34. I talk to someone who could do something concrete about the problem.
35. I put aside other activities in order to concentrate on this.

36. I sleep more than usual.
37. I accept that this has happened and that it can't be changed.
38. I talk to someone about how I feel.
39. I hold off doing anything about it until the situation permits.
40. I make a plan of action.
41. I pray more than usual.
42. I try to grow as a person as a result of the experience.
43. I try to see it in a different light, to make it seem more positive.
44. I drink alcohol or take drugs, in order to think about it less.
45. I do what has to be done, one step at a time.
46. I get upset, and am really aware of it.
47. I put my trust in God.
48. I learn to live with it.
49. I try to get advice from someone about what to do.
50. I refuse to believe that it has happened.
51. I think about how I might best handle the problem.
52. I take additional action to try to get rid of the problem.
53. I try to get emotional support from friends or relatives.

## APPENDIX H

**Modified Centrality of Events Scale**

1. I feel that this event has become a positive part of my identity.
2. This event has become a positive reference point for the way I understand myself and the world.
3. I feel that this event has become a central part of my life story in a positive way.
4. I feel that this event has colored the way I think and feel about other experiences in a positive way.
5. This event has permanently changed my life for the better.
6. I often think about the positive effects this event will have on my future.
7. This event was a turning point for the better in my life.
8. I feel that this event has become a negative part of my identity.
9. This event has become a negative reference point for the way I understand myself and the world.
10. I feel that this event has become a central part of my life story in a negative way.
11. I feel that this event has colored the way I think and feel about other experiences in a negative way.
12. This event has permanently changed my life for the worse.
13. I often think about the negative effects this event will have on my future.
14. This event was a turning point in my life for the worse.
15. In the most stressful or traumatic event that you used to answer questions 1 to 14, did you experience, witness, or were you confronted with an event that involved actual or threatened death or serious injury, or threat to your physical integrity or that of others.
16. In the most stressful or traumatic event that you used to answer questions 1 to 14, did you response involve intense fear, helplessness, or horror.

## APPENDIX I

*Factor Loadings for EFA Model*

| Scale | Item | CES | I/A | N/H |
|---|---|---|---|---|
| CES | 1. Part of Identity | .76 | | |
| | 2. Reference Point | .77 | | |
| | 3. Central to Life Story | .82 | | |
| | 4. Thoughts of Other Experiences | .80 | | |
| | 5. Changed Life | .83 | | |
| | 6. Think Effects on Future | .66 | | |
| | 7. Turning Point | .78 | | |
| PCL | 1. Repeated Memories or Thoughts | | .79 | |
| | 2. Repeated Dreams | | .72 | |
| | 3. Reliving | | .58 | |
| | 4. Upset by Reminder | | .76 | |
| | 5. Physical Reaction when Reminded | | .70 | |
| | 6. Avoid Thoughts or Talking | | .62 | |
| | 7. Avoid Situations | | .58 | |
| | 8. Trouble Remembering | | | .33 |
| | 9. Loss of Interest | | | .69 |
| | 10. Feeling Distant | | | .82 |
| | 11. Feeling Emotionally Numb | | | .78 |
| | 12. Future Cut Short | | | .66 |
| | 13. Trouble Sleeping | | | .64 |
| | 14. Feeling Irritable | | | .73 |
| | 15. Difficulty Concentrating | | | .72 |
| | 16. Super Alert/Watchful/On Guard | | | .40 |
| | 17. Jumpy or Easily Started | | | .50 |

*Note:* Factor loadings below 0.30 are not shown in this Appendix. Items of the PCL and CES cleanly factored into three factors, event centralization, Intrusion/Avoidance (I/A), and Numbing/Hyperarousal (N/H).

## APPENDIX J

*Correlations between EFA Subscales*

| | CES | I/A | N/H |
|---|---|---|---|
| CES | 1.00 | ----- | ----- |
| I/A | .40 | 1.00 | ----- |
| N/H | .33 | .73 | 1.00 |

*Note*: All correlations were significant, $p < .001$.

## APPENDIX K

*Fit Indices for CFA Models*

| | *df* | $\chi^2$ | RMSEA | CFI | NNFI | $\Delta df$ | $\Delta\chi^2$ |
|---|---|---|---|---|---|---|---|
| 1-Factor | 252 | 8496.61* | .187 | .89 | .89 | ---- | ---- |
| 3-Factor | 249 | 2008.80* | .067 | .98 | .97 | 3 | 6487.81* |
| 5-Factor | 242 | 1566.71* | .058 | .98 | .98 | 7 | 442.09* |
| Higher Order | 247 | 1761.23* | .061 | .98 | .98 | 5 | 194.52* |
| Replication | 242 | 1424.18* | .085 | .95 | .94 | ---- | ---- |

*Note:* Chi-square change test for higher order model is in reference to the 5-factor model; * = $p < .001$

## APPENDIX L

*Factor Loadings and Descriptive Statistics for 5-Factor CFA Models*

| | | Sample One ($N$ = 1723) | | | | | Sample Two ($N$ = 541) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Scale | Item | CES | R | EA | EN | H | CES | R | EA | EN | H |
| CES | 1 | 1.02 | | | | | 0.87 | | | | |
| | 2 | 1.05 | | | | | 0.78 | | | | |
| | 3 | 1.11 | | | | | 1.00 | | | | |
| | 4 | 1.04 | | | | | 0.81 | | | | |
| | 5 | 1.12 | | | | | 0.95 | | | | |
| | 6 | 1.03 | | | | | 0.84 | | | | |
| | 7 | 1.08 | | | | | 0.91 | | | | |
| PCL | 1 | | 0.92 | | | | | 0.98 | | | |
| | 2 | | 0.75 | | | | | 0.91 | | | |
| | 3 | | 0.79 | | | | | 0.88 | | | |
| | 4 | | 0.98 | | | | | 0.98 | | | |
| | 5 | | 0.82 | | | | | 0.95 | | | |
| | 6 | | | 0.93 | | | | | 0.93 | | |
| | 7 | | | 0.98 | | | | | 1.11 | | |
| | 8 | | | | 0.49 | | | | | 0.53 | |
| | 9 | | | | 0.80 | | | | | 1.09 | |
| | 10 | | | | 0.97 | | | | | 1.11 | |
| | 11 | | | | 0.88 | | | | | 1.07 | |
| | 12 | | | | 0.76 | | | | | 0.97 | |
| | 13 | | | | | 0.85 | | | | | 0.96 |
| | 14 | | | | | 0.87 | | | | | 1.00 |
| | 15 | | | | | 0.96 | | | | | 1.05 |
| | 16 | | | | | 0.73 | | | | | 0.98 |
| | 17 | | | | | 0.72 | | | | | 0.96 |
| | *M* | 21.56 | 10.12 | 4.38 | 8.78 | 9.58 | 23.06 | 12.50 | 5.38 | 10.85 | 11.99 |
| | *SD* | 7.77 | 4.56 | 2.21 | 4.23 | 4.50 | 6.63 | 5.06 | 2.40 | 5.13 | 5.31 |
| | *α* | .92 | .87 | .75 | .83 | .84 | .89 | .86 | .74 | .85 | .85 |

*Note:* R = reexperiencing; EA = effortful avoidance; EN = emotional numbing; H = hyperarousal

## APPENDIX M

*Correlations between Factors for the 5-Factor Models*

| | Sample One ($N$ = 1723) | | | | | Sample Two ($N$ = 541) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CES | R | EA | EN | H | CES | R | EA | EN | H |
| CES | 1.00 | ---- | ---- | ---- | ---- | 1.00 | ---- | ---- | ---- | ---- |
| R | .48 | 1.00 | ---- | ---- | ---- | .45 | 1.00 | ---- | ---- | ---- |
| EA | .40 | .83 | 1.00 | ---- | ---- | .47 | .82 | 1.00 | ---- | ---- |
| EN | .39 | .75 | .75 | 1.00 | ---- | .41 | .76 | .74 | 1.00 | ---- |
| H | .39 | .80 | .70 | .88 | 1.00 | .42 | .81 | .72 | .86 | 1.00 |

*Note*: All correlations were significant at $p < .05$.

## APPENDIX N

*Factor Loadings for Higher Order Model*

Sample One ($N$ = 1723)

| Scale | Item | CES | R | EA | EN | H |
|---|---|---|---|---|---|---|
| CES | 1 | 1.02 | | | | |
| | 2 | 1.05 | | | | |
| | 3 | 1.11 | | | | |
| | 4 | 1.04 | | | | |
| | 5 | 1.12 | | | | |
| | 6 | 1.03 | | | | |
| | 7 | 1.08 | | | | |
| PCL | 1 | | 0.92 | | | |
| | 2 | | 0.75 | | | |
| | 3 | | 0.80 | | | |
| | 4 | | 0.97 | | | |
| | 5 | | 0.82 | | | |
| | 6 | | | 0.92 | | |
| | 7 | | | 0.99 | | |
| | 8 | | | | 0.49 | |
| | 9 | | | | 0.80 | |
| | 10 | | | | 0.97 | |
| | 11 | | | | 0.88 | |
| | 12 | | | | 0.75 | |
| | 13 | | | | | 0.85 |
| | 14 | | | | | 0.86 |
| | 15 | | | | | 0.95 |
| | 16 | | | | | 0.73 |
| | 17 | | | | | 0.73 |

*Note:* R = reexperiencing; EA = effortful avoidance; EN = emotional numbing; H = hyperarousal

## APPENDIX O

*Event Centralization x PTSD Symptoms*

| | High Centralization | Low Centralization |
|---|---|---|
| High PTSD | A. HiPTSD-HiCES | B. HiPTSD-LoCES |
| Low PTSD | C. LoPTSD-HiCES | D. LoPTSD-LoCES |

## APPENDIX P

*Fit Indices for Event Centralization, Neuroticism, & PTSD Symptom Models*

| | *df* | $\chi^2$ | RMSEA | CFI | NNFI | $\Delta df$ | $\Delta\chi^2$ |
|---|---|---|---|---|---|---|---|
| CFA | 24 | 41.21* | .036 | .997 | .995 | ---- | ---- |
| Model A | 25 | 80.07** | .063 | .990 | .985 | ---- | ---- |
| Model B | 24 | 41.21* | .036 | .997 | .995 | 1 | 38.86** |

*Note:* The model in which the correlation between neuroticism and event centralization was estimated (Model B) represented a significantly better fit of the data than the model in which this relationship was constrained to zero (Model A). (* $p < .05$; ** $p < .001$)

## APPENDIX Q

*Factor Loadings and Correlations for CFA model of Event Centralization, Neuroticism, & PTSD Symptoms*

| | N | CES | PCL |
|---|---|---|---|
| N1 | 4.97 | | |
| N2 | 4.26 | | |
| N3 | 4.73 | | |
| CES1 | | 5.81 | |
| CES2 | | 5.75 | |
| CES3 | | 5.18 | |
| PCL1 | | | 5.68 |
| PCL2 | | | 5.08 |
| PCL3 | | | 4.47 |
| N | 1.00 | | |
| CES | .28 | 1.00 | |
| PCL | .53 | .52 | 1.00 |

*Note*: N = Neuroticism; All factor loadings and correlations were significant, $p < .05$.

## APPENDIX R

*Factor Loadings for CFA Model of Variables in the Joint Mediation Model*

| | N | A | C | GR | DR | IR | Ref | CES | PFC | EFC | PCL | PTG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N1 | 5.05 | | | | | | | | | | | |
| N2 | 4.27 | | | | | | | | | | | |
| N3 | 4.65 | | | | | | | | | | | |
| A1 | | 3.48 | | | | | | | | | | |
| A2 | | 3.45 | | | | | | | | | | |
| A3 | | 2.98 | | | | | | | | | | |
| C1 | | | 4.14 | | | | | | | | | |
| C2 | | | 3.97 | | | | | | | | | |
| C3 | | | 3.97 | | | | | | | | | |
| GR1 | | | | 2.92 | | | | | | | | |
| GR2 | | | | 3.06 | | | | | | | | |
| GR3 | | | | 2.97 | | | | | | | | |
| DR1 | | | | | 3.42 | | | | | | | |
| DR2 | | | | | 2.66 | | | | | | | |
| DR3 | | | | | 2.47 | | | | | | | |
| IR1 | | | | | | 3.84 | | | | | | |
| IR2 | | | | | | 2.95 | | | | | | |
| IR3 | | | | | | 2.63 | | | | | | |
| Ref1 | | | | | | | 2.57 | | | | | |
| Ref2 | | | | | | | 2.43 | | | | | |
| Ref3 | | | | | | | 2.27 | | | | | |
| CES1 | | | | | | | | 5.83 | | | | |
| CES2 | | | | | | | | 5.75 | | | | |
| CES3 | | | | | | | | 5.17 | | | | |
| PFC1 | | | | | | | | | 2.84 | | | |
| PFC2 | | | | | | | | | 3.46 | | | |
| PFC3 | | | | | | | | | 2.66 | | | |
| EFC1 | | | | | | | | | | 3.63 | | |
| EFC2 | | | | | | | | | | 3.17 | | |
| EFC3 | | | | | | | | | | 2.61 | | |
| PCL1 | | | | | | | | | | | 5.67 | |
| PCL2 | | | | | | | | | | | 5.08 | |
| PCL3 | | | | | | | | | | | 4.48 | |
| PTG1 | | | | | | | | | | | | 7.12 |
| PTG2 | | | | | | | | | | | | 8.02 |
| PTG3 | | | | | | | | | | | | 7.69 |

*Note*: N = Neuroticism; A = Agreeableness; C = Conscientiousness; GR = General Rumination; DR = Deliberate Rumination; IR = Intrusive Rumination; Ref = Reflection; PFC = Problem-Focused Coping; EFC = Emotion-Focused Coping; PTG = Posttraumatic Growth; All factor loadings were significant at $p < .001$

## APPENDIX S

*Factor Correlations for CFA Model*

| | N | A | C | GR | DR | IR | Ref | CES | PFC | EFC | PCL | PTG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | **-.22** | 1.00 | | | | | | | | | | |
| C | **-.32** | **.44** | 1.00 | | | | | | | | | |
| GR | **.64** | .04 | **-.21** | 1.00 | | | | | | | | |
| DR | **.30** | **.11** | -.03 | **.37** | 1.00 | | | | | | | |
| IR | **.40** | .03 | **-.17** | **.37** | **.71** | 1.00 | | | | | | |
| Ref | -.05 | **.34** | -.03 | **.22** | **.28** | **.17** | 1.00 | | | | | |
| CES | **.28** | **.12** | -.04 | **.34** | **.69** | **.59** | **.24** | 1.00 | | | | |
| PFC | -.01 | **.38** | **.32** | .08 | **.32** | **.14** | **.23** | **.28** | 1.00 | | | |
| EFC | **.12** | **.34** | **.17** | **.17** | **.35** | **.18** | **.21** | **.27** | **.75** | 1.00 | | |
| PCL | **.53** | **-.14** | **-.22** | **.46** | **.48** | **.57** | **.11** | **.52** | **.11** | **.15** | 1.00 | |
| PTG | .03 | **.15** | **.12** | .07 | **.48** | **.29** | **.19** | **.47** | **.30** | **.38** | **.25** | 1.00 |
| A2 | **.15** | .03 | **-.11** | **.17** | **.19** | **.23** | .08 | **.18** | .06 | .02 | **.26** | **.11** |

*Note*: N = Neuroticism; A = Agreeableness; C = Conscientiousness; GR = General Rumination; DR = Deliberate Rumination; IR = Intrusive Rumination; Ref = Reflection; PFC = Problem-Focused Coping; EFC = Emotion-Focused Coping; PTG = Posttraumatic Growth; Bold numbers indicate correlations that are significant at $p < .05$

## APPENDIX T

*Factor Correlations for Joint Mediation Model*

| | N | A | GR | DR | PFC | PCL |
|---|---|---|---|---|---|---|
| A | -.21* | | | | | |
| C | -.32* | .44* | | | | |
| DR | ----- | ----- | .18* | | | |
| IR | ----- | ----- | .10* | .59* | | |
| EFC | ----- | ----- | ----- | ----- | .69* | |
| PTG | ----- | ----- | ----- | ----- | ----- | .04 |

*Note*: N = Neuroticism; A = Agreeableness; C = Conscientiousness; GR = General Rumination; DR = Deliberate Rumination; IR = Intrusive Rumination; PFC = Problem-Focused Coping; EFC = Emotion-Focused Coping; PTG = Posttraumatic Growth. (* $p < .05$)

## APPENDIX U

*Standardized Indirect Effects for the Joint Mediation Model*

| | *β* | *z* |
|---|---|---|
| Neuroticism to Event Centralization | .28* | 7.01 |
| Neuroticism to PTSD Symptoms | .11* | 5.97 |
| Neuroticism to Posttraumatic Growth | .12* | 5.82 |
| General Rumination to PTSD Symptoms | .03 | 1.84 |
| Intrusive Rumination to PTSD Symptoms | .07* | 3.21 |
| Deliberate Rumination to PTSD Symptoms | .22* | 7.07 |
| General Rumination to Posttraumatic Growth | .03 | 1.84 |
| Intrusive Rumination to Posttraumatic Growth | .07* | 3.20 |
| Deliberate Rumination to Posttraumatic Growth | .23* | 6.94 |
| Agreeableness to Problem-Focused Coping | .10* | 4.18 |
| Conscientiousness to Problem-Focused Coping | -.05* | -3.05 |
| Agreeableness to Emotion-Focused Coping | .10* | 3.99 |
| Conscientiousness to Emotion-Focused Coping | -.05* | -2.97 |
| Agreeableness to Posttraumatic Growth | .03* | 3.29 |
| Conscientiousness to Posttraumatic Growth | -.01* | -2.65 |
| Agreeableness to PTSD Symptoms | .001 | 0.21 |
| Conscientiousness to PTSD Symptoms | < .001 | -0.21 |
| Reflection to Posttraumatic Growth | .06* | 3.58 |
| Reflection to PTSD Symptoms | .002 | 0.21 |
| A2 Emotions to PTSD Symptoms | .01 | 1.03 |
| A2 Emotions to Posttraumatic Growth | .01 | 1.03 |

*Note*: * significant effect

## APPENDIX V

*Specific Indirect Effects for the Joint Mediation Model*

| Outcome | Predictor | Mediator | SIE | Sobel Test | % TIE |
|---|---|---|---|---|---|
| CES | N | GR | 0.06 | 1.85 | 16.38 |
| | | DR | 0.23 | 5.12* | 57.65 |
| | | IR | 0.10 | 3.17* | 25.96 |
| PCL | N | GR & CES | 0.02 | 1.82 | 16.38 |
| | | DR & CES | 0.09 | 4.53* | 57.65 |
| | | IR& CES | 0.04 | 3.02* | 25.96 |
| PCL | A | Ref & PFC | 0.004 | 0.48 | 58.17 |
| | | Ref & EFC | -0.003 | 0.36 | 41.83 |
| PCL | C | Ref & PFC | -0.002 | 0.47 | 58.17 |
| | | Ref & EFC | 0.001 | 0.36 | 41.83 |
| PCL | Ref | PFC | 0.009 | 0.48 | 58.17 |
| | | EFC | -0.006 | 0.36 | 41.83 |
| PTG | N | GR & CES | 0.02 | 1.82 | 16.94 |
| | | DR & CES | 0.08 | 4.48* | 56.75 |
| | | IR& CES | 0.04 | 3.00* | 26.30 |
| PTG | A | Ref & PFC | -0.003 | 0.34 | 7.88 |
| | | Ref & EFC | -0.03 | 2.90* | 92.12 |
| PTG | C | Ref & PFC | 0.001 | 0.34 | 7.88 |
| | | Ref & EFC | 0.02 | 2.42* | 92.12 |
| PTG | Ref | PFC | -0.006 | 0.35 | 7.88 |
| | | EFC | -0.07 | 3.05* | 92.12 |

*Note:* * $p < .05$; abbreviations are as follows: N = Neuroticism; A = Agreeableness; C = Conscientiousness; GR = General Rumination; DR = Deliberate Rumination; IR = Intrusive Rumination; Ref = Reflection; PFC = Problem-Focused Coping; EFC = Emotion-Focused Coping; PTG = Posttraumatic Growth; SIE = specific indirect effect; TIE = total indirect effect

## APPENDIX W

*Partial Aggregation of Personality Factors*

| Factor | Item | Parcel | Wording |
|---|---|---|---|
| Neuroticism | Am relaxed most of the time. | 1 | N |
| | Seldom feel blue. | 2 | N |
| | Am not easily bothered by things. | 3 | N |
| | Rarely get irritated. | 1 | N |
| | Seldom get mad. | 2 | N |
| | Get stressed out easily. | 3 | P |
| | Worry about things. | 1 | P |
| | Am easily disturbed. | 2 | P |
| | Get upset easily. | 3 | P |
| | Change my mood a lot. | 1 | P |
| | Get irritated easily. | 2 | P |
| | Panic easily. | 3 | P |
| | Get caught up in my problems. | 1 | P |
| | Grumble about things. | 2 | P |
| | Have frequent mood swings. | 3 | P |
| | Often feel blue. | 1 | P |
| | Get angry easily. | 2 | P |
| | Feel threatened easily. | 3 | P |
| | Get overwhelmed by emotions. | 1 | P |
| | Take offense easily. | 2 | P |
| Agreeableness | Insult people. | 1 | N |
| | Am not interested in other people's problems. | 2 | N |
| | Feel little concern for others. | 3 | N |
| | Am not really interested in others. | 1 | N |
| | Am hard to get to know. | 2 | N |
| | Am indifferent to the feelings of others. | 3 | N |
| | Am interested in people. | 1 | P |
| | Sympathize with others' feelings. | 2 | P |
| | Have a soft heart. | 3 | P |
| | Take time out for others. | 1 | P |
| | Feel others' emotions. | 2 | P |
| | Make people feel at ease. | 3 | P |
| | Love children. | 1 | P |
| | Have a good word for everyone. | 2 | P |
| | Show my gratitude. | 3 | P |
| | Think of others first. | 1 | P |
| | Inquire about others' well-being. | 2 | P |
| | Know how to comfort others. | 3 | P |
| | Am on good terms with nearly everyone. | 1 | P |
| | Love to help others. | 2 | P |

| Factor | Item | Parcel | Wording |
|---|---|---|---|
| Conscientiousness | Leave my belongings around. | 1 | N |
| | Make a mess of things. | 2 | N |
| | Often forget to put things back in their proper place. | 3 | N |
| | Shirk my duties. | 1 | N |
| | Neglect my duties. | 2 | N |
| | Waste my time. | 3 | N |
| | Find it difficult to get down to work. | 1 | N |
| | Do things in a half-way manner. | 2 | N |
| | Leave a mess in my room. | 3 | N |
| | Am always prepared. | 1 | P |
| | Pay attention to details. | 2 | P |
| | Get chores done right away. | 3 | P |
| | Follow a schedule. | 1 | P |
| | Am exacting in my work. | 2 | P |
| | Continue until everything is perfect. | 3 | P |
| | Like order. | 1 | P |
| | Do things according to a plan. | 2 | P |
| | Make plans and stick to them. | 3 | P |
| | Love order and regularity. | 1 | P |
| | Like to tidy up. | 2 | P |

*Note*: Parcels were created using the a priori questionnaire construction method (Williams & O'Boyle, 2008) by distributing positively and negatively worded items equally across the parcels.

## APPENDIX X

*Partial Aggregation of PCL Items*

| Symptom Cluster | Item | Parcel |
|---|---|---|
| B. Reexperiencing | Repeated, disturbing memories, thoughts, or images of the stressful experience. | 1 |
| | Repeated, disturbing dreams of the stressful experience. | 2 |
| | Suddenly acting or feeling as if the stressful experience were happening again (as if you were reliving it). | 3 |
| | Feeling very upset when something reminded you of the stressful experience. | 1 |
| | Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of the stressful experience. | 2 |
| C. Avoidance/ Numbing | Avoiding thinking about or talking about the stressful experience or avoiding having feelings related to it. | 3 |
| | Avoiding activities or situations because they reminded you of the stressful experience. | 1 |
| | Trouble remembering important parts of the stressful experience. | 2 |
| | Loss of interest in activities that you used to enjoy. | 3 |
| | Feeling distant or cut off from other people. | 1 |
| | Feeling emotionally numb or being unable to have loving feelings for those close to you. | 2 |
| | Feeling as if your future somehow will be cut short. | 3 |
| D. Hyperarousal | Trouble falling or staying asleep. | 1 |
| | Feeling irritable or having angry outbursts. | 2 |
| | Having difficulty concentrating. | 3 |
| | Being "superalert" or watchful or on guard. | 1 |
| | Feeling jumpy or easily startled. | 2 |

*Note*: Parcels were created using the a priori questionnaire construction method (Williams & O'Boyle, 2008) by distributing items from each factor equally across the parcels.

## APPENDIX Y

*Factor Loadings and Descriptive Statistics for EFA Model*

| Scale | *M* | *SD* | Item | NCES | PCES |
|---|---|---|---|---|---|
| PCL | 39.48 | 13.75 | ---------- | ------ | ------ |
| NCES | 17.37 | 6.65 | 1. Negative Part of Identity | .75 | |
| | | | 2. Negative Reference Point | .75 | |
| | | | 3. Negatively Central to Life Story | .78 | |
| | | | 4. Negatively Colored Thoughts | .74 | |
| | | | 5. Negatively Changed Life | .77 | |
| | | | 6. Think about Negative Effects on Future | .72 | |
| | | | 7. Negative Turning Point | .78 | |
| PCES | 20.86 | 6.49 | 1. Positive Part of Identity | | .72 |
| | | | 2. Positive Reference Point | | .76 |
| | | | 3. Positively Central to Life Story | | .79 |
| | | | 4. Positively Colored Thoughts | | .73 |
| | | | 5. Positively Changed Life | | .79 |
| | | | 6. Think about Positive Effects on Future | | .74 |
| | | | 7. Positive Turning Point | | .75 |

*Note:* Factor loadings with an absolute value below 0.30 are not shown in this Appendix. Items in the modified CES cleanly factored into two factors representing the hypothesized constructs of positive event centralization (PCES) and negative event centralization (NCES).

## APPENDIX Z

*Multiple Regression Predicting PTSD Symptoms*

| Step | $R$ | $R^2$ | $\Delta R^2$ | Predictor | $\beta$ | $t$ | $p$ | $r$ |
|---|---|---|---|---|---|---|---|---|
| 1 | .30 | .09 | ---- | Age | -.11 | -2.35 | .02 | -.11 |
| | | | | Gender | .03 | 0.53 | .60 | .03 |
| | | | | A2 | .27 | 5.60 | < .001 | .27 |
| 2 | .31 | .10 | .004 | Age | -.12 | -2.38 | .02 | -.12 |
| | | | | Gender | .03 | 0.53 | .59 | .03 |
| | | | | A2 | .27 | 5.53 | < .001 | .27 |
| | | | | Positive CES | -.06 | -1.24 | .22 | -.06 |
| 3 | .62 | .39 | .29 | Age | -.11 | -2.83 | .01 | -.11 |
| | | | | Gender | -.01 | -0.13 | .90 | -.01 |
| | | | | A2 | .14 | 3.46 | .001 | .14 |
| | | | | Positive CES | .21 | 4.62 | < .001 | .19 |
| | | | | Negative CES | .62 | 13.52 | < .001 | .54 |

*Note*: $r$ = semi-partial correlation; After accounting for age, gender, and the A2 criterion, both positive and negative event centralization were predictive of increased levels of PTSD symptoms; however, negative event centralization (29%) uniquely accounted for more variance than positive event centralization (3.6%).

## APPENDIX AA

*Fit Indices for CFA and Mediation Models*

| | *df* | $\chi^2$ | RMSEA | CFI | NNFI | $\Delta df$ | $\Delta\chi^2$ |
|---|---|---|---|---|---|---|---|
| CFA | 436 | 1174.61* | .072 | .96 | .95 | ----- | ----- |
| Partial Mediation | 446 | 1290.03* | .075 | .95 | .95 | 10 | 115.42* |
| Full Mediation | 449 | 1370.52* | .078 | .95 | .94 | 13 | 195.91* |
| Partial vs. Full | ----- | ----- | ----- | ----- | ----- | 3 | 80.49* |

*Note:* The CFA model represented a good fit of the data, suggesting that the partial aggregation procedures were appropriate. The partial mediation model represented a significantly better fit to the data than did the full mediation model. (* = $p < .001$)

## APPENDIX AB

*Factor Loadings for CFI Model Depicting Valenced Event Centralization, PTSD Symptoms, and Individual Differences*

| Scale | Item/Parcel | NCES | PCES | PCL | N | A | C | O | E |
|---|---|---|---|---|---|---|---|---|---|
| NCES | 1 | .93 | | | | | | | |
| | 2 | .94 | | | | | | | |
| | 3 | .96 | | | | | | | |
| | 4 | .88 | | | | | | | |
| | 5 | .84 | | | | | | | |
| | 6 | .89 | | | | | | | |
| | 7 | .87 | | | | | | | |
| PCES | 1 | | .79 | | | | | | |
| | 2 | | .85 | | | | | | |
| | 3 | | .91 | | | | | | |
| | 4 | | .84 | | | | | | |
| | 5 | | .96 | | | | | | |
| | 6 | | .89 | | | | | | |
| | 7 | | .92 | | | | | | |
| PCL | 1 | | | 4.80 | | | | | |
| | 2 | | | 4.48 | | | | | |
| | 3 | | | 3.93 | | | | | |
| N | 1 | | | | 5.03 | | | | |
| | 2 | | | | 4.33 | | | | |
| | 3 | | | | .476 | | | | |
| A | 1 | | | | | 3.69 | | | |
| | 2 | | | | | 3.47 | | | |
| | 3 | | | | | 3.20 | | | |
| C | 1 | | | | | | 3.90 | | |
| | 2 | | | | | | 3.88 | | |
| | 3 | | | | | | 3.69 | | |
| O | 1 | | | | | | | 3.30 | |
| | 2 | | | | | | | 3.77 | |
| | 3 | | | | | | | 3.40 | |
| E | 1 | | | | | | | | 4.40 |
| | 2 | | | | | | | | 4.60 |
| | 3 | | | | | | | | 3.73 |

*Note:* N = Neuroticism; A = Agreeableness; C = Conscientiousness; O = Openness to Experience; E = Extraversion; All items loaded well on the appropriate latent constructs providing support for the partial aggregation procedures used in this study.

## APPENDIX AC

*Correlations between Factors*

| | NCES | PCES | PCL | N | A | C | O | E |
|---|---|---|---|---|---|---|---|---|
| NCES | 1.00 | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| PCES | -.50* | 1.00 | ---- | ---- | ---- | ---- | ---- | ---- |
| PCL | .62* | -.10 | 1.00 | ---- | ---- | ---- | ---- | ---- |
| N | .41* | -.12* | .60 | 1.00 | ---- | ---- | ---- | ---- |
| A | -.11* | .01 | -.15* | -.14* | 1.00 | ---- | ---- | ---- |
| C | -.25* | .03 | -.31* | -.30* | .38* | 1.00 | ---- | ---- |
| O | -.07 | .06 | -.11 | -.19* | .55* | .41* | 1.00 | ---- |
| E | -.27* | .14* | -.23* | -.33* | .47* | .23* | .45* | 1.00 |

*Note:* N = Neuroticism; A = Agreeableness; C = Conscientiousness; O = Openness to Experience; E = Extraversion; * = $p < .05$; All personality factors were significantly correlated with one another, and all of these correlations were in the expected direction. Positive event centralization was associated with negative event centralization, Neuroticism, and Extraversion, while negative event centralization was associated with positive event centralization, PCL scores, Neuroticism, Agreeableness, Conscientiousness, and Extraversion.

## APPENDIX AD

*Standardized Indirect Effects of Personality on PTSD Symptoms*

| | Neuroticism | Agreeableness | Conscientiousness |
|---|---|---|---|
| Full Mediation | .31* | .002 | .005 |
| Partial Mediation | .21* | .002 | .005 |

*Note:* Only Neuroticism had a significant indirect effect on PTSD symptoms in the present models. This effect was significant in both the full and partial mediation models. (* = $p < .05$)

## APPENDIX AE

### Captions

**Appendix AF.** *CFA Models of PTSD.* The 1-factor model (a) did not fit the data well as can be seen in Appendix 3. The 3-factor model (b) was based on the outcome of the EFA. This model fit the data well, but not as well as the 5-factor model (c). The 5-factor model was based on the work of King and colleagues (1998), but adds the items of the CES as a separate, albeit correlated, factor.

**Appendix AG.** *Higher Order Model of PTSD.* The higher order model was comparable in fit to the 5-factor model, suggesting that these five factors can be conceptualized as underlying one higher order PTSD factor. All factor loadings were significant. Abbreviations are defined in Appendix L.

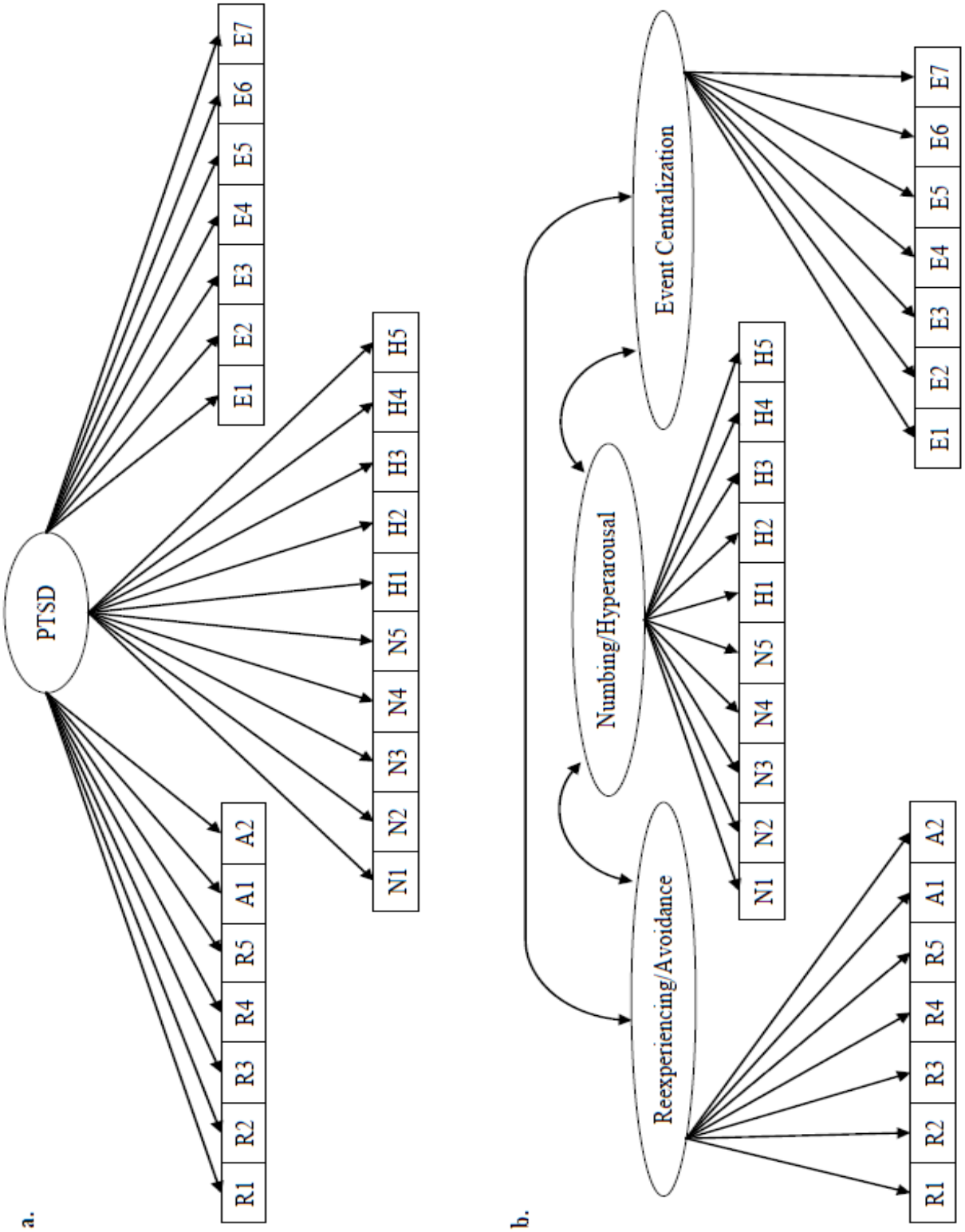
**Appendix AH.** *Neuroticism and Event Centralization Predict PTSD.* Model b fit the data significantly better than model a (Appendix P), which suggests that neuroticism and event centralization are codependent predictors of PTSD symptoms.

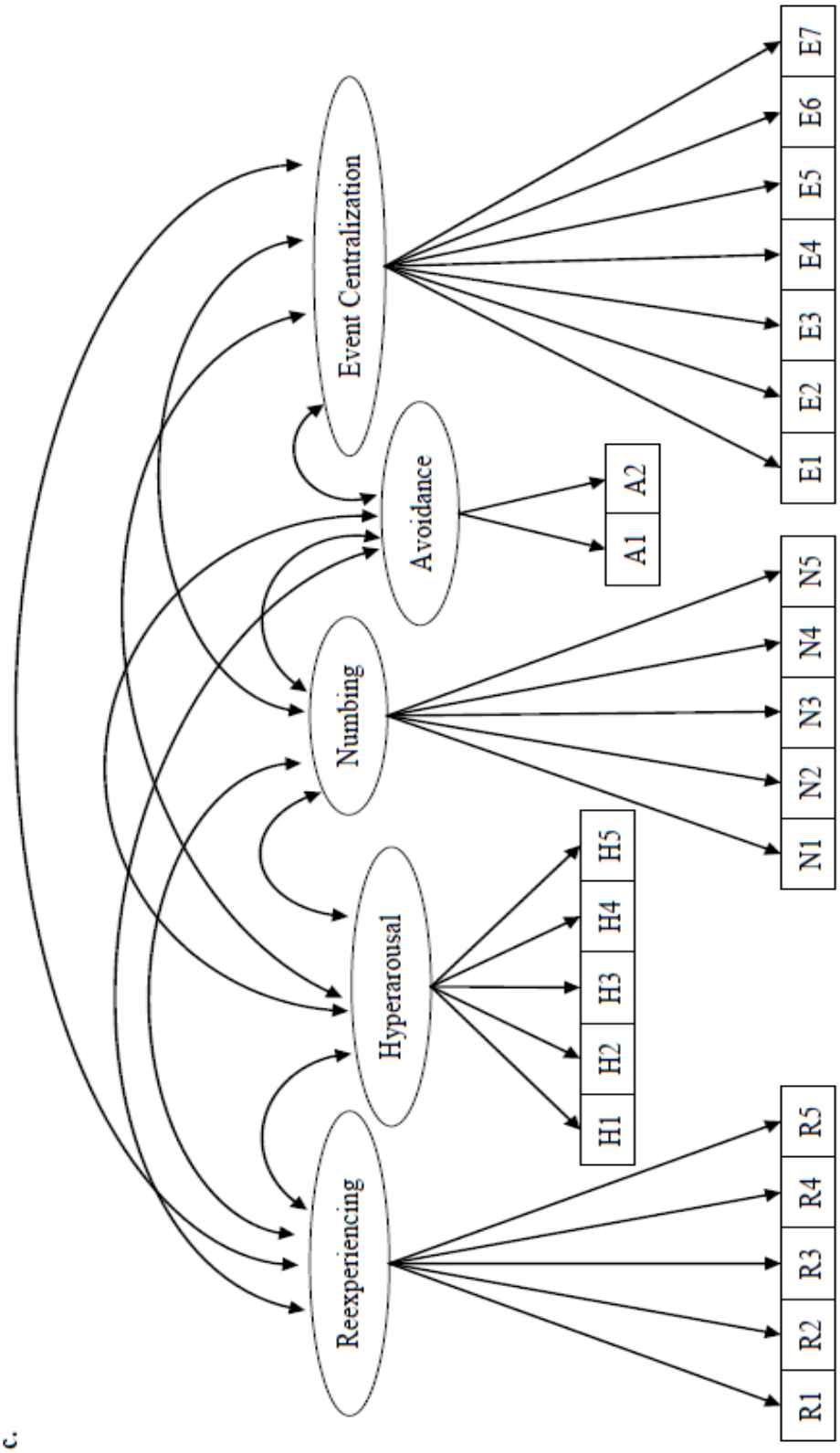
**Appendix AI.** *Latent Variable Model of the Variables Influencing PTSD symptoms and Posttraumatic Growth.* This model also contains correlations which are not shown for ease of viewing. These can be found in Appendix T. Indirect effects for this model can be seen in Appendices U & V.

**Appendix AJ.** *Negative Event Centralization Mediates the Relationship between Neuroticism and PTSD symptoms.* This figure depicts the direct pathways for the full mediation (a) and partial mediation (b) models of the mediating effect of negative event centralization on the relationship between Neuroticism and PTSD symptoms. The partial mediation model represented a better fit of the data as can be seen in Appendix AA. As can be seen

in the figure, positive event centralization did not mediate the effect of Agreeableness and Conscientiousness on PTSD symptoms.

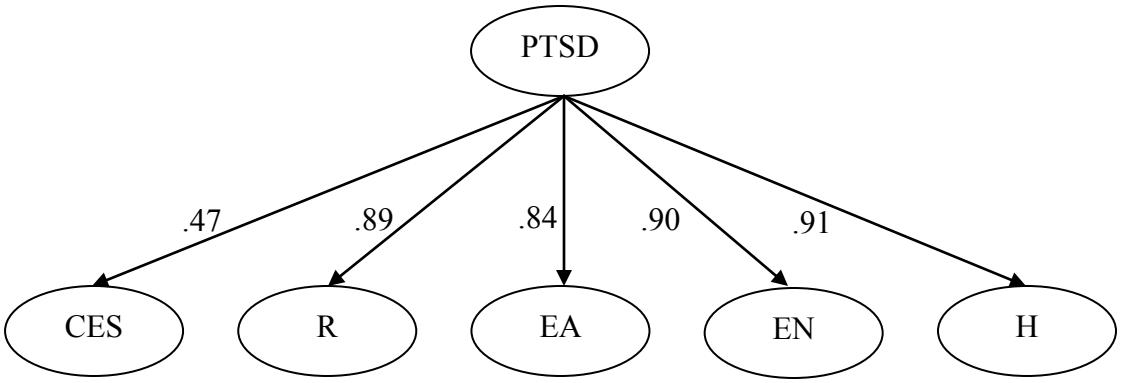
**APPENDIX AF**





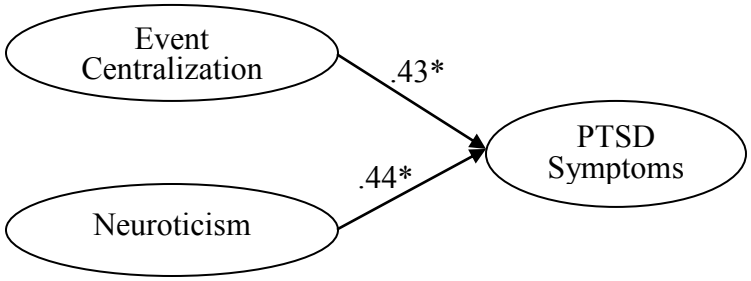

c.

**APPENDIX AG**

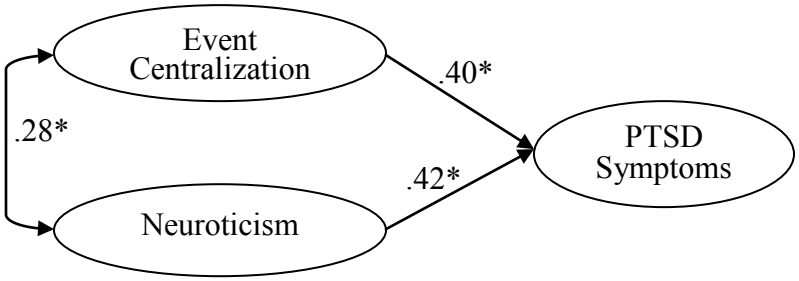


## APPENDIX AH

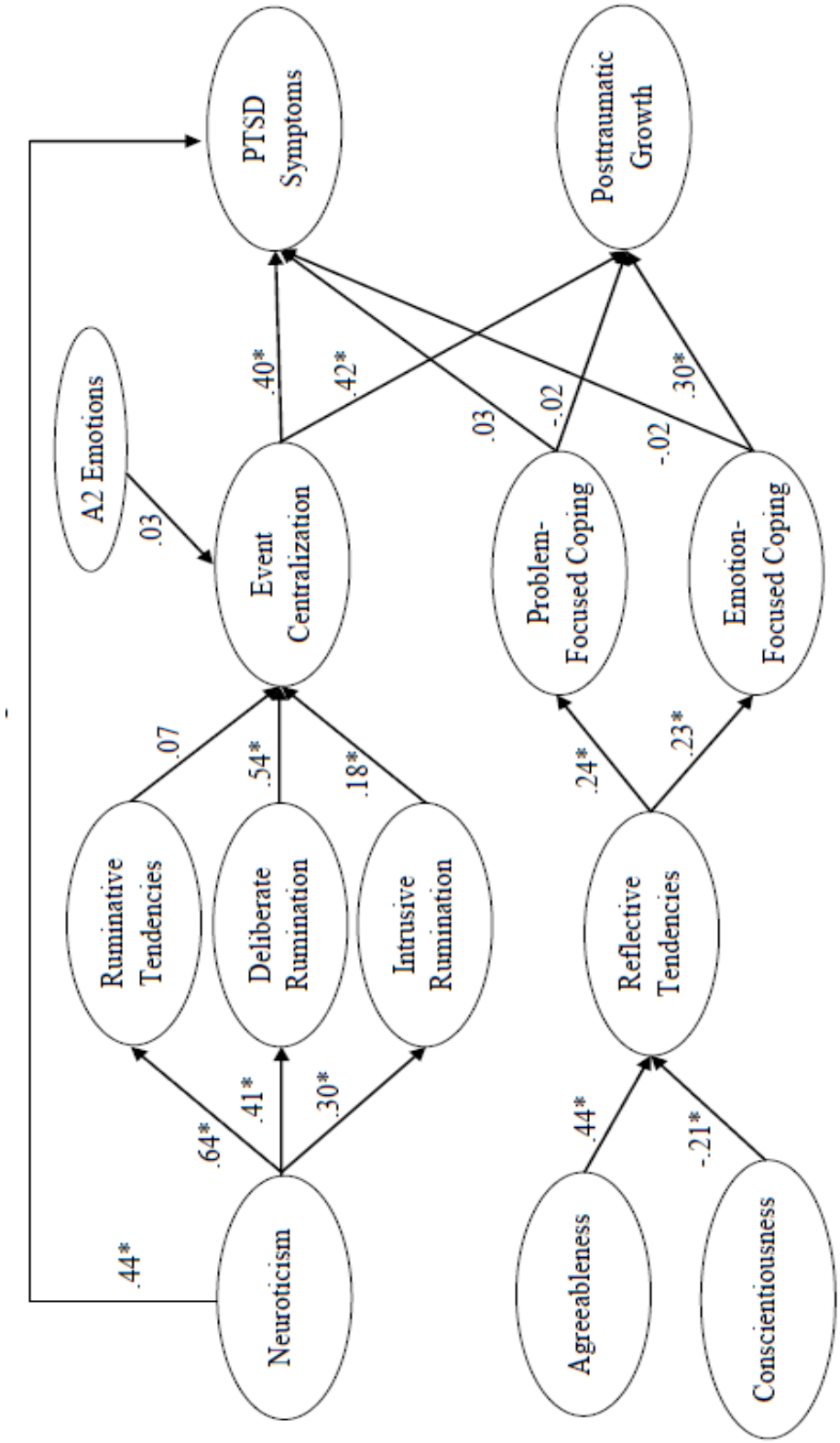
**a. Neuroticism and Event Centralization Independently Predict PTSD**




**b. Neuroticism and Event Centralization as Interdependent Predictors of PTSD**

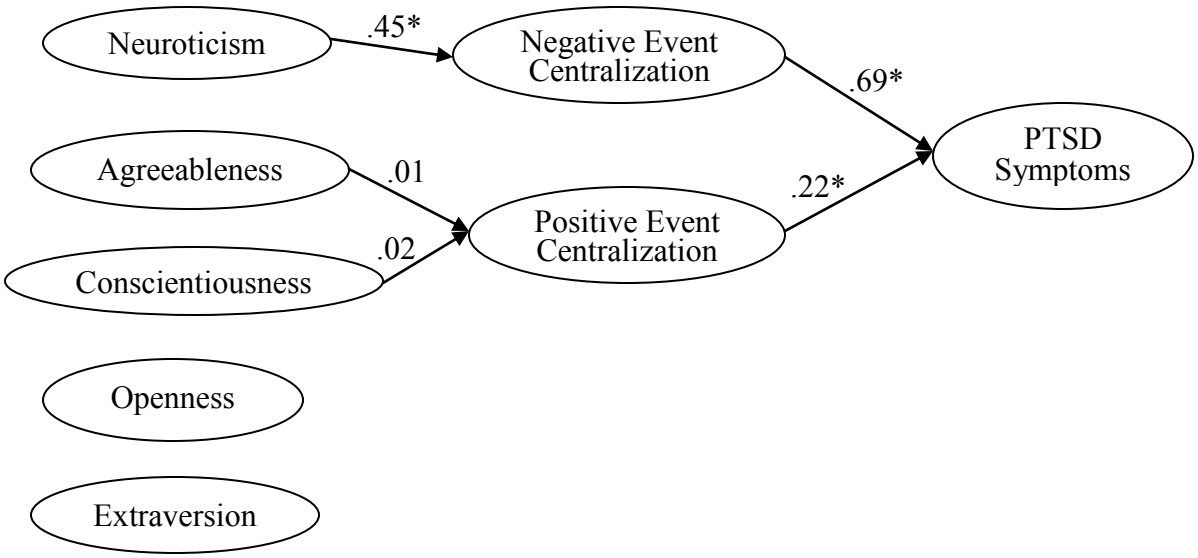


**APPENDIX AI**



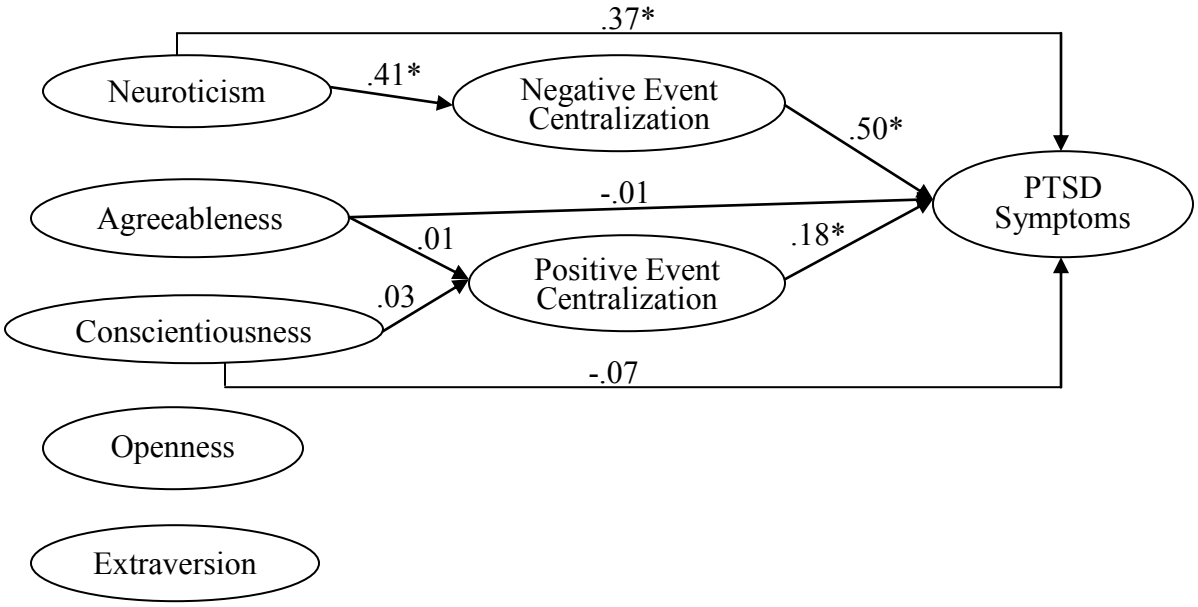
## APPENDIX AJ

**a. Full Mediation Model**




*Note:* All personality facets were allowed to correlate (See Appendix AC).

**b. Partial Mediation Model**




*Note:* All personality facets were allowed to correlate (See Appendix AC).

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## ABSTRACT

**THE ROLE OF MEMORY, PERSONALITY AND THOUGHT PROCESSES IN POSTTRAUMATIC STRESS DISORDER**

by

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**August 2013**

**Advisor:** Dr. Joseph M. Fitzgerald

**Major:** Psychology

**Degree:** Doctor of Philosophy

The autobiographical memory model of PTSD posits that the memory for the traumatic experience is influential in development of the disorder (Rubin, Berntsen, & Bohni, 2008). In particular, Berntsen & Rubin (2006) argue that the degree of event centralization, the incorporation of the memory into the individual's sense of self and life story, is directly related to the degree of PTSD symptoms exhibited by the individual. The present series of studies systematically analyzes event centralization and its relationship to PTSD, while taking into account other variables such as cognitive and emotion variables, as well as individual differences.

Study one explored event centralization as an additional factor of PTSD symptoms. Results from this study suggest that PTSD is best described by a higher order model that includes the following five lower order factors: event centralization, reexperienceing, effortful avoidance, emotional numbing, and hyperarousal. In study two, predictors of adaptive and maladaptive outcomes were compared in a joint mediation model. The results from this model suggest that Neuroticism is a risk factor for PTSD, and that this may be due to Neuroticism causing increases in event-related rumination and event centralization. Conversely, Agreeableness is a protective

factor that increases reflection and emotion-focused coping, which subsequently leads to posttraumatic growth. Finally, study three expanded the centrality of events scale to specify the emotional direction of the centralization. Results from this study suggest that some individuals centralized their traumatic event in a positive way, but negative event centralization was a stronger predictor of PTSD symptoms than was positive event centralization.

Combined, the results of these studies support the theorized role of event centralization in the development of PTSD. Given the growing body of evidence for the relationship between event centralization and PTSD symptoms, clinical practices should be updated to better serve the individuals afflicted by PTSD.

## AUTOBIOGRAPHICAL STATEMENT

Carissa L. Broadbridge is a Cognitive Psychologist who received her B.A. in Psychology from Oakland University in May 2007 and her M.A. in Psychology from Wayne State University in May 2010. She is currently finishing the requirements for a Ph.D. in Cognitive Psychology at Wayne State University, and will be moving on to a position as an Assistant Professor at Kentucky Wesleyan College in August 2013.

Carissa's research has focused on autobiographical memory as it applies to the lives of older adults and to individuals who have experienced traumatic events. She has co-authored an article examining the structure of memory ratings, as well as a book chapter discussing the development of autobiographical memory from a lifespan perspective. She has also written a theoretical paper on the impact of various developmental milestones on the reminiscence bump, which is currently in revision. Carissa has also been assisting in a project funded by the National Institute of Mental Health (NIMH; grant number R01MH085793, Dr. B. Arnetz, Principal Investigator) that longitudinally examines the predictors of somatic and mental health outcomes in trauma-exposed, Iraqi refugees.

Carissa enjoys teaching and has taught a variety of courses including Introductory Psychology, Developmental Psychology, and Statistical Methods in Psychology. Carissa is an active member of the academic community, having volunteered for a number of organizations including, the Society for Integrative Experimental Psychology Research, the Association of Psychological Science, the Graduate Employees' Organizing Committee, and the American Federation of Teachers. She is also actively engaged in the wider community as a sponsor for the Rite of Christian Initiation for Adults and a third-grade Catechist for the after school Faith Formation Program at her local church.