THE ROLES OF PSYCHOLOGICAL AND COGNITIVE FLEXIBILITY IN

COMPLEX PTSD

by

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ABSTRACT

Psychological flexibility is considered to be a person’s ability to flexibly use emotional, behavioral, and cognitive strategies to adapt to changing situational demands. A lack of psychological flexibility has been associated with the development and maintenance of posttraumatic stress disorder (PTSD) symptoms. Complex PTSD (CPTSD) is a relatively new diagnosis characterized by disturbances in self-organization. Emotion regulation deficits have commonly been cited as underlying the development and maintenance of CPTSD symptoms. However, psychological flexibility may better explain the pervasive rigidity seen in individuals with CPTSD. The purpose of this study was to clarify the relationship between emotion regulation and psychological flexibility and determine whether a relationship exists between psychological and cognitive flexibility and CPTSD symptom severity as measured using both self-report and neuropsychological assessments. Data from 93 trauma-exposed adults demonstrated that the factors underlying measures of emotion regulation, psychological flexibility, and cognitive flexibility do not meaningfully overlap with each other. However, flexible use of emotion regulation strategies, a sense of control when under stress, and performance on a neuropsychological task of cognitive flexibility were uniquely predictive of CPTSD symptom severity, whereas emotion regulation was not. These results suggest that the inflexibility underlying CPTSD may be multidimensional and reach beyond simply using emotion regulation strategies. Clinically, developing greater psychological and cognitive
flexibility may be a promising target for the treatment of CPTSD. Further research is needed in order to replicate these findings and determine the directionality of the relationships between emotion regulation, psychological and cognitive flexibility, and CPTSD symptoms.

*Key words:* Complex PTSD, emotion regulation, psychological flexibility, cognitive flexibility, neuropsychological assessment
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CHAPTER I
INTRODUCTION

Researchers and clinicians alike have long known that the posttraumatic stress disorder (PTSD) diagnosis (American Psychiatric Association, 2013) is inadequate for describing several post-trauma sequelae experienced by certain trauma survivors, often those who have endured chronic, sustained traumas. A Complex PTSD (CPTSD) diagnosis was recently developed and included in the International Classification of Diseases, 11th Revision (ICD-11; World Health Organization, 2018) that describes the disturbances in self-organization experienced by some trauma survivors in addition to the typical symptoms of PTSD. However, a stand-alone disorder of CPTSD has not yet been created for the Diagnostic and Statistical Manual of Mental Disorders (DSM), suggesting that more research is needed to fully understand the vast array of symptoms that trauma survivors can experience and the mechanisms underlying different symptom presentations.

Emotion regulation has been posited as a potential underlying mechanism for the development and maintenance of the symptoms specific to the CPTSD diagnosis. However, the research on this relationship has produced inconsistent results. Some of this inconsistency may be due to measurement issues. But, it is possible that emotion regulation difficulties are only part of a larger problem related to deficits in a broader self-regulatory ability described as psychological flexibility.
Psychological flexibility has been associated with effective self-regulation, or the biological processes that develop throughout the lifespan and underlie emotion regulation and information processing (Kashdan & Rottenberg, 2010; Ford, 2009). Decreased flexibility has also predicted the development of PTSD symptoms (Kumpula, Orcutt, Bardeen & Varkovitsky, 2011). Therefore, flexibility may be a promising candidate in the search for other mechanisms that may be underlying the development and maintenance of CPTSD symptoms.

The construct of flexibility has been defined and operationalized in a variety of ways, but the constructs of psychological flexibility and cognitive flexibility are two of the ones most relevant to the field of psychology and the study of PTSD. Cognitive flexibility has been operationalized via neuropsychological tasks in the study of PTSD. Objective measures of flexibility like neuropsychological testing move trauma assessment beyond the self-report of symptoms and could provide a valuable perspective on the development and maintenance of CPTSD symptoms.

The purpose of the proposed study is to expand our understanding of the constructs of emotion regulation and psychological flexibility and these constructs’ relationships to the symptoms of CPTSD. The proposed study will investigate the relationships between psychological and cognitive flexibility and emotion regulation, as well as psychological and cognitive flexibility’s relationship with CPTSD symptom severity.
CHAPTER II
LITERATURE REVIEW

More than 80% of people will experience at least one traumatic event over the course of their lifetime (Kilpatrick, Resnick, Milanak, Miller, Keyes, & Friedman, 2013). Although most individuals undergo a normal recovery process, a minority will experience significant symptoms of posttraumatic stress disorder (PTSD; American Psychiatric Association (APA), 2013). PTSD is characterized by symptoms including intrusive memories of the event, effortful avoidance of reminders of the event, altered cognitions and moods, and hyper-arousal or reactivity (APA, 2013). Lifetime prevalence in the United States has been estimated to be 11.7% for women and 4.0% for men (Kessler et al., 2012).

Although a single posttraumatic stress diagnosis currently exists to describe the pathological symptoms of those who experience traumatic events and do not undergo a normal recovery, research on posttraumatic stress trajectories has shown vast heterogeneity in symptom development (Galetzer-Levy & Bryant, 2013). Galetzer-Levy and Bryant (2013) calculated that there are 636,120 possible presentations of PTSD based on the number of symptoms and criteria included in the DSM-5 alone. They hypothesize that this vast heterogeneity in the diagnosis may be contributing to the inconsistent results obtained by PTSD researchers, including large variation in the effect sizes of known predictors of PTSD and the variable efficacy of evidence-based treatments for PTSD. Up to 50% of participants in efficacy trials will still meet criteria for PTSD once treatment is
complete (Bradley, Greene, Russ, Dutra, & Westen, 2005; IOM & Committee on Treatment of Posttraumatic Stress Disorder, 2008), and 60% to 72% of participants who received either cognitive processing therapy (CPT; Ehlers & Clark, 2000) or prolonged exposure therapy (PE; Foa & Rothbaum, 1998) retained their military-related PTSD diagnosis at the end of treatment (Steenkamp, Liza, Hoge, & Marmar, 2015). Bradley and colleagues (2005) fittingly concluded, “[D]ifferent kinds of treatment may be more efficacious for different kinds of patients, although the search for such patient-by-treatment interactions has as yet been disappointing” (p. 225). This statement by the authors highlights the fact that treatment approaches developed to alleviate symptoms associated with PTSD thus far have assumed the development of this disorder and individuals’ symptom presentations to be relatively homogenous, which may be a disservice to many individuals suffering from this disorder.

**Complex PTSD**

Over the past three decades, a significant amount of attention has been paid to the idea that a related but distinct constellation of posttraumatic stress symptoms is experienced by a substantial portion of individuals affected by PTSD. This constellation of symptoms has most recently been operationalized by the World Health Organization (WHO) in the newest edition of the International Classification of Diseases (ICD-11; WHO, 2018) as Complex PTSD (CPTSD). CPTSD is considered to be a sibling diagnosis of PTSD and is categorized under ‘Disorders specifically associated with stress’ (Karatzias et al., 2017b). Individuals who meet the new diagnosis of CPTSD must first meet the criteria for PTSD and then display the additional symptoms of CPTSD. The criteria for PTSD comprise three domains: (1) re-experiencing symptoms, (2) deliberate
avoidance of reminders of the trauma, and (3) a sense of current threat. The criteria for CPTSD consist of three areas referred to as ‘Disturbances in Self-Organization’ (DSO): (1) affective dysregulation, (2) a negative self-concept, and (3) disturbances in relationships (WHO, 2018). As the term DSO implies, adding CPTSD to the ICD class of stress-related disorders was done in order to formally recognize the changes in self-organization that can occur after the experience of trauma and that can cause clinically significant distress, but that are not adequately captured by previous conceptualizations of PTSD or addressed by treatments specifically designed for PTSD (Brewin et al., 2017; Cloitre et al., 2011). This new diagnostic category is the result of over three decades of clinical observations, scientific research, and international discussion amongst trauma experts.

**History of the Complex PTSD Diagnosis**

The shortcomings of the PTSD diagnosis became apparent shortly after publication of the third edition of the DSM (DSM-III; APA, 1980). DSM-III was the first edition of the manual to include the PTSD diagnosis. However, researchers and clinicians working with traumatized populations quickly recognized that PTSD did not adequately capture the posttraumatic symptoms of survivors of all types of trauma. More specifically, traumas that (1) were repetitive and prolonged, (2) involved harm or abandonment by caregivers or other attachment figures, and/or (3) occurred at developmentally vulnerable times within the victim’s life, such as early childhood or adolescence were observed to have different effects than traumas that occurred only in adulthood, one time, or in an accidental manner (i.e., natural disasters, car accidents; Ford & Courtois, 2009). The former types of trauma have been categorized as *complex*
psychological trauma (Ford & Courtois, 2009). The symptoms observed in complex trauma survivors have not only been found to be substantially different from those that comprise PTSD, but they have also been observed to be associated with greater functional impairment (Ford, 1999). Comorbid diagnoses were often necessary to fully capture the symptom presentations of individuals exposed to complex trauma, which led to convoluted and often ineffective treatment plans (Courtois, 2008). Professionals in the traumatic stress field thus called for the creation of a diagnosis distinct from the current PTSD diagnosis that captured the unique impact of complex trauma on a person’s personality development and attachment style in order to better direct the assessment of and treatment planning for survivors of complex trauma.

Herman’s seminal work on this topic (1992) described seven specific problem areas that she observed in individuals who had experienced complex traumas that were not common to all individuals suffering from PTSD: (1) alterations in the regulation of affective impulses; (2) alterations in attention or consciousness (i.e., dissociation); (3) alterations in self-perception resulting in chronic feelings of guilt or shame; (4) alterations in perceptions of the perpetrator of their trauma; (5) alterations in their relationships with others that result in not being able to trust or be intimate with others; (6) somatization and/or medical problems; and (7) alterations in their systems of meaning. Ford (2009) proposed that these particular problems occur because complex trauma negatively impacts the development and function of the brain systems responsible for emotion regulation and information processing. Prolonged trauma that occurs at critical developmental periods during childhood and/or adolescence directly impacts the developmental trajectories of an individual, or the changes in the body and personality
that occur as a person develops and learns from experiences. Complex trauma therefore would shape the types of stimuli within a person’s environment to which they attend, how they form relationships with others, and the manner in which they approach life experiences generally (Ford, 2009). These types of effects have profound implications for the types of dysfunction that would be experienced by an individual who has experienced complex trauma and likely extend beyond those described in the PTSD criteria. Thus, the first conceptualization of a complex traumatic stress disorder was proposed to be included in the fourth edition of the DSM (DSM-IV; APA, 1994) and called Disorders of Extreme Stress, Not Otherwise Specified (DESNOS).

**DESNOS.** The proposed criteria for DESNOS described the self-regulatory functions thought to be impaired by the experience of complex trauma as described by Herman (1992) and that were associated with profound and enduring problems not captured by the PTSD diagnostic criteria (Ford & Courtois, 2009). Field trials for this new diagnosis were conducted between 1991 and 1992 in order to determine whether it would be included in the DSM-IV as a separate diagnosis from PTSD. However, the researchers who conducted the DSM-IV PTSD Field Trials (van der Kolk, Pelcovitz, Roth, Mandel, McFarlane, & Herman, 1996) concluded that DESNOS was too rare (occurring in less than 7% of treatment and community samples) and too comorbid with PTSD (71%) to be included as a stand-alone disorder in the DSM-IV.

Despite this apparent setback, the DSM-IV field trials also demonstrated that the proposed diagnosis had high construct validity, as it only occurred in trauma survivors and rarely occurred in individuals not exposed to trauma. This result encouraged several researchers to conduct subsequent investigations of complex traumatic stress syndromes.
These studies provided support for the clinical usefulness of a separate diagnosis from PTSD in a variety of populations including combat veterans, victims of child abuse, and women exposed to intimate partner violence (Ford, 1999; Ford & Kidd, 1998; Pelcovitz & Kaplan, 1995). They also demonstrated that DESNOS symptoms were distinct from those associated with PTSD, as they could not be explained by the presence of PTSD symptoms (Roth Newman, Pelcovitz, Van der Kolk, & Mandel, 1997).

These studies also provided evidence that certain types of trauma, specifically early interpersonal traumas (i.e., child abuse), were more strongly associated with the symptoms of DESNOS than other types of trauma, such as accidents and natural disasters (Roth et al., 1997). That being said, ‘complex trauma history’ never became part of the criteria proposed for DESNOS or any other complex PTSD diagnosis to date. Researchers and clinicians recognized that early interpersonal traumas were a risk factor for this type of diagnosis, but the symptoms of DESNOS were also observed in individuals without a complex trauma history (Roth et al., 1997). It was therefore decided that the type of trauma experienced by an individual should not be part of the criteria for disorders like DESNOS, as it could prevent individuals exhibiting DESNOS symptoms from receiving the diagnosis and access to treatments specifically designed to alleviate these symptoms.

Complex PTSD and the International Classification of Diseases. The findings previously described were taken into consideration as the 10th revision of the International Classification of Diseases (ICD-10; WHO, 1994) was made. Diagnoses relevant to these observations were included in the ICD-10 in the form of two personality disorders specific to personality changes that occur after catastrophic experiences, (1)
traumatic stress personality disorder and (2) posttraumatic personality disorder (Classen, Pain, Field, & Woods, 2006; Ford & Courtois, 2009; Parson, 1997). Subsequently, these personality disorders were replaced with the Complex PTSD (CPTSD) diagnosis previously described in the 11th revision of the ICD (ICD-11; WHO, 2018; Karatzias et al., 2017a).

The International Trauma Questionnaire (ITQ; Cloitre et al., 2018) is a self-report measure that has been validated for the assessment of ICD-11 PTSD and CPTSD symptoms in both clinical and community samples. The three symptom clusters of PTSD (i.e., re-experiencing, avoidance, a current sense of threat) and the three DSO clusters specific to CPTSD (i.e., affect dysregulation, negative self-concept, and disturbances in relationships) are each represented by two items, leading to a total of 12 items for this measure. Respondents are asked to rate how much they have been bothered by each problem in the past month using a scale ranging from 0 (Not at all) to 4 (Extremely). The ITQ has undergone multiple revisions in order to identify the items that best represent the six symptom clusters that make up the PTSD and CPTSD diagnoses, and several studies have confirmed the latent structure of the ITQ, which comprises separate latent factors for PTSD and DSO. This finding further confirms the idea that PTSD and CPTSD are separate but related constructs (Brewin et al., 2017; Cloitre et al., 2018).

*ICD-11 CPTSD and Trauma Type.* Research has demonstrated an association between the ICD-11 CPTSD symptoms and the experience of complex trauma, such as childhood interpersonal trauma. Hyland and colleagues (2017) used data from a national study conducted by The Danish National Centre for Social Research to investigate what factors differentially predict a PTSD and CPTSD response to trauma. The authors found
that childhood sexual abuse was the strongest risk factor for CPTSD and was the only trauma type that differentiated between participants classified as meeting the criteria for PTSD versus CPTSD. Also, exposure to childhood and/or adulthood physical assault increased the risk of being classified as having CPTSD. Finally, cumulative exposure to childhood interpersonal trauma was positively correlated with CPTSD symptom severity in their sample from a national study. More research is needed to confirm and expand upon these findings, but the results make sense given that the ICD-11 CPTSD diagnosis is attempting to capture the pervasive physical and psychological effects that the experience of early life complex trauma can cause.

Despite the connections that have been drawn between experiences of interpersonal, repeated, and prolonged forms of trauma and more complex symptom profiles such as that comprised by the ICD-11 CPTSD criteria, the experience of a complex trauma is not required for an individual to qualify for a diagnosis of CPTSD. Exposure to trauma is still a criterion, but the type of trauma is considered to be only a risk factor for the development of CPTSD symptoms in addition to those associated with PTSD. Labeling trauma type as a risk factor rather than as a requirement for a CPTSD diagnosis was done with the intent to recognize the important influence of genetic and environmental risk and protective factors on post-trauma adaptation (Hyland et al., 2017). Researchers have recognized that CPTSD symptoms are more likely to develop after the experience of a complex trauma, but that they are not exhibited only by individuals who have been exposed to this type of trauma (van der Kolk et al., 2005). Therefore, it would be imprudent to limit this diagnosis only to those with a specific trauma history if others
without a complex trauma history profile could benefit from treatments specifically for CPTSD symptoms (Brewin et al., 2017).

**Comparing ICD-11 PTSD and CPTSD to Other Trauma-Related Disorders**

**ICD-11 CPTSD versus DESNOS.** The ICD-11 CPTSD diagnosis was created based on the symptoms most frequently reported by participants in the CPTSD Field Trials for DSM-IV (Hyland, Murphy, Shevlin, Vallières, McElroy, …, & Cloitre, 2017; van der Kolk, Roth, Pelcovitz, Sunday, & Spinazolla, 2005). However, there are significant differences between the criteria proposed for DESNOS and those listed in the ICD-11 for CPTSD. Most prominently, symptoms of dissociation and somatization are not included in the ICD-11 CPTSD criteria, but were part of the DESNOS conceptualization. This is somewhat surprising given that van der Kolk and colleagues (2005) reported that the rate of dissociation was significantly higher for individuals who experienced early-onset abuse (80%) compared to those who experienced late-onset abuse (59%) or a natural disaster (44%; van der Kolk et al., 2005). Although the CPTSD criteria is not based on the type of trauma experienced by an individual, this finding by van der Kolk and colleagues suggested that dissociation is more specific to the experience of early interpersonal traumas than other types of trauma, and therefore may be indicative of a Complex PTSD symptom profile. A similar trend was found for digestive problems, a form of somatization. Digestive problems were reported significantly more often by survivors of early-onset (69%) and late-onset abuse (60%) than by survivors of natural disasters (29%), but no significant difference was found between the frequencies of reporting for the early-onset and late-onset abuse groups.
Surprisingly little has been written about the decision process that led to the exclusion of dissociation and somatization from ICD-11’s conceptualization of CPTSD. However, the ICD-11 Working Group for Disorders Specifically Associated with Stress was working within the confines of the ICD-11’s emphasis on clinical utility, which translates to limiting the number of symptoms that make up a diagnosis (Brewin et al., 2017). The DESNOS conceptualization originally had 6 scales and 27 subscales that comprised 48 symptoms (Brewin et al., 2017), so it may have been virtually impossible to include all of the DESNOS symptoms that were commonly reported in the ICD-11 CPTSD criteria while still adhering to the ICD-11’s requirement of a limited number of symptoms. Additionally, in a review of the current evidence regarding the ICD-11’s PTSD and CPTSD diagnoses, Brewin and colleagues (2017) described dissociation as a symptom that should be revisited in the future, as it is unclear based on our current understanding of whether it should be considered a form of re-experiencing (and therefore fall under the PTSD diagnosis) or a symptom of emotion dysregulation (and thus be considered part of the CPTSD diagnosis). This discussion suggests that more research is necessary before a final decision can be made regarding how to handle dissociation (and presumably somatization) in relation to PTSD and specifically whether it should be included in the ICD’s conceptualization of either the PTSD or CPTSD diagnosis.

**ICD-11 PTSD and DSM-5 PTSD.** The ICD-11 PTSD criteria is substantially different from the criteria for PTSD included in the DSM-5. The ICD-11 includes only three of the five symptom clusters needed for a diagnosis of PTSD according to the DSM-5, and the ICD-11 has more strict criteria for meeting a diagnosis of PTSD than
does the DSM-5. Comparison analyses of the ICD-11 and DSM-5 PTSD criteria have confirmed that the ICD-11 criteria for PTSD is indeed more strict even when rates of DSM-5 PTSD are compared to rates of ICD-11 PTSD and CPTSD combined. Approximately 13% of individuals who met the criteria for PTSD under DSM-5 did not meet the ICD-11’s criteria for PTSD or CPTSD (Hyland et al., 2017).

Some have argued that the difference in prevalence rates that results when different PTSD diagnostic systems are used suggests that the ICD-11 is diverging too far from what is already known about PTSD (Vermetten, Baker, Jetly, & McFarlane, 2016). However, Brewin and colleagues (2017) offer that there is as of yet no universally-accepted empirical foundation for PTSD given the relatively recent creation of the diagnosis (APA, 1980), and the field should continue to advance the diagnostic criteria as our understanding of the condition changes.

Another concern is that individuals identified as having PTSD under the less strict DSM-5 criteria will not receive a diagnosis of PTSD under ICD-11 and therefore not have access to appropriate treatment. However, PTSD as defined by the DSM-5 has been criticized for overlapping with the symptoms of several other diagnoses, including depression, phobias, and other anxiety disorders (Brewin, Lanius, Novac, Schnyder, & Galea, 2009). The considerable overlap in symptoms with other diagnoses makes it likely that individuals who no longer meet PTSD criteria under ICD-11 will still receive other diagnoses, and therefore appropriate treatment. Assigning diagnoses other than PTSD and subsequently applying non-trauma-focused treatment plans to their care may even increase the efficacy of psychotherapy, as trauma-focused treatments may not be appropriate for individuals with a symptom profile primarily dominated by depressive or
generalized anxiety symptoms, even if the symptoms developed after the experience of a trauma (Brewin et al., 2017). The average Cohen’s $d$ effect size of 1.43 for PTSD treatments (Bradley, Greene, Russ, Dutra, & Westen, 2005; Cusack et al., 2016) indicates that people benefit from these interventions, but there is substantial “room for improvement” (Brewin et al., 2017, p. 9). Further research is necessary to explore this speculation, and the differences in the DSM-5 and ICD-11 PTSD criteria offer the field the opportunity to do so.

**Complex PTSD and DSM-5**

A CPTSD diagnosis has yet to be included in the DSM as a separate disorder from PTSD despite the advances made in regard to CPTSD in the ICD-11 and the support research provides for the potential clinical utility of such a diagnosis. A dissociative subtype of PTSD has been included in the most recent edition of the DSM (DSM-5; APA, 2013), which was intended to fulfill the need for a complex traumatic stress syndrome by capturing the dissociative symptoms often experienced by individuals exposed to complex trauma that are not seen in all individuals diagnosed with PTSD. Overlap can also be observed between the DSM-5 PTSD symptoms and the DSO categories of the ICD-11 CPTSD diagnosis. For example, the DSO category of ‘affect dysregulation’ is conceptually similar to the PTSD symptoms of having difficulty experiencing positive feelings or expressing irritability or anger through one’s behavior. The PTSD symptom of feeling distant or cutoff from others can also be compared to the DSO category of ‘disturbances in relationships.’ The parallels that exist between the DSO clusters and certain symptoms of the PTSD diagnosis suggests that the DSM-5 conceptualization of PTSD may be too broad and is attempting to cover symptoms that
may be more appropriately assigned to a complex traumatic stress syndrome. This could also potentially explain why significant overlap occurs between the PTSD criteria and the criteria of other psychological disorders (Brewin, Lanius, Novac, Schnyder, & Galea, 2009).

The fact that the DSM-5 does not include a separate diagnosis equivalent to the ICD-11 CPSTD category suggests that the effects of complex trauma and the development of complex posttraumatic sequelae continue to be too debatable for a consensus to be reached regarding how to handle them diagnostically. Although the ICD-11 has formally created a CPTSD diagnosis, it is being questioned by several in the field of clinical psychology (e.g., Vermetten, Baker, Jetly, & McFarlane, 2016), and it still remains to be seen whether this new diagnosis has clinical utility in regard to treatment effects (Brewin et al., 2017). As always, more research is needed to understand how complex trauma syndromes develop, the mechanisms that underlie them, and how best to treat individuals with PTSD due to complex trauma. Deficits in the ability to regulate one’s emotions has specifically been identified as a potential underlying mechanism of complex trauma sequelae and a target for mental health treatment.

**Emotion Regulation**

Emotion regulation, or “how individuals influence which emotions they have, when they have them, and how they experience and express them” (Gross, 1998, p. 271), has been a primary focus of treatments developed for the treatment of complex trauma sequelae to date. The notion that the experience of complex trauma would lead to difficulties with emotion regulation comes from the field of developmental psychology (Ehring & Quack, 2010). The occurrence of complex traumas at developmentally critical
periods within an individual’s life and the severity of such traumas may interrupt the normal development of emotion regulation abilities in multiple ways.

First, complex trauma has been observed to physically compromise the development of the neural networks used to regulate the stress response (Frewen & Lanius, 2006). Whereas detecting emotion-related stimuli in one’s environment and generating emotions are considered to be automatic or ‘bottom-up’ processes, intentionally regulating one’s affective states is considered to be a ‘top-down,’ or executive function (Gross, 1998; Phillips, Drevets, Rauch, & Lane, 2003). Neuroimaging studies have provided evidence that areas of the brain involved in executive functioning, such as the dorsolateral and ventromedial prefrontal cortex (PFC), anterior cingulate cortex (ACC), and orbitofrontal cortex (OFC), are activated when individuals are actively regulating their emotions (Ochsner, Bunge, Gross, & Gabrieli, 2002; Phan, Fitzgerald, Nathan, Moore, Uhde, & Tancer, 2005; Schaefer et al., 2003). Individuals with PTSD have demonstrated two activation patterns in response to traumatic stimuli. The first is an underactivation of the brain areas involved in emotion regulation, leading to feelings of being overwhelmed by their traumatic memories and sometimes of reliving the event(s) in the form of flashbacks (Lanius et al., 2001). The second pattern is an overactivation of these same brain regions, which is associated with dissociation and feelings of detachment (Hooper, Frewen, van der Kolk, and Lanius, 2007; Lanius et al., 2002).

Second, complex trauma often jeopardizes the relationships victims have with their primary caretakers, from whom they learn adaptive emotion regulation strategies through repeated interactions and modeling (Calkins & Hill, 2007). Children learn through interactions with their caregivers which strategies are most useful for reducing
emotional arousal (Sroufe, 1996). The child also develops an “internal working model,” or a cognitive representation of themselves and others, through these repeated interactions with their caregivers (Bowlby, 1988). This working model then shapes the child’s expectations about future interactions, how people will respond to their emotional needs, and their ability to regulate their own emotional arousal (Ainsworth, Blehar, Waters, & Wall, 1978).

Research has shown that children who develop insecure attachment demonstrate difficulties in emotion regulation, including decreased emotional self-awareness, difficulty modulating positive emotions, and difficulty recovering from distress (e.g., Shields & Cicchetti, 1997). Furthermore, several studies have demonstrated that childhood maltreatment, a form of complex trauma, is one of the strongest predictors of developing an insecure attachment style and psychological maladjustment in later life (e.g., Riggs et al., 2007). Attachment theory asserts that individuals with insecure attachment styles do not receive the opportunity to learn how to adaptively regulate negative emotions, and this is associated with compromised functioning in several domains later in life (Bowlby, 1988). Ford (2009) summarized this process and the work of Lyons-Ruth and colleagues (2006) by stating,

> When attachment relationships are disrupted or lost in infancy or toddlerhood, the coregulation, modeling, and guidance that is necessary for children to learn how to recognize, label, and modulate the behavioral expression of emotions and impulses may be severely compromised. (p. 48)

Without any form of correction, this compromised development can engender dysfunction across the lifespan. Path analysis research has provided empirical support for this assertion, demonstrating that insecure attachment leads to emotion regulation
difficulties, which then leads to decreased functional status in adulthood (Cloitre, Stovall-McClough, Zorbas, & Charuvastra, 2008).

**Emotion Regulation and PTSD**

Difficulties with emotion regulation are not necessarily unique to the experience of complex trauma, however. Several studies have demonstrated a relationship between emotion regulation difficulties and the development of PTSD after the experience of both complex and non-complex traumas. Individuals with PTSD have been observed to experience alexithymia (Frewen, Dozois, Neufeld, & Lanius, 2008), suppress negative emotions (e.g., Moore, Zoellner, & Mollenholt, 2009), avoid experiences that have the potential to elicit negative emotions (e.g., Kashdan, Morina, & Priebe, 2009), and self-report issues with emotion regulation (Tull, Barrett, McMillan, & Roemer, 2007) in reaction to multiple types of trauma. Lanius et al. (2001; 2002) observed dysregulation of the brain areas associated with emotion regulation in participants who had been exposed both to complex trauma (i.e., sexual assault or abuse) and non-complex trauma (i.e., motor vehicle accidents). Furthermore, Jerud, Zoellner, Pruitt, and Feeny (2014) conducted a study of emotion regulation in adults with and without a history of childhood abuse (a form of complex trauma) and found no difference in emotion regulation abilities between the two groups.

However, the timing of complex traumas at developmentally critical periods and the fact that attachment bonds may be disrupted because caretakers or other trusted individuals are often involved in the perpetration of complex trauma makes the potential impact of complex trauma on emotion regulation abilities more severe than the impact of non-complex trauma on this domain (Ford, 2009; Frewen & Lanius, 2006). Some
research has demonstrated a stronger relationship between emotion regulation difficulties and the experience of complex trauma than between emotion regulation and non-complex trauma.

**Emotion Regulation and Complex Trauma**

Ehring and Quack (2010) conducted an online investigation of the relationship between PTSD and emotion regulation difficulties in a sample of 616 individuals exposed to at least one traumatic event within their lifetime. Participants were classified into one of four groups based on the type of trauma they had experienced: (1) survivors of non-interpersonal traumas, (2) survivors of late-onset interpersonal traumas, (3) survivors of early-onset single or repeated interpersonal traumas that lasted for less than one year, and (4) survivors of early-onset chronic interpersonal traumas that lasted for at least one year. The authors observed that individuals exposed to early-onset chronic interpersonal traumas had greater emotion regulation difficulties than individuals exposed only to single-event or late-onset traumas. On the surface, this finding supports the idea that complex trauma leads to greater emotion regulation difficulties than the experience of other types of traumas. However, when Ehring and Quack (2010) controlled for PTSD symptom severity in the previously described analyses, the differences in emotion regulation abilities between the various trauma-exposed groups remained significant for only two of the nine dimensions of emotion regulation measured, specifically the Lack of Emotional Clarity subscale (e.g., “I am confused about how I feel”) and the Difficulties with Goal-Directed Behavior When Distressed subscale (e.g., “When I'm upset, I have difficulty getting work done”; Gratz & Roemer, 2004).
Although two of nine dimensions were still significant, this substantial change brings into question whether the greater emotion regulation difficulties are due to the type of trauma experienced or simply the experience of more severe PTSD symptoms. The latter would support the idea that emotion dysregulation is an underlying mechanism of general PTSD symptoms. However, Ehring and Quack (2010) proposed that the constructs of emotion regulation and PTSD as operationalized via self-report measures in their investigation overlap considerably. They concluded that if this is indeed the case, then it is possible that the effect of PTSD symptom severity as a covariate was artificially increased and led to Type II error in their study.

Kulkarni, Pole, and Timko (2012) observed a similar pattern of findings and possibly encountered the same methodological issue. This group studied 150 retired police officers and found that the experience of childhood victimization was significantly negatively correlated with negative mood regulation (-.21, \( p < .01 \)), while only experiencing adult trauma was not significantly correlated with this variable (.11, \( p > .05 \)). Upon further examination, the authors found that adult PTSD symptom severity mediated the relationship between childhood victimization and emotion regulation difficulties, rather than emotion regulation mediating the relationship between childhood victimization and PTSD symptom severity. These results bring into question whether the greater emotion regulation difficulties observed in complex trauma survivors are a result of the experience of complex trauma or simply the development of more severe PTSD symptoms. However, it is possible that the operationalization of PTSD and emotion regulation in this study overlap as they did in Ehring and Quack’s (2010) investigation, which could confound the results of this study as well.
Given the mixed results in this area of research, it is possible that emotion regulation difficulties are the result of any traumatic experience that results in the development of PTSD rather than the result of experiencing complex trauma specifically. However, in addition to the issue of construct overlap raised by Ehring and Quack (2010), both their study and Kulkarni et al.’s (2012) study relied on self-report, cross-sectional data. This limits the confidence that can be placed in their conclusions in relation to longitudinal relationships. Self-report questionnaires can limit how well constructs can be differentiated from one another given the constraints of needing to use words familiar to responders. Responses to self-report questionnaires are also often affected by response bias. Furthermore, several measures of emotion regulation exist, and each operationalizes this construct in a slightly different manner, which could be contributing to the unclear results of investigations into emotion regulation and its relationships with other constructs.

**Operationalizing Emotion Regulation**

Many measures of emotion regulation have been developed and used in post-trauma outcomes research. Some of these measures include the Negative Mood Regulation Scale (NMRS; Catanzaro & Mears, 1990), the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), and the Emotion Regulation Questionnaire (ERQ; Gross and John, 2003). Each of these measures is based on a different theory of emotion, and therefore each assesses the construct of emotion regulation in a unique way.

**The NMRS and the DERS.** Catanzaro and Mears (1990) created the NMRS based on the concept of generalized expectancies from social learning theory (Rotter,
1954) as applied to people’s behavior regarding changing their negative mood states. The authors believed that people’s generalized expectancies about their ability to change negative mood states influence their actual behavioral and cognitive attempts to cope with negative mood. They therefore created a measure to assess people’s generalized expectancies about their negative mood states: the NMRS. Gratz and Roemer (2004), on the other hand, drew on multiple theories of emotion regulation (e.g., Cole, Michele, & Teti, 1994; Hayes et al., 1996; Thompson & Calkins, 1996) in order to develop what they considered to be a comprehensive conceptualization of emotion regulation. They concluded that emotion regulation involves four dimensions: (1) awareness and understanding of emotions, (2) acceptance of emotions, (3) the ability to manage negative emotions in order to enact goal-directed behavior, and (4) the ability to access and use emotion regulation strategies in a context-dependent manner. The DERS was thus created to measure these four aspects of emotion regulation.

The ERQ. In contrast to the NMRS and the DERS, the ERQ (Gross & John, 2003) was developed on the basis of the process model of emotion, which proposes that people evaluate emotion cues, which leads to the experience of an emotion. Emotions then lead to coordinated sets of experiential, behavioral, and physiological responses. The authors assert that once responses arise, we can modulate these responses using both strategies that we implement before the emotion response tendencies become fully activated (antecedent-focused) and strategies that we use once the response tendencies are already underway (response-focused). Gross and John (2003) decided to focus their scientific study on two strategies that they believed exemplify each of the types of strategies previously described, are used commonly in everyday life, and that could be
manipulated experimentally: cognitive reappraisal and expressive suppression. They have found that the use of cognitive reappraisal is associated with a greater expression of positive emotion, less experience of negative emotion, better interpersonal functioning, and correlates positively with overall well-being. The inverse has been found for the use of expressive suppression, which has been associated with the experience and expression of less positive emotion (Gross & John, 2003). Additionally, suppression has been shown experimentally to be associated with more negative outcomes, including disrupted communication and increased blood pressure (Butler et al., 2003).

**Flexible Regulation of Emotional Expression (FREE).** Finally, the authors of the FREE (Burton & Bonanno, 2016) emphasized that flexibility in self-regulatory behaviors is an important component of adjusting to stressful situations, and the context in which particular strategies are used is important to determining whether they are functional or dysfunctional strategies (Burton & Bonanno, 2016). Burton and Bonanno suggested that deeming certain emotion regulation strategies as unequivocally dysfunctional disregards the fact that these strategies have been functional within certain contexts, including social interactions (Robert, Levenson, & Gross, 2008). The authors suggest that other measures of emotion regulation were too focused on the frequency with which emotion regulation strategies are used with little to no attention given to the context in which those behaviors are enacted. Thus, the FREE was designed to measure emotion regulation while considering the importance of the context and the use of a variety of regulation strategies. This was done by posing hypothetical scenarios to respondents and asking them how they would respond under those particular circumstances.
Comparing ER Constructs and Measures. The NMRS, the DERS, and the ERQ have each been used in previous studies of complex trauma sequelae. However, the FREE scale most directly assesses flexibility in the use of emotion regulation strategies, which is thought to be necessary for effective emotion regulation by some theorists (Burton and Bonanno, 2016; Cole et al., 2004). The DERS assesses a respondent’s access to emotion regulation strategies, but it does not directly assess how flexibly and/or effectively one uses those strategies. The newness of the FREE measure (being published in 2016) means that it has either not been used in studies of complex trauma sequelae or the results of these studies have not been published yet. It is therefore impossible to know at this time whether more traditional measures of emotion regulation (e.g., the NMRS, DERS, or ERQ) or the FREE is the most appropriate measure of emotion regulation for studies of CPTSD symptoms.

Furthermore, the differences between the measures, specifically how they conceptualize emotion regulation, could be adding to the confusion regarding the relationship between emotion regulation abilities and complex trauma sequelae. Alternatively, it may be that self-reported emotion dysregulation is not fully capturing the effects of complex trauma and therefore is not adequately differentiating the effects of complex trauma from those of non-complex trauma.

Are Self-Report Assessments Enough?

From the perspective of developmental psychology, emotion regulation is seen as part of a larger self-regulatory system. Ford (2009) described that the experience of early interpersonal trauma influences not only the development of emotion regulation abilities, but also the areas of the brain that determine how people process information, which will
have an immense impact on how they think about themselves in relation to others and the world around them and the choices and behaviors they enact. Brain areas used during emotion regulation are significantly intertwined with areas used for other self-regulatory capacities (Calkins & Hill, 2007). The brain areas involved in emotion regulation are part of the executive functioning system, which is responsible for not only emotion regulation, but also judgment, planning, attention and other cognitive processes. The structural brain abnormalities of individuals with CPTSD have been observed to be more extensive than and distinctive from the structural abnormalities of individuals with PTSD caused by a single-incident trauma (Thomaes et al., 2015).

If differences have been observed at the neurobiological level but not consistently at the behavioral level, then it may be that self-report assessments are insufficient for capturing trauma’s full effects on a person. Self-report questionnaires are not likely to be sensitive to differences at the neurobiological level as observed by Thomaes and colleagues (2015). The field’s primary reliance on self-report measures of emotion regulation to date may explain the lack of consistent explanatory power of this construct in regard to complex trauma sequelae. It may therefore be helpful for future studies to operationalize each of the constructs of interest in a manner other than self-report questionnaires given their possible limitations. Future studies of complex trauma sequelae should also control for PTSD symptom severity as was done in previous studies in order to differentiate between the effects of trauma type and PTSD symptom severity on emotion regulation.
**Beyond Emotion Regulation**

Furthermore, how could complex trauma only affect emotion regulation abilities if the brain areas responsible for this function are also involved in a variety of other processes? The idea that trauma could be affecting a broader self-regulatory system in some individuals is recognized by the ICD-11 CPTSD diagnosis, which captures trauma’s impact on three domains of ‘self-organization.’ Emotion dysregulation is only one of those three areas. This indicates that the research on complex trauma sequelae has produced and clinicians have observed disturbances in self-organization in more areas than just emotion regulation. Thomaes et al.’s (2015) findings also warrant the consideration of other constructs that could account for the potentially more pervasive dysregulation experienced by individuals with CPTSD. Thus, we may need to expand our search for mechanisms underlying complex trauma sequelae to encompass other self-regulatory capacities.

**Self-Regulation versus Self-Organization.** Self-regulation is a person’s ability to regulate or manage his or her internal experiences in order to respond effectively to external stimuli and engage in goal-directed behaviors. The development of self-regulation starts early in life and is shaped by the interactions a child has with his or her caregivers and environment (Ford, 2009). Self-regulation is thought to have a strong biological basis and involve several brain areas, including the limbic system, the cortices, and the brainstem. Trauma, especially developmental trauma, is thought to significantly affect the biological systems underlying self-regulation. Ford (2009) defined two specific areas of self-regulation impacted by trauma: (1) emotion regulation abilities and (2) information processing. The dysregulation of these specific domains occurs via
detrimental effects on the neural networks underlying emotion regulation and information processing. The result of these effects include a sense of constant threat and emotional distress, an inability to attune to and modulate emotional responses, and the attending to any stimuli that could potentially be threatening. Ford (2009) refers to this state as “survival brain.” Survival brain leaves few mental resources available to engage in self-directed emotion regulation, the development of meaningful relationships, or openness to new experiences, all of which are necessary for the development of an integrated self-concept.

The deficits produced by a lack of self-regulation (i.e., being in “survival brain”) reflect the disturbances in self-organization that make up the ICD-11 CPTSD symptom clusters. Thus, one way to think about the relationship between self-regulation and self-organization is that deficits in self-organization are secondary to deficits in self-regulation. Self-regulation may therefore be a major underlying mechanism of self-organization – Without the capacity for self-regulation, one is unlikely to be able to develop an organized self-concept or an effective means of interacting with the world around them. Self-regulation may not be all that is required to develop self-organization, but it is at least a foundational aspect of self-organization, and thus relevant to the development and maintenance of CPTSD symptoms.

**Summary.** Individuals with emotion regulation difficulties are often seen to be rigid in their use of emotion regulation strategies, relying on only a few strategies to respond to all types of situations, stressors, and stimuli. If they are demonstrating rigidity in this one area of functioning, and the areas of the brain that are used for emotion regulation are also implicated in other self-regulatory processes (i.e., information
processing; Ford, 2009), it is possible that these individuals are demonstrating rigidity, or a lack of flexibility in other domains of functioning, including their psychological and cognitive processes, especially those involved in other executive functions.

**Psychological Flexibility**

One potential construct to consider as an underlying mechanism of CPTSD is psychological flexibility. Psychological flexibility has been defined as how one adapts to changing situational demands, allocates mental resources, shifts perspective, and finds balance in the face of competing demands (Kashdan & Rottenberg, 2010).

The specific term “psychological flexibility” has received increasing attention over the last two decades from the field of clinical psychology due to the centrality of this construct to a prominent third-wave behavioral therapy, Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 2003). The primary goal of ACT is to develop psychological flexibility, as flexibility is believed to be a key mechanism of change that leads to psychological well-being (Kashdan & Rottenberg, 2010). Psychological flexibility is thought to result in an individual being open and willing to experience the discomfort associated with difficult internal and external experiences. This mitigates the avoidance of unpleasant experiences and allows the individual to live more in accordance with their values despite the potential for encountering difficult or uncomfortable experiences.

A significant amount of research on psychological flexibility has been conducted using the definition associated with ACT and operationalized via self-report measures such as the Acceptance and Action Questionnaire (AAQ, Hayes, Strosahl, & Wilson, 2003; AAQ-II, Bond et al. 2011). This questionnaire was designed specifically to
measure experiential avoidance (EA), which is thought within ACT to be indicative of psychological inflexibility. EA involves both emotional and cognitive avoidance employed in an effort to minimize the discomfort associated with internal experiences (Hayes et al., 1996). It is considered to be a manifestation of psychological inflexibility because engaging in EA leads one to respond in a consistent or inflexible manner to a variety of stimuli.

However, Kashdan and Rottenberg (2010) asserted that the construct of psychological flexibility encompasses more than simply the acceptance of unpleasant experiences. They argued that psychological flexibility has actually been studied for several decades under terms such as ego-resiliency, executive control, and self-regulation. This assertion highlights the fact that researchers have struggled to name, define, and routinely study this dynamic construct that encompasses emotional, behavioral, and cognitive functions. This uncertainty has resulted in fragmented research conducted by groups from several areas of psychology that is rarely synthesized and integrated. Future investigations may be necessary to determine how broadly this construct should reach and how to best measure it if it is indeed a dynamic construct as some researchers have suggested (e.g., Kashdan & Rottenberg, 2010; Wolgast, 2014).

Currently, psychological flexibility is only measured through self-report questionnaires like the AAQ-II and the Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs, Rogge, & Wilson, 2018).

**Psychological Flexibility versus Cognitive Flexibility**

One concept commonly studied and most closely related to psychological flexibility is cognitive flexibility. Cognitive flexibility is a component of the executive
function system and has been defined as the ability to change and adapt one’s behavior, including both actions and thoughts, in response to changing environments and stimuli (Whiting, Deane, Simpson, McLeod, & Ciarrochi, 2015). It is considered to be a dynamic process involving several executive functions, attention, memory, and other cognitive mechanisms (Ionescu, 2012), some of which are processes that cannot be consciously observed or accurately reported on by an individual.

Definitionaly, cognitive flexibility overlaps considerably with the broadly defined construct of psychological flexibility. However, Whiting and colleagues (2015) suggested that psychological flexibility encompasses more domains than cognitive flexibility, and they point to measurement instruments for the two constructs as evidence for this assertion. As previously described, psychological flexibility has been operationalized via self-report measures, and these assessments attempt to capture how psychological flexibility functions at the emotional, behavioral, and cognitive levels. Cognitive flexibility, on the other hand, has been operationalized primarily through neuropsychological tasks, as well as through self-report measures. The neuropsychological tasks used to assess cognitive flexibility tend to measure a person’s ability to switch between tasks or sets of information. Some feel that these tests are not ecologically valid tests of flexibility and may be reductionist given the breadth of domains to which flexibility could apply (Whiting et al., 2015). The existing self-report measures of cognitive flexibility tend to be limited to measuring the behavioral dimension of flexibility, and specifically behavioral processes associated with cognitive behavior therapy, such as challenging dysfunctional thoughts and generating alternative explanations or solutions (Whiting et al., 2015).
A handful of studies have studied psychological and cognitive flexibility in tandem in an attempt to understand the relationship between these constructs. Palm and Follette (2011) measured psychological flexibility (using the AAQ) and cognitive flexibility (using a self-report measure, the Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995) in a sample of women who had experienced interpersonal victimization. The authors found a positive relationship between these two constructs ($r = .45$, $p < .01$).

Researchers have also studied cognitive flexibility in the context of mindfulness interventions, which is an intervention used within ACT to decrease experiential avoidance and ultimately increase psychological flexibility. Teper, Segal, and Inzlicht (2013) found an association between mindfulness and improved executive control, and Moore and Malinowski (2009) reported a positive association between mindfulness and cognitive flexibility measured via a Stroop task, which is one of the neuropsychological tasks commonly used to measure cognitive flexibility.

However, Semple (2010) found that a short-term mindfulness training did not result in improved cognitive flexibility measured via neuropsychological tasks, even though other domains of executive function (i.e., sustained attention) improved. Further, it is still in question whether the construct measured by self-report assessments of cognitive flexibility actually overlaps with the construct assessed by neuropsychological measures, as researchers have found a weak correlation between self-report and neuropsychological tests of cognitive flexibility (Johnco, Wuthrich, & Rapee, 2014). This lack of correlation calls into question which type of measure is actually measuring “cognitive flexibility” and whether the results of studies operationalizing cognitive flexibility using one or the other method are accurate.
Despite these measurement issues, the results of these studies suggested that some type of relationship exists between the similarly defined constructs of psychological and cognitive flexibility. Given the available evidence, Whiting and colleagues (2015) concluded that cognitive flexibility is likely a subcomponent of psychological flexibility given cognitive flexibility’s limited scope and psychological flexibility’s more far-reaching definition, but more research is needed to elucidate this relationship and understand how these two constructs interact on a functional level.

Furthermore, measures of both psychological and cognitive flexibility may still be warranted in any study of psychological flexibility given the objective lens that neuropsychological tasks of cognitive flexibility provide. Using neuropsychological tasks of cognitive flexibility in addition to self-report assessments of psychological and cognitive flexibility could capture a facet of flexibility that cannot be measured by self-report measures alone.

**Psychological Flexibility and PTSD**

The construct of psychological flexibility has been repeatedly associated with overall mental and physical well-being regardless of the precise definition or term through which it is operationalized (Kashdan & Rottenberg, 2010). Furthermore, the inverse of psychological flexibility, or inflexibility, has been associated several mental health disorders, including PTSD (e.g., Kumpula, Orcutt, Bardeen, & Varkovitsky, 2011; Meyer, La Bash, DeBeer, Kimrel, Gulliver, & Morisette, 2018; Orcutt, Bonanno, Hannan, & Miron, 2014). The relationship between inflexibility and PTSD symptoms makes sense in light of the theoretical foundations of both psychological flexibility and PTSD.
Theory. Relational Frame Theory. Given the centrality of psychological flexibility to Acceptance and Commitment Therapy (ACT), relational frame theory (RFT), which is central to the theoretical foundation of ACT, is relevant to understanding the theory of psychological flexibility. RFT posits that the relationships that people build between themselves and other objects in their environment, such as other people or objects that hold special meaning for a person, shape the language they use to describe and communicate with the world around them as well as their higher order cognition (Barnes-Holmes, Hayes, Barnes-Holmes, & Roche, 2002; Hayes et al., 2003). It has been suggested that rigidity, or inflexibility, in these relationships with objects in the environment can result in psychopathology (Barnes-Holmes, Barnes-Holmes, McHughes, & Hayes, 2004).

ACT encourages the development of greater flexibility through learning to accept things that cannot be changed or are not within a person’s control. This approach to treatment is substantially different from the approaches promoted by other theories of psychotherapy. For instance, cognitive behavioral approaches encourage people to change the way that they think about themselves or situations and to replace maladaptive thoughts with more functional ones. This strategy contrasts starkly with the practice of acceptance promoted by ACT. Still, the overarching goal according to both of these approaches is to increase a person’s flexibility by expanding the number of ways in which a person can choose to respond to situations, whether that is through the new skill of acceptance or a new way of thinking about something. Most importantly, the idea of a connection existing between inflexibility and psychopathology is common to both ACT and prevailing theories of PTSD (Foa & Kozak, 1986; Ehlers & Clark, 2000).
Emotional Processing Theory of PTSD. Rauch and Foa’s (2006) emotional processing theory of PTSD is an expansion of Foa and Kozak’s (1986) original emotional processing theory for anxiety disorders, and this original theory is further based on Lang’s bioinformational theory of fear (1977, 1979). Lang posited that fear is composed of memory structures that are themselves comprised of stimuli, associated behavioral and physiological responses, and meaning elements. In applying this theory to anxiety disorders, Foa and Kozak (1986) theorized that the fear structures underlying anxiety disorders are pathological, or that the structures include a disproportionate number of response elements, are not easily changed, and do not map onto reality. When adapted for PTSD, Foa and Rothbaum (1998) conjecture that the fear structure of those with PTSD includes excessive stimuli and response elements and pathological meanings associated with those stimuli and responses that are not easily changed. The goal of PTSD treatment is therefore to modify the pathological fear structure by requiring the person to process their emotional reactions to trauma-related stimuli, which will in turn assist them in replacing their dysfunctional cognitions with realistic ideas about the world and self (Rauch & Foa, 2006). The goal of modifying the fear structure is a form of increasing an individual’s psychological flexibility, which is necessary given that rigidity of the fear structure led to the development and maintenance of the person’s PTSD.

Cognitive Model of PTSD. A second theory of PTSD is Ehlers and Clark’s (2000) cognitive model of PTSD. The cognitive model asserts that PTSD symptoms develop and persist when an individual processes his or her trauma experience in a way that creates a constant sense of threat. This is caused by (1) a negative appraisal of the traumatic event and its consequences, and (2) the autobiographical memory of the event being poorly
elaborated and contextualized (Ehlers & Clark, 2000). These negative appraisals and poorly encoded memories are then reinforced by maladaptive behavioral strategies and cognitive processes. These strategies are employed as an attempt to control the perceived threat and symptoms being experienced by the person, but they ultimately maintain the individual’s PTSD symptoms (Ehlers & Clark, 2000). Part of the goal of PTSD treatment according to this theory is to modify problematic appraisals that maintain the current sense of threat they experience and reduce the frequency (or eliminate the use, if possible) of dysfunctional behaviors and cognitive strategies that exacerbate their PTSD symptoms or promote their problematic appraisals of the trauma or its sequelae (Ehlers & Clark, 2000). Again, the modification of cognitions and behaviors is a way of reintroducing flexibility into the person’s psychological processes, as their way of thinking about their trauma and their response to it have become rigid and almost automatic given the reinforcing relationship between the person’s appraisals and behaviors.

Theories of PTSD and the Role of Flexibility. Inflexibility at the emotional, cognitive, and behavioral levels is clearly central to the two most prominent theories of PTSD even if it is not called “psychological flexibility” within the context of either one. Despite not being explicitly referenced in the theories, the relevance of psychological inflexibility to the maintenance and development of PTSD has not been lost on several groups of researchers. Several studies of the relationship between PTSD and psychological/cognitive flexibility have been conducted, and the evidence produced by these investigations lends further support to the idea that psychological inflexibility is integral to the development of PTSD symptoms.
**Research with Psychological Flexibility.** Cross-sectional Research. Several studies have associated psychological inflexibility with increased PTSD symptom severity using cross-sectional designs. Plumb, Orsillo, and Luterek (2004) investigated the relationship between experiential avoidance (EA) and post-trauma symptomatology in 235 undergraduate students cross-sectionally. EA is a concept within ACT that is thought to be indicative of psychological inflexibility. EA involves both emotional and cognitive avoidance employed in an effort to minimize the discomfort associated with internal experiences (Hayes et al., 1996). It is considered to be a manifestation of psychological inflexibility because engaging in EA leads one to respond in a consistent or inflexible manner to a variety of stimuli. This construct is operationalized through the Acceptance and Action Questionnaire (AAQ; Hayes et al., 2003). Higher scores on the AAQ are indicative of greater EA and inflexibility. Plumb and colleagues (2004) observed that scores on the AAQ were significantly positively correlated with PTSD symptom severity \( (r = .37, p < .001) \). Using hierarchical regression, the authors also found that scores on the AAQ predicted PTSD symptom severity after accounting for the severity of the participants’ traumas. AAQ scores explained 13% of the unique variance in PTSD symptom severity in this investigation. These results were replicated by the same group with 37 combat-exposed, treatment-seeking male veterans. AAQ scores were once again significantly positively correlated with PTSD symptom severity \( (r = .32, p < .01) \) and predicted PTSD symptom severity after controlling for the severity of the participants’ combat trauma. AAQ scores similarly accounted for 13% of the unique variance in PTSD symptom severity (Plumb, Orsillo, & Luterek, 2004).
Meyer and colleagues (2013) later investigated the incremental, predictive validity of the updated version of the AAQ (AAQ-II; Bond et al. 2011) for PTSD symptom severity. This study was conducted with 109 trauma-exposed Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans and after accounting for previously identified predictors of PTSD development, including neuroticism (operationalized as negative and positive emotionality), peritraumatic dissociation, recent life stress, and perceived social support. The authors observed that higher AAQ-II scores accounted for 5% of unique variance on a clinician-administered measure of PTSD symptom severity (Clinician-Administered PTSD Scale; Blake et al., 1995) and 12% of unique variance on a self-report measure of PTSD symptom severity (PTSD Checklist – Military Version; Weathers, Litz, Herman, Huska, & Keane, 1993) after controlling for the identified predictors. The authors concluded that these findings supported the idea that EA is distinct from related constructs like the avoidance symptom cluster of PTSD, negative emotionality, and the experience of peritraumatic dissociation. EA and psychological inflexibility more generally are thought to reflect how a person generally relates to distress, which is likely characterized by a tendency to avoid all unwanted internal experiences.

Longitudinal Research. Longitudinal designs have also been used to investigate the relationship between psychological inflexibility and PTSD symptom severity, and the results of these studies confirm and expand upon the results obtained in cross-sectional studies. Kumpula, Orcutt, Bardeen and Varkovitsky (2011) investigated the role of EA in the onset and maintenance of posttraumatic stress symptomatology (PTS) in 532 undergraduate women who were exposed to a campus mass shooting. The authors found
that higher levels of EA as measured via the AAQ-II pre-shooting were predictive of dysphoria and intrusion symptoms one month post-shooting and of dysphoria and hyperarousal symptoms eight months post-shooting. The authors concluded that EA appears to increase vulnerability to PTSD. Their ability to collect information about EA and PTSS before the shooting and to control for pre-shooting PTSS increases the confidence that can be placed in the temporal precedence of EA to PTSS demonstrated in this study (Kumpula, Orcutt, Bardeen & Varkovitsky, 2011).

Researchers continued to follow this same group of undergraduate women exposed to the campus mass shooting for 31 months and collected seven sets of assessments in total. Orcutt, Bonanno, Hannan, and Miron (2014) therefore took the opportunity to examine post-trauma symptom trajectories longitudinally and predictors associated with these trajectories. The 660 female participants exhibited four distinct trajectories: (1) a minimal impact-resilient group, (2) a high impact-recovery group, (3) a moderate impact-moderate symptoms group, and (4) a chronic dysfunction group. The predictors investigated as part of this study included EA as measured by the AAQ-II and three domains of emotion regulation as captured by the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), specifically emotional clarity, non-acceptance of emotions, and limited access to emotion regulation strategies. The authors found that participants in the chronic dysfunction group endorsed higher pre-shooting EA than any of the other groups. They also observed that participants in the resilient group endorsed less difficulty on the DERS emotional clarity measure, less difficulty on the DERS measure of access to emotion regulation strategies, less prior trauma exposure, and less exposure to the campus shooting.
Based on these results, the argument could be made that engaging in EA or psychological inflexibility places a person at risk for developing PTSD, whereas strong emotion regulation abilities acts as a protective factor against PTSD. Whether this is a correct interpretation or not, the results of Orcutt and colleagues’ (2014) investigation suggest that EA and emotion regulation abilities differentially affect the course of post-trauma recovery. However, it remains unclear why this is the case, what mechanisms are driving the effects of EA and emotion regulation for the different symptom trajectory groups, and if or how these constructs may be related.

**Questioning the Research.** These studies appear to support the idea that psychological inflexibility is associated with the development of PTSD symptoms, but some questions need to be asked of the research before drawing firm conclusions. Although the AAQ has accounted for a significant amount of the unique variance in PTSD symptoms in multiple cross-sectional studies, the amount of variance is small (5 to 13%). If these results were used to develop a PTSD intervention, would increasing psychological flexibility have a clinically significant impact on PTSD symptoms?

As previously mentioned, it is possible that the AAQ is too limited in scope to fully capture the construct of psychological flexibility. Experiential avoidance appears to be the only underlying mechanism of psychological flexibility captured by the items that comprise the AAQ. But can a construct like psychological flexibility, which has been defined as a dynamic construct that encompasses emotional, behavioral, and cognitive functions, be captured by such a simple conceptualization and operationalization (Kashdan & Rottenberg, 2010)? It is possible that the AAQ is not fully capturing psychological inflexibility, which could be contributing to the small amounts of variance
in PTSD symptom severity explained by this measure. More research is needed to understand how this self-report measure of psychological flexibility could be improved and if other measures of this construct better capture the impact of psychological inflexibility on the development and maintenance of PTSD symptoms. It may even be important to include measures like the Personal Need for Structure Questionnaire (PNS; Thompson, Naccarato, & Parker, 1992) that measure the inverse of flexibility, or the need for structure. When used in a study of children exposed to trauma, scores on this measure did not correlate significantly with PTSD symptom severity \( p > .05 \). However, in a study of depersonalization using this measure, scores on the PNS were significantly positively correlated with two types of dissociative experiences (Wolfradt & Engelmann, 1999). Dissociation is not a criteria of the ICD-11 CPTSD diagnosis, but historically it has been a feature associated with the experience of complex trauma (Herman, 1992). Thus, it may still be important to utilize measures like this to ensure that all facets of psychological flexibility are being explored.

**Research with Cognitive Flexibility.** Cognitive flexibility has also been studied in the context of trauma and PTSD. Fu and Chow (2017) investigated the role of cognitive flexibility in the relationship between exposure to an earthquake and psychological well-being in 491 Chinese adolescents. Cognitive flexibility was measured using the Cognitive Flexibility Inventory (CFI; Dennis & Vander Wal, 2010), a 20-item self-report measure of two aspects of cognitive flexibility: (1) the tendency to perceive difficult situations as controllable and (2) the ability to perceive multiple alternative explanations and alternative solutions to difficult situations. Fu and Chow (2017) observed that cognitive flexibility moderated the relationship between being injured
during the earthquake and post-trauma psychological well-being. This finding suggested that cognitive flexibility plays a role in post-trauma outcomes, and therefore could play a role in the development and maintenance of PTSD.

As for objective measures of cognitive flexibility and PTSD, several studies have used neuropsychological tasks such as the Wisconsin Card-Sorting Task (Grant & Berg, 1948), the Trail Making Test (TMT; Reitan, 1955), and versions of the Stroop task (Stroop, 1935) to investigate the relationship between cognitive flexibility and PTSD.

*Wisconsin Card-Sorting Task (WCST)*. The WCST has been described as a set-shifting task because it requires the respondent to shift his or her attention between different attributes of the presented stimuli in order to respond correctly during the task. The attribute to which the respondent needs to pay attention in order to determine the correct response changes as the task progresses. Thus, greater flexibility in regard to the respondent’s attention and the attribute they deem to be most meaningful is thought to be associated with better performance on this task.

This task has been used as a measure of cognitive flexibility in relation to PTSD. Polak and colleagues (2012) summarized and analyzed many of these investigations comparing individuals with and without PTSD as part of a larger systematic review of the role of executive function in PTSD. These authors found that the pooled standard mean differences of scores on WCST perseverative errors and categories completed between individuals with PTSD and trauma-exposed controls was significant ($p = .008$ for both analyses), as the PTSD group scored significantly worse on these two scores of the WCST. Characteristics such as the type of trauma experienced by the individual, age, gender, and years of education did not have an impact on the observed difference
between individuals with PTSD and trauma-exposed controls. However, no significant difference was observed between individuals with PTSD and individuals who had not experienced trauma. This suggests that decreased performance on the WCST is associated specifically with the development of PTSD and not simply exposure to trauma.

*Trail Making Test (TMT) A and B.* The TMT (Reitan, 1955) is a task during which respondents are asked to switch between connecting numbers and letters in sequential/alphabetical order. Therefore, respondents must both track the order of the numbers and letters while shifting their attention between these two sets of stimuli. The task consists of two subtests, and the second subtest (TMT B) requires the respondent to conduct the alpha-numeric sequencing while switching between these two sets. The difference in the time taken to complete TMT A versus TMT B is considered to be a measure of a person’s cognitive flexibility, with larger differences between TMT A and B indicating decreased flexibility.

Several studies of PTSD have utilized TMT A and B. In the systematic review conducted by Polak and colleagues (2012), results from eight studies that utilized the TMT and analyzed the results of TMT B scores minus TMT A scores specifically were included. Beckham et al. (1998) found a significant difference in performance on both TMT A \((F(1, 86) = 6.16, p < .05)\) and TMT B \((F(1, 86) = 8.39, p < .005)\) between Vietnam combat veterans with and without PTSD, even when controlling for age and education. Gilbertson et al. (2001) used the TMT in a sample of male Vietnam combat veterans, and they found that mean performance on this test was not significantly different between the participants who met criteria for PTSD and those who did not \((t(30)\)
In a study of rape survivors, Jenkins et al. (2000) observed that participants who met criteria for PTSD performed significantly worse on TMT B than either rape survivors without PTSD or unexposed control participants \((F(2, 43) = 9.76, p = .001)\). Koenen et al. (2001) compared individuals with PTSD to “neurologically intact” control participants (who were not necessarily trauma exposed), and the authors observed no significant differences between the two groups on any of the TMT scores measured (i.e., time in seconds to complete TMT A and TMT B, numbers of corrected and non-corrected errors on each trial). Koso and Hansen (2006) used the TMT as a measure of cognitive flexibility in an investigation of neurocognitive functioning in a group of Bosnian war veterans with PTSD. Compared to Bosnian war veterans without PTSD, the veterans with PTSD took significantly more time to complete both TMT A \((t = 3.60, p < .001, \eta^2 = 0.50)\) and TMT B \((t = 4.80, p < .001, \eta^2 = 0.61)\). In a replication of Koso and Hansen’s (2006) study, Koso, Sarač Hadžihalilović, and Hansen (2012) found similar results for both TMT A \((t(77) = 8.45, p < .001, \eta^2 = 0.48)\) and TMT B \((t(77) = 8.52, p < .001, \eta^2 = 0.48)\) when comparing individuals with PTSD recruited from Bosnian and Herzegovinian support groups to trauma-exposed individuals without PTSD who were visiting primary health care centers. Stein et al. (2002) observed that female victims of intimate partner violence who met criteria for PTSD performed significantly worse on TMT B \((p = .01)\) and TMT B – TMT A \((p = .03)\) than female victims who did not meet criteria for this disorder and women had not been exposed to trauma. In a sample of undergraduate students, Twamley et al. (2004) found no significant differences between a PTSD group, a no-PTSD group and a normal comparison group on TMT B \((F = 0.40, p = .80)\).
After applying meta-analytic techniques to aggregate the results of the above studies and generate pooled standard mean differences, Polak and colleagues (2012) concluded that PTSD patients were significantly different from both trauma-exposed controls ($p < .001$) and non-trauma-exposed controls ($p = .02$) on TMT B scores. When controlling for trauma type, the authors found that scores on TMT B were significantly worse for PTSD patients exposed to war-related trauma or sexual abuse compared to other types of trauma. Similar effects were found for male gender, older age, and a comorbid diagnosis of depression. These findings suggest that individuals with PTSD have decreased set-shifting abilities compared to individuals without PTSD and those not exposed to trauma.

**Stroop and Other Color-Word Interference Tasks.** Stroop tasks (Stroop, 1935) test both a person’s switching abilities and their ability to inhibit automatic responses. Several different versions of the Stroop task exist (Strauss, Sherman, & Spreen, 2006), but they all have the same basic premise of requiring respondents to name a characteristic of the presented stimuli that is not the most easily identifiable characteristic. For example, a color word may be presented on the screen in an incongruent ink color (e.g., the word “orange” would be presented on the screen in purple ink), and the respondent is asked to name the color of the ink in which the word is printed rather than simply to read the word presented on the screen. Respondents typically take more time to name the color of the ink when the color word presented on the screen does not match the color of the ink (e.g., “orange” is presented in purple ink) than when the color word and ink color match (e.g., “orange” is printed in orange ink). Naming the incongruent ink color requires the
respondent to inhibit their automatic response of saying the word that they read on the page, and instead redirect their attention to the color of the ink.

Several PTSD studies have used versions of the Stroop interference task to investigate switching and inhibitory abilities in this population. Five studies utilizing the Stroop task were included in the review conducted by Polak and colleagues (2012). They observed that the PTSD groups performed significantly worse on the interference tasks than the non-trauma exposed control groups ($p = .004$). The authors also found that performance on Stroop interference tasks was not significantly affected by the type of trauma experienced by the individual, age, gender, or a comorbid diagnosis of depression. Several other studies of PTSD have used versions of the Stroop task and have confirmed the findings of Polak et al. (2012). Nijdam and colleagues (2018) used the Stroop Color Word test as part of a battery of neurocognitive functioning administered before and after a course of trauma-focused psychotherapy for PTSD. The authors observed that PTSD symptom decreases were associated with significantly improved neurocognitive performance post-treatment ($p < .005$), including on the Stroop task (Cohen’s $d$ 0.16-0.20). These results expand upon the findings of Polak and colleagues (2012) by observing a longitudinal relationship between PTSD symptom severity and Stroop task performance in response to an intervention.

**Summary.** All of the previously described studies demonstrate that cognitive flexibility as measured using both neurocognitive measures and self-report assessments is associated with the presence of PTSD. No studies to date, however, have investigated whether cognitive flexibility specifically plays a role in the development and maintenance of CPTSD symptoms.
Psychological Flexibility, Emotion Regulation, and Complex PTSD

The definition of emotion regulation has evolved as more research on this topic has accumulated. However, the various definitions associated with this construct have some common features, including being able to use multiple strategies to regulate one’s emotions, having some degree of control over which strategy to employ, and being able to flexibly adapt one’s chosen strategies to various contexts and situations. Aldao, Sheppes, and Gross (2015) went so far as to assert that the term ‘emotion regulation flexibility’ should replace use of the term ‘emotion regulation’ in order to capture the idea that emotion regulation is more of a process than an endpoint, and is a process that requires flexibility and adapting to one’s changing environment rather than a static thing that people simply do or do not do. This idea is introduced by the authors after briefly reviewing that greater flexibility – whether it has been investigated in the realm of attention, executive control, goal pursuit, affect, or other domains – has been associated with enhanced adaptation to one’s environment, and subsequently better mental health.

Given the centrality of flexibility to emotion regulation, and the fact that the concept of flexibility has been studied in relation to several psychological constructs and shown to be almost universally beneficial and to promote greater well-being and mental health (Aldao, Sheppes, & Gross, 2015; Kashdan & Rottenberg, 2010), it may be beneficial to expand the study of emotion regulation and PTSD to include other psychological constructs to which flexibility is relevant. It may even be necessary to shift how we think about the relationship between the constructs of emotion regulation and psychological flexibility. Given the broad definition of psychological flexibility (which includes an emotional component) and the idea that flexibility is key to regulating one’s
emotions effectively, it may be more accurate to denote the construct of emotion regulation as a subcomponent of psychological flexibility rather than as a completely separate domain. The research on these topics has occurred in essentially separate spheres up until this point. If emotion regulation is actually part of a larger flexibility construct, then this separation in research could explain why the results of emotion regulation and complex trauma sequela investigations have been mixed. These investigations could have been focused on only a part of the larger picture. Studying emotion regulation and psychological flexibility in conjunction with each other may clarify the relationship between these psychological processes and how they mutually influence the development and maintenance of psychological disorders like PTSD.

Furthermore, despite the connection that has been made between psychological inflexibility and PTSD, the same has not occurred for any relationship to CPTSD despite the significant dysregulation that occurs in CPTSD. Clinicians have long noticed a pervasive rigidity underlying the symptoms associated with this disorder. For example, individuals with this diagnosis often have a rigid, negative self-concept that centers on feelings of being a failure or feeling worthless (Herman, 1992; van der Kolk et al., 2005; Cloitre et al., 2018). They may also relate to others in an inflexible manner, usually by remaining isolated and harboring a deep distrust of other people (National Center for PTSD, 2016). It is therefore plausible that psychological flexibility is particularly impaired in individuals suffering from CPTSD, but this relationship has not yet been studied.
The Present Study

The new ICD-11 CPTSD diagnosis places great emphasis on the disturbances in self-organization that can occur for certain trauma survivors. Yet more research is needed to clarify how disturbances in self-organization develop and are maintained. Psychological and cognitive flexibility have been associated with overall health and well-being, and a lack of flexibility is a risk factor for the development of PTSD symptoms. However, little is known about the role that psychological and cognitive flexibility may play in the development and maintenance of complex trauma sequelae, and specifically the ICD-11 CPTSD symptoms. Questions also remain about how the constructs of psychological flexibility and emotion regulation relate to one another and if and how they interact and mutually contribute to the development and maintenance of CPTSD symptoms. Although the CPTSD literature focuses on emotion regulation difficulties as being an underlying mechanism of these symptoms, some of the research suggests that more than just emotion regulation difficulties contributes to the development of these symptoms. The purpose of the present study is to investigate these issues and add to the existing literature through an in-person study of trauma-exposed individuals using relevant self-report measures and neuropsychological tests. My hypotheses and exploratory research questions for this investigation are the following:

Research Question 1: What factors underlie measures of psychological flexibility, cognitive flexibility, and emotion regulation? Are there common factors underlying these concepts treated as distinct constructs within the scientific literature, or are there separate underlying factors for each of these constructs?
Hypothesis 1: Psychological flexibility, cognitive flexibility, and emotion regulation each have been found to be positively correlated with overall health and well-being, negatively correlated with symptoms of PTSD, and to share definitional qualities. Thus, I expect them to be significantly associated with each other, though not completely overlapping given the differences in their definitions and operationalizations. First, correlations will demonstrate the bivariate associations of the measures. Then, their underlying factor structure will be assessed. I hypothesize that factors will comprise items from measures of multiple constructs rather than only items from measures of a singular construct, leading to common factors underlying the measures. For example, a factor (or more than one factor) may emerge that contains some items from a psychological flexibility measure, some items from a cognitive flexibility self-report measure, and some items from an emotion regulation measure, suggesting a shared construct underlying these three measures. This would be in contrast to a situation in which a factor contains only items from a single measure, suggesting that the construct operationalized by the measure is indeed distinct from those operationalized by the other measures included in this investigation.

Research Question 2: Are psychological and cognitive flexibility significantly related to CPTSD symptom severity, even when accounting for effects of emotion regulation and PTSD symptom severity?

Hypothesis 2: At the bivariate level, psychological and cognitive flexibility are hypothesized to be negatively correlated with CPTSD symptom severity, such that individuals with more severe CPTSD symptoms will exhibit decreased
flexibility (or higher inflexibility). Then, I will explore whether some measures of flexibility exhibit a stronger relationship with CPTSD symptom severity than others. I hypothesize that all of the measures of psychological flexibility and cognitive flexibility will account for significant variance in CPTSD symptom severity, even when accounting for emotion regulation and PTSD symptom severity.

Exploratory Research Question: Which factors of flexibility and emotion regulation predict CPTSD symptom severity most successfully?

I will explore whether factors derived from the individual measures or the factors derived by testing Hypothesis 1 produce a better model fit for a model predicting CPTSD symptom severity.
CHAPTER III

METHODS

Participants

A total of 96 participants were recruited and enrolled into this study. Participants were required to be between the ages of 18 and 65, able to read, comprehend, and speak English, and have experienced a psychological trauma as defined by Criterion A of the PTSD diagnosis in the DSM-5 (APA, 2013). Exclusion criteria included the following: younger than 18 or older than 65 years of age, a self-reported history of cerebral palsy, an intellectual disability, Autism Spectrum Disorder, epilepsy, stroke, pervasive developmental disorder, brain tumor, advanced HIV, chronic kidney disease, liver disease, stroke, a diagnosis of psychotic or bipolar disorder, history of a severe traumatic brain injury, and/or current alcohol or drug dependence. These conditions are associated with neurocognitive deficits and could confound the results of the study. After 65 years of age, neurocognitive changes have been observed that could specifically impact the domain of cognitive flexibility (Wecker, Kramer, Hallam, & Dellis, 2005). Participants who were determined by the Test of Memory Malingering (TOMM) to be malingering neuropsychological problems (more than five errors on Trial 2) during the in-person visit would also have been excluded from the study and their data not included in the final analyses. It was also confirmed that participants had not received neuropsychological testing in the past three months, as this could have introduced practice effects into the current study’s results.
A total of 330 individuals were contacted as part of recruitment for this study. Participants were recruited from the Trauma Health and Hazards Center (THHC) registry; from the community via advertisements posted on Craig’s List and flyers posted in approved locations; and from the undergraduate student pool at the University of Colorado Colorado Springs via Sona, the recruitment platform utilized by the university. Thirty four percent of the final sample was recruited from Sona.

Of those contacted, 171 were not interested in participating in the study, and 63 were deemed ineligible (62 during the phone screen, 1 during the first visit). Reasons for ineligibility included the following: No experience of a Criterion A1 trauma \( (n = 31) \), outside the age range required for the study \( (n = 10) \), history of loss of consciousness longer than 24 hours \( (n = 3) \), prior diagnosis of Autism Spectrum Disorder or an intellectual disability \( (n = 3) \), living out of state \( (n = 3) \), prior diagnosis of schizophrenia or a psychotic disorder \( (n = 3) \), history of bipolar disorder \( (n = 3) \), prior diagnosis of a medical condition that could/did cause neurological impairment \( (n = 2) \), history of seizures or a seizure disorder \( (n = 2) \), current drug or alcohol abuse \( (n = 1) \), and providing invalid data during participation in a previous research study \( (n = 1) \). Ninety six individuals were identified as eligible for the study and completed the study procedures.

**Demographics**

The final sample comprised 54 females (58%), 37 males (40%), and 2 transgender individuals (2%). Participants ranged in age from 18 to 64, with a mean age of 35.74 \( (SD = 14.29) \). A majority of the participants identified as White-Not Hispanic \( (n = 64, 69\%) \). The remaining participants identified themselves as White-Hispanic \( (n = 10, 11\%) \), Black/African American \( (n = 5, 5\%) \), Asian \( (n = 2, 2\%) \), American Indian or Alaskan
Native ($n = 1, 1\%)$, or as more than one race ($n = 8, 9\%)$. Three participants chose not to identify their race and/or ethnicity.

As for highest level of education, seven participants reported having a high school diploma or GED (8\%), 35 participants reported having attended some college (38\%), 22 received an Associate’s degree or trade school degree (24\%), 19 received a Bachelor’s degree (20\%), and 10 received a Master’s degree (11\%). For marital status, a majority of the participants reported being single or never married ($n = 42, 45\%$); 29 participants said they were currently married (31\%); 13 participants reported being divorced (14\%); 7 participants reported that they were living with a partner (8\%); 1 participant reported being widowed (1\%); and 1 reported being separated (1\%). In regard to employment status, a majority of the participants reported that they were employed either full-time ($n = 18, 19\%$) or part-time ($n = 25, 27\%$). Twenty three of the participants reported that they were students ($n = 23, 25\%$), and the remaining participants reported that they were retired ($n = 12, 13\%$), unable to work ($n = 8, 9\%$), or out of work ($n = 7, 7\%$). When asked about current household income, 23 of the participants (25\%) reported that their household income is under $15,000, 27 participants reported income below $45,000 (29\%), 23 participants were below $75,000 (25\%), and the remaining 18 participants reported household incomes above $75,000 (19\%).

**Trauma History.** During the in-person visit, participants verbally described their index traumas, or the traumatic event by which he or she felt most strongly affected at the time of the study. The most common index trauma was combat, followed by childhood sexual abuse and adulthood domestic violence. Participants reported that the index traumas occurred between two months and 53 years prior to participating in the study,
with a mean of 11.69 years ($SD = 11.41$). See Table 1 for a summary of the index trauma types endorsed by the participants.

Table 1

*Index Trauma Events Reported by Participants*

<table>
<thead>
<tr>
<th>Index trauma type</th>
<th>% (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combat</td>
<td>17.2 (16)</td>
</tr>
<tr>
<td>Adult domestic violence</td>
<td>14.0 (13)</td>
</tr>
<tr>
<td>Child sexual abuse</td>
<td>14.0 (13)</td>
</tr>
<tr>
<td>Rape</td>
<td>10.8 (10)</td>
</tr>
<tr>
<td>Adult physical assault</td>
<td>9.7 (9)</td>
</tr>
<tr>
<td>Sudden death of a loved one</td>
<td>8.6 (8)</td>
</tr>
<tr>
<td>Motor vehicle accident</td>
<td>6.5 (6)</td>
</tr>
<tr>
<td>Witnessed violence/death</td>
<td>5.4 (5)</td>
</tr>
<tr>
<td>Child physical abuse</td>
<td>4.3 (4)</td>
</tr>
<tr>
<td>Other accident</td>
<td>3.2 (3)</td>
</tr>
<tr>
<td>Other</td>
<td>3.2 (3)</td>
</tr>
<tr>
<td>Life threatening illness</td>
<td>1.1 (1)</td>
</tr>
<tr>
<td>Neglect</td>
<td>1.1 (1)</td>
</tr>
<tr>
<td>Perpetration</td>
<td>1.1 (1)</td>
</tr>
</tbody>
</table>

According to responses to the Trauma History Questionnaire (THQ), which asks respondents to identify which of 24 types of trauma they have experienced, the number of trauma types endorsed by the participants ranged from one to 18, with the experience of eight types of trauma being most common ($M = 7.72$, $SD = 3.70$). See Table 2 for a summary of the trauma types endorsed by participants based on the THQ.

**Procedures**

The procedures of this investigation were part of a larger study for which the Institutional Review Board application was approved by the University of Colorado at Colorado Springs. Interested individuals were first phone screened to determine if they met the study’s inclusion and exclusion criteria. If an individual was deemed eligible for the study based on his or her answers during the phone screen, he or she was sent a link
Table 2

*Trauma Experiences Reported by Participants on the Trauma History Questionnaire*

<table>
<thead>
<tr>
<th>Trauma type</th>
<th>% (N)</th>
<th>Number of trauma types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robbery with force or threat of force</td>
<td>23.7 (22)</td>
<td>$M (SD)$: 7.72 (3.70)</td>
</tr>
<tr>
<td>Attempted robbery</td>
<td>45.2 (42)</td>
<td>Range: 1-18</td>
</tr>
<tr>
<td>Break-in – While not home</td>
<td>25.8 (24)</td>
<td>Mode: 8</td>
</tr>
<tr>
<td>Break-in – While home</td>
<td>7.5 (7)</td>
<td></td>
</tr>
<tr>
<td>Serious accident (work, car, etc.)</td>
<td>58.1 (54)</td>
<td></td>
</tr>
<tr>
<td>Natural disaster</td>
<td>24.7 (23)</td>
<td></td>
</tr>
<tr>
<td>Man-made disaster</td>
<td>17.2 (16)</td>
<td></td>
</tr>
<tr>
<td>Exposure to chemicals/radioactivity</td>
<td>30.1 (28)</td>
<td></td>
</tr>
<tr>
<td>Other serious injury</td>
<td>33.3 (31)</td>
<td></td>
</tr>
<tr>
<td>Other life-threatening situation</td>
<td>59.1 (55)</td>
<td></td>
</tr>
<tr>
<td>Witnessed death/serious injury</td>
<td>46.2 (43)</td>
<td></td>
</tr>
<tr>
<td>Seen/Handled dead bodies</td>
<td>46.2 (43)</td>
<td></td>
</tr>
<tr>
<td>Close friend/Family member killed by drunk driver</td>
<td>18.3 (17)</td>
<td></td>
</tr>
<tr>
<td>Spouse/Child/Romantic partner death</td>
<td>10.8 (10)</td>
<td></td>
</tr>
<tr>
<td>Life-threatening illness</td>
<td>16.1 (15)</td>
<td></td>
</tr>
<tr>
<td>Learned of someone close dying/incuring serious injury</td>
<td>61.3 (57)</td>
<td></td>
</tr>
<tr>
<td>Combat</td>
<td>23.7 (22)</td>
<td></td>
</tr>
<tr>
<td>Rape</td>
<td>43.0 (40)</td>
<td></td>
</tr>
<tr>
<td>Sexual assault</td>
<td>36.6 (34)</td>
<td></td>
</tr>
<tr>
<td>Other unwanted sexual contact</td>
<td>25.8 (24)</td>
<td></td>
</tr>
<tr>
<td>Physical assault with weapon</td>
<td>28.0 (26)</td>
<td></td>
</tr>
<tr>
<td>Physical assault without weapon</td>
<td>21.5 (20)</td>
<td></td>
</tr>
<tr>
<td>Physical abuse</td>
<td>29.0 (27)</td>
<td></td>
</tr>
<tr>
<td>Other stressful situation</td>
<td>40.9 (38)</td>
<td></td>
</tr>
</tbody>
</table>

via email to complete a series of self-report questionnaires using Qualtrics. The first part of the Qualtrics survey was an electronic consent form. Participants were asked to acknowledge that they had read the consent form and agreed to participate in the study before completing any of the self-report questionnaires.

Next, participants came to the THHC research space at 1867 Austin Bluffs Parkway in order to complete an in-person visit with one of five trained UCCS Clinical Psychology graduate students who have experience conducting clinical interviews and neuropsychological assessments. All assessors were under the close supervision of a
clinical psychologist/ neuropsychologist. Participants had the opportunity to ask any questions they had about their participation at the beginning of this visit and were provided a paper copy of the informed consent document. They then completed a neuropsychological assessment battery. Participants were compensated for their participation: Those recruited via the THHC registry and from the community were provided $25 for their participation, and undergraduate students had the option to receive $25 or one credit for each hour spent participating in the study via the Sona system.

**Measures**

**Self-Report Measures**

**The Trauma History Questionnaire.** The THQ (Hooper, Stockton, Krupnick, & Green, 2011) was used to assess participants’ history of psychological trauma and confirm that they have been exposed to a psychological trauma as defined in Criterion A of the PTSD diagnosis in the DSM-5 (APA, 2013). This measure has been used in previous studies of complex trauma sequelae (e.g., Doukas, D’Andrea, Doran, & Pole, 2014; Ehring & Quack, 2010). The THQ is a 24-item questionnaire that asks respondents to report whether they have experienced several potentially traumatic events and about the frequency with which they have experienced those events. This measure has been shown to have moderate to high test-retest reliability, excellent interrater reliability, and good to excellent construct and predictive validity (Hooper, Stockton, Krupnick, & Green, 2011). Participants’ responses were aggregated to characterize the types and number of traumatic events the participants have experienced or witnessed.

**The International Trauma Questionnaire (ITQ).** The ITQ (Cloitre et al., 2018) assesses participants’ current level of PTSD and CPTSD symptoms as defined in the
ICD-11. Psychometric studies have confirmed the internal reliability as well as the discriminant, concurrent, predictive, and cross-cultural validity of the ITQ using both factor analysis models and item response theory in clinical and community samples (Cloitre et al., 2018; Hyland et al., 2017; Karatzias et al., 2017b).

Total scores were calculated separately for the items representing the PTSD clusters (the first six items) and the items representing DSO or the additional clusters that would qualify someone for a CPTSD diagnosis if the measure were being used diagnostically (the last six items). In subsequent analyses, a participant’s total score on the PTSD items was used to control for PTSD symptom severity; the total score of the three DSO domains was used to represent overall CPTSD symptom severity (Karatzias et al., 2019). The internal reliability of the ITQ items measuring PTSD (Cronbach’s $\alpha = .86$) and CPTSD symptoms (Cronbach’s $\alpha = .87$) were good in the sample used for the current investigation.

**Emotion Regulation Questionnaire (ERQ).** The ERQ (Gross & John, 2003) was used to operationalize the construct of emotion regulation. It was chosen over other measures like the NMRS and DERS given its brevity and its previous use in studies of complex trauma sequelae (e.g., Ehring & Quack, 2010; Karatzias et al., 2018). This measure contains 10 items that are meant to capture respondents’ tendencies to regulate their emotions using the strategies of cognitive reappraisal and expressive suppression in response to both positive and negative emotions. An example of a cognitive reappraisal item is, “When I want to feel more positive emotion, I change the way I’m feeling about a situation,” and an example of an expressive suppression item is, “I keep my emotions to myself.” Respondents are asked to rate each item using a Likert scale ranging from 1
(strongly disagree) to 7 (strongly agree). Two total scores are generated – one for the cognitive reappraisal factor, and one for the expressive suppression factor of the questionnaire. This measure has been found to have acceptable internal reliability, convergent validity, and divergent validity (Gross & John, 2003). The internal reliability of the items comprising the cognitive reappraisal factor was Cronbach’s α = .88, and the Cronbach’s α for the items comprising the expressive suppression factor was .65. The internal reliability of the expressive suppression factor may have been low given the small number of items (four) included in this particular factor (Streiner, 2003).

Flexible Regulation of Emotional Expression (FREE). The FREE (Burton & Bonanno, 2016) is a 16-item questionnaire that assesses respondents’ flexibility in their ability to enhance and suppress their expression of both positive and negative emotions. Unlike other traditional assessments of emotion regulation, this measure more specifically captures respondents’ ability to flexibly use different emotion regulation strategies. Therefore, it was included in this investigation alongside the ERQ. Respondents are asked to rate how well they would be able to be more expressive or to conceal a positive or negative emotion in a variety of hypothetical scenarios using a scale of 1 (unable) to 6 (very able). An example of one of these scenarios is, “While having dinner with a friend who just recently lost their job, you receive a phone call from your boss stating you will get a raise.” Multiple subscale scores can be generated, including an enhancement score, a suppression score, specifically positive enhancement and suppression scores, and specifically negative enhancement and suppression scores. A flexibility score can also be calculated in two ways, one of which is more often used in publications using this scale. This flexibility score is created by calculating the average
total scores of the enhancement scales (A) and suppression scales (B) (e.g., \([\text{positive enhancement score + negative enhancement score}] / 2 = \text{enhancement scale total score or “A”}\)), then calculating the sum of the enhancement and suppression total scores \((A + B)\), the difference between the enhancement and suppression total scores \((A − B)\), and finally calculating a flexibility score by dividing the sum of the enhancement and suppression total scores by the difference of these values \((A + B) / (A – B)\). Internal consistency, convergent, and divergent validity have been demonstrated to be acceptable for the FREE’s various subscales (Burton & Bonanno, 2016). The flexibility score described above will be used in analyses for this investigation. The internal reliability of the FREE items (Cronbach’s \(\alpha = .77\)) was acceptable in the sample used for the current investigation.

**Psychological Flexibility Questionnaire (PFQ).** The 20-item PFQ (Ben-Itzhak, Bluvstein, & Maor, 2014) assesses the following aspects of psychological flexibility: (1) perceiving change as positive (i.e., “I feel ready to accept future changes”), (2) characterizing the self as flexible (i.e., “When I encounter difficulties in achieving a goal, I am able to try numerous different solutions”), (3) characterizing the self as open and innovative (i.e., “I think of myself as someone who is attentive to a variety of different messages and ideas”), (4) perceiving reality as dynamic and changing (i.e., “Reality is never absolute”), and (5) perceiving reality as multifaceted (i.e., “Concepts may possess different meanings when perceived in different contexts”). Respondents are asked to indicate the extent to which each statement characterizes them on a Likert scale from 1 (not at all) to 6 (very much). The PFQ has demonstrated good internal reliability, construct validity, as well as convergent and divergent validity with a variety of
constructs (Ben-Itzhak, Bluvstein, & Maor, 2014). A total score will be calculated using a respondent’s answers to all items of the PFQ. The internal reliability of the PFQ items (Cronbach’s $\alpha = .89$) was good in the sample used for the current investigation.

**Cognitive Flexibility Inventory (CFI).** The CFI (Dennis & Vander Wal, 2010) is a 20-item measure originally designed to measure three aspects of respondents’ cognitive flexibility that are thought to reflect their ability to challenge and replace maladaptive thoughts with more balanced and adaptive ones. These three aspects were (1) the tendency to perceive difficult situations as controllable, (2) the ability to perceive multiple alternative explanations for life occurrences and human behavior, and (3) the ability to generate multiple alternative solutions to difficult situations (Dennis & Vander Wal, 2010). Subsequent exploratory and confirmatory factor analyses produced a reliable two-factor structure that included a Control factor (i.e., “When encountering difficult situations, I become so stressed that I cannot think of a way to resolve the situation”) and an Alternatives factor (i.e., “I consider multiple options before making a decision”). Respondents are asked to respond to each statement using a scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Investigations of the two-factor CFI have demonstrated that the measure has excellent internal consistency, good test-retest reliability, convergent and discriminant reliability (Dennis & Vander Wal, 2010). Two subscores (Control subscore and Alternatives subscore) will be calculated and used in subsequent analyses. The internal reliability of the items comprising the Control factor (Cronbach’s $\alpha = .88$) and those comprising the Alternatives factor (Cronbach’s $\alpha = .90$) were good to excellent in the current investigation.
The Personal Need for Structure Questionnaire (PNS). The PNS (Thompson, Naccarato, & Parker, 1992) is a 12-item measure that assesses a person’s need for simple structure. Participants respond to each item using a Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Examples of the items that make up this scale are, “I don’t like situations that are uncertain” or “I hate to be with people who are unpredictable.” The PNS has been shown to have good internal and test-retest reliability and reasonably good convergent and divergent validity (Neuberg & Newsom, 1993). The necessary items were reverse scored prior to creating a total score and factor scores for this measure. Original studies of the psychometric properties of the PNS suggested that there were two factors: (1) a Desire for Structure factor and (2) a Response to a Lack of Structure factor (Neuberg & Newsom, 1993). However, the internal reliability of the Response factor in the current sample was unacceptable (Cronbach’s $\alpha = .55$). The Cronbach’s $\alpha$ for the Desire factor was slightly higher at .66, but still quite low. The internal reliability of all of the PNS items was Cronbach’s $\alpha = .66$. Most sources state that Cronbach’s $\alpha$ values below .70 indicate poor internal reliability. Previous internal reliability analyses of the PNS produced values between .76 and .86 for all of the items together, and between .69 and .79 for the separate factors (Neuberg & Newsom, 1993). Low subscale internal reliability values were also found by Wolfradt and Engelmann (1994) ($\alpha = .69$ for the Desire factor and $\alpha = .72$ for the Response factor), though not quite as low as in the current sample. It remains unclear why the current sample had such low internal reliability for this measure. Given the particularly low internal reliability of the Response factor, the total of the PNS items was used in subsequent analyses rather than the factor scores.
Neuropsychological Assessments

Cognitive flexibility was assessed via neuropsychological assessments administered in person. These will include the Wisconsin Card-Sorting Task (WCST; Grant & Berg, 1948), the Trail Making Test (TMT) A and B (Reitan, 1955), and the D-KEFS Color-Word Interference Test (Delis, Kaplan, & Kramer, 2001). Higher values on each of the scores chosen to be independent variables for the current study are thought to indicate decreased cognitive flexibility.

In the WCST, the respondent was provided with a deck of 128 cards that have different combinations of shapes (circles, triangles, crosses, or stars), colors (red, yellow, green, or blue), and numbers of shapes (one, two, three, or four). Four stimulus cards were placed in front of the respondent, and he or she was required to sort the deck of 128 cards while receiving feedback about whether he or she sorted each card correctly or incorrectly. The feedback provided was based on the sorting rule, which changes as the task progresses. For instance, at first, the respondent might be expected to sort the cards according to the color of the shape(s) on the card and receive feedback accordingly. At some point, the sorting rule changes to being based on the number of shapes on the card or the type of shape, and the respondent will receive feedback that they incorrectly sorted a card until they identify what the new sorting rule is. The rule changes were not be explicitly stated and therefore had to be inferred by the respondent based on the feedback they received after each trial. The manual version of the WCST (as opposed to the computerized version) was used in the present investigation. Participants’ perseverative errors scores served as an independent variable in subsequent analyses.
The TMT has two conditions, A and B. During TMT A, respondents are asked to connect a series of circles containing numbers in sequential order. Then, during TMT B, respondents are required to switch between connecting circles containing numbers and letters in sequential/alphabetical order. A participant’s final score on the TMT is calculated by subtracting the time it took them (in seconds) to complete TMT A from the time it took them to complete TMT B. This calculation is thought to indicate how much extra time the respondent needed to shift attention between the numbers and the letters and keep track of the order of each set of stimuli, skills which were not required during TMT A.

The D-KEFS Color-Word Interference Test is a version of the Stroop task (Stroop, 1935) with four conditions. Respondents are presented with a series of color words (red, blue, and green) printed either in black ink or red, blue or green ink. When the words are printed in red, blue, or green ink, the color word is incongruent with the color of the ink in which the words are printed. In Condition 3, respondents are asked to name the color of the ink, not to read the word written on the page. In Condition 4 of this task, respondents are asked to continue naming the color of the ink in which the words are printed unless the color word is in a box, in which case the respondents are asked to read the word printed on the page rather than naming the ink color. This adds the switching dimension to the inhibition task, requiring even greater flexibility on the part of the participant. Participants’ time scores on Condition 4 of the D-KEFS Color-Word Interference Test will be used as an independent variable in subsequent analyses, as this score typically represents a person’s switching and inhibitory abilities.
Data Analysis

Statistical Package for the Social Sciences (SPSS), Version 26 was used to conduct statistical analyses. Data was collected from a total of 96 participants. Three participants were missing part of the self-report data because they either did not complete the trauma measures or stopped part way through the self-report battery and thus did not complete the measures toward the end of the battery specifically. The data from these participants were deemed to not be missing at random, so the data were deleted using listwise deletion. The WCST was either incorrectly administered or recorded for three additional participants, and these administration errors made it impossible to generate a score for this neuropsychological test. Although imputation of this missing data was not possible, the data for these three participants were retained given that only one score was missing for each participant. Data from a total of 93 participants were therefore used in subsequent analyses, except those analyses that utilized all of the measures (i.e., multiple regression). For these analyses, listwise deletion was applied and data from the 90 participants with complete data were used.

Power Analysis

An a priori power analysis was conducted using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) for a multiple regression including 10 predictors, a medium effect size (.50), and a power level of .80. A medium effect size of .50 was chosen given the strength of the correlations observed in other investigations of post-trauma outcomes and measures of psychological and cognitive flexibility. Richardson and Jost (2019) found a significant correlation of -.19 between the PTSD Checklist for DSM-5 (PCL-5) and the PFQ. Marx and Sloan (2005) reported a Pearson’s correlation of .31 between the
Posttraumatic Stress Diagnostic Scale (PDS) and the AAQ, whereas Meyer and colleagues (2013) reported a correlation of .79 between scores on the PTSD Checklist – Military version and the AAQ-II. They also found a correlation of .68 between clinician ratings on the Clinician Administered PTSD Scale (CAPS) and the AAQ-II. Fu and Chow (2017) reported a correlation of .45 between scores on a measure of psychological well-being and the CFI.

The majority of studies involving neuropsychological assessment of cognitive flexibility, and specifically the TMT, have found significant differences between PTSD and control groups representing medium effect sizes (e.g., Polak et al., 2012). Unfortunately, fewer studies have provided correlations between TMT performance and CAPS. Ben-Zion and colleagues (2018) found no correlation between the Trail Making Test and PTSD symptoms measured by the CAPS for DSM-5 ($r = -.06, p = .25$).

Similarly, Twamley et al. (2009) did not find significant correlations between the CAPS for DSM-IV and various measures of cognitive flexibility: D-KEFS Trail Making Test, Letter-Number Sequencing ($r = .08, p = .58$), D-KEFS Color Word Interference Condition 4 ($r = .13, p = .38$), and WCST total errors $T$ score ($r = -.04, p = .80$).

However, Twamley et al. (2009) did find a significant correlation between higher levels of dissociation and the WCST total errors score ($r = -.54, p < .001$). A medium effect size of .50 was chosen based in part on studies of self-report measures, and in part based on studies documenting significant differences between PTSD and control groups on the TMT, reflecting a medium effect size.

With the above parameters, the $a$ priori power analysis demonstrated that a total sample size of 75 participants was necessary to achieve a significance level of .05; 101
participants would be needed to achieve a significance level of .01; and 112 participants was necessary to achieve a significance level of .005. A total of 100 participants was set as the goal sample size in an effort to balance the need for statistical power with the feasibility of collecting in person neuropsychological data as part of this investigation.

Typical power analyses do not provide information about the sample size necessary for exploratory factor analysis. Earlier researchers suggested minimum sample sizes regardless of the research question being asked or the factor structure underlying the data. For instance, Guilford (1954) suggested a minimum sample size of 200, and Cattell (1978) recommended a sample size of 500, but reasoned that sample sizes of 200 were acceptable. However, more recent research on this topic has demonstrated that the minimum sample size needed for exploratory factor analysis depends heavily on the number of items entered into the analysis, the number of factors underlying the data, the number of items per factor, and the size of the communalities (de Winter, Dodou, & Wieringa, 2009; Mundfrom, Shaw, & Ke, 2005). Prior to conducting principal axis factoring (PAF), it was known that communalities would be required to be .50 or higher for each item, and approximately 75 variables were to be entered into the analysis. With this criteria, Monte Carlo simulations conducted by de Winter and colleagues (2009) demonstrated that as few as 12 participants would be necessary for satisfactory factor recovery if the PAF resulted in a 1-factor solution, 31 participants would be necessary for a 2-factor solution, 50 participants for a 3-factor solution, 71 participants for a 4-factor solution, and 156 participants for an 8-factor solution (specific data for 5- to 7-factor solutions were not provided). The number of factors underlying the data could not be
known prior to data analyses, but de Winter and colleagues’ (2009) research suggests that a sample size of 93 is sufficient for at least a 4-factor solution.

**Checking Assumptions**

Once missing data were accounted for, total scores were calculated as appropriate from the item-level data for each of the self-report measures and neuropsychological tests. The statistical assumptions necessary to conduct the planned analyses were then checked. The initial skewness and kurtosis values for each of the quantitative variables were observed to be between 2 and -2 (skewness range: -0.83 to 1.40, kurtosis range: -1.06 to 1.93), which suggested that none of the variables were non-normally distributed. However, the histogram for one of the variables, the TMT total score (Time in seconds to complete Trails B – Time in seconds to complete Trails A), demonstrated that this variable was slightly positively skewed despite having acceptable skewness (1.40) and kurtosis values (1.93). The TMT total scores were transformed using natural log transformation to correct for the positive skewness of the scores. After the natural log transformation, the range of the skewness and kurtosis values for all of the quantitative variables decreased (skewness: -0.83 to 0.27, kurtosis: -1.06 to 0.86). Finally, the scatter plots for the correlations between each variable were visually examined, which confirmed acceptable homogeneity of variances and a linear relationship between each of the quantitative variables. These observations confirmed that the data met the necessary statistical assumptions, and thus the previously stated hypotheses could be tested.
CHAPTER IV
RESULTS

Preliminary Analyses

Table 3 contains the overall means and standard deviations of the PTSD and CPTSD symptom severity measures and the measures of emotion regulation and flexibility. The correlations between these measures are also included in this table.

Preliminary analyses were also conducted to examine the correlations between demographic variables and the measures used in subsequent analyses. See Tables 4 and 5 for means and standard deviations for each measure based on gender and race/ethnicity. Of note, PTSD symptom severity ($t(89) = -2.22, p = .03$) and CPTSD symptom severity ($t(89) = -2.29, p = .03$) were significantly different based on gender. Females were observed to have significantly higher scores on both of these measures. The CFI Alternatives factor score was significantly different based on participants self-reported race and ethnicity, $F(5, 84) = 2.85, p = .02$. Post-hoc tests were not possible given that there were less than five participants in some of the race/ethnicity categories. The CFI Control factor score was significantly different based on participants’ highest level of education, $F(4, 88) = 4.30, p = .003$. Participants with a high school degree or GED had significantly lower scores than the other education groups on this measure (LSD comparison $p$ values: <.001 to .02).

Comparisons were made between the participants recruited via UCCS’s online undergraduate research platform and the participants recruited from the community or the
Table 3

Means, Standard Deviations, Ranges, and Intercorrelations of the Measures of Emotion Regulation, Flexibility, and PTSD/CPTSD

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ERQ CR</td>
<td>27.57</td>
<td>6.92</td>
<td>12.00-42.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. ERQ ES</td>
<td>16.32</td>
<td>4.68</td>
<td>4.00-26.00</td>
<td>.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. FREE flexibility</td>
<td>7.21</td>
<td>1.72</td>
<td>3.25-11.00</td>
<td>.46**</td>
<td>-.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. PFQ</td>
<td>84.73</td>
<td>14.19</td>
<td>39.00-113.00</td>
<td>.27**</td>
<td>-.08</td>
<td>.33**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. CFI Alternatives</td>
<td>71.00</td>
<td>10.04</td>
<td>40.00-91.00</td>
<td>.47**</td>
<td>.03</td>
<td>.36**</td>
<td>.53**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. CFI Control</td>
<td>33.22</td>
<td>8.78</td>
<td>13.00-49.00</td>
<td>.35**</td>
<td>-.04</td>
<td>.13</td>
<td>.36**</td>
<td>.32**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. PNS</td>
<td>47.65</td>
<td>7.21</td>
<td>35.00-65.00</td>
<td>-.05</td>
<td>-.25*</td>
<td>.07</td>
<td>.16</td>
<td>.17</td>
<td>-.22*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. WCST perseverative errors</td>
<td>98.59</td>
<td>20.09</td>
<td>55.00-145.00</td>
<td>.11</td>
<td>.01</td>
<td>.14</td>
<td>.23*</td>
<td>.28**</td>
<td>.09</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. ln(TMT score)</td>
<td>3.18</td>
<td>0.55</td>
<td>1.95-4.49</td>
<td>-.10</td>
<td>-.05</td>
<td>-.00</td>
<td>-.11</td>
<td>-.11</td>
<td>-.18</td>
<td>.14</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. DKEFS C-W Condition 4 scaled</td>
<td>11.09</td>
<td>2.55</td>
<td>3.00-16.00</td>
<td>.08</td>
<td>.02</td>
<td>.04</td>
<td>.02</td>
<td>.13</td>
<td>.05</td>
<td>.08</td>
<td>-.24*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. ER CR = Emotion Regulation Questionnaire Cognitive Reappraisal, ERQ ES = Emotion Regulation Questionnaire Expressive Suppression, FREE = Flexible Regulation of Emotional Expression, PFQ = Psychological Flexibility Questionnaire, CFI = Cognitive Flexibility Inventory, PNS = Personal Need For Structure, WCST = Wisconsin Card-Sorting Task, ln = natural log, TMT = Trail Making Test, DKEFS C-W = Delis-Kaplan Executive Function Scale Color-Word Interference, ITQ = International Trauma Questionnaire, PTSD = Posttraumatic Stress Disorder, CPTSD = Complex Posttraumatic Stress Disorder. *p < .05, **p < .01.
Table 4

Preliminary Analyses of Primary Measures by Gender

<table>
<thead>
<tr>
<th>Measure</th>
<th>Male</th>
<th>Female</th>
<th>t(89)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 37)</td>
<td></td>
<td>(n = 54)</td>
<td></td>
</tr>
<tr>
<td>ITQ CPTSD score</td>
<td>8.43 (5.70)</td>
<td>11.35 (6.17)</td>
<td>-2.29*</td>
</tr>
<tr>
<td>ITQ PTSD score</td>
<td>8.59 (6.19)</td>
<td>11.52 (6.17)</td>
<td>-2.22*</td>
</tr>
<tr>
<td>ERQ CR score</td>
<td>29.03 (6.48)</td>
<td>26.61 (7.05)</td>
<td>1.66</td>
</tr>
<tr>
<td>ERQ ES score</td>
<td>17.43 (4.21)</td>
<td>15.74 (4.91)</td>
<td>1.71</td>
</tr>
<tr>
<td>FREE flexibility score</td>
<td>6.89 (1.68)</td>
<td>7.34 (1.71)</td>
<td>-1.25</td>
</tr>
<tr>
<td>PFQ score</td>
<td>83.32 (11.97)</td>
<td>85.91 (15.45)</td>
<td>-0.86</td>
</tr>
<tr>
<td>CFI Alternatives score</td>
<td>71.46 (9.14)</td>
<td>70.70 (10.62)</td>
<td>0.35</td>
</tr>
<tr>
<td>CFI Control score</td>
<td>35.03 (8.04)</td>
<td>32.33 (9.45)</td>
<td>1.42</td>
</tr>
<tr>
<td>PNS score</td>
<td>45.45 (6.69)</td>
<td>49.02 (7.31)</td>
<td>-2.31*</td>
</tr>
<tr>
<td>WCST perseverative errors</td>
<td>98.19 (15.65)</td>
<td>98.48 (22.94)</td>
<td>-0.07</td>
</tr>
<tr>
<td>standard score*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(TMT score)</td>
<td>3.10 (0.52)</td>
<td>3.23 (0.58)</td>
<td>-1.10</td>
</tr>
<tr>
<td>DKEFS C-W Condition 4 scaled</td>
<td>11.16 (2.52)</td>
<td>11.02 (2.57)</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Notes. SE = standard error of $B$, ITQ = International Trauma Questionnaire, CPTSD = Complex posttraumatic stress disorder, PTSD = posttraumatic stress disorder, ERQ = Emotion Regulation Questionnaire, CR = Cognitive Reappraisal, FREE = Flexible Regulation of Emotional Expression, PFQ = Psychological Flexibility Questionnaire, CFI = Cognitive Flexibility Inventory, PNS = Personal Need For Structure, WCST = Wisconsin Card-Sorting Task, ln = natural log, TMT = Trail Making Test, DKEFS C-W = Delis-Kaplan Executive Function Scale Color-Word Interference. *$p < .05$. †Due to missing data, data from 36 males and 52 females were used to calculate the means and standard deviations for the WCST perseverative errors standard score, and the degree of freedom for the $t$ test was 86 for this variable.

THHC registry in order to see if these groups were significantly different from each other in regard to demographic characteristics or the main variables of interest. The UCCS undergraduate participants were significantly different from the community participants in expected ways, including being significantly younger ($t(91) = 5.20, p < .001$), reporting their employment status as students more often and retired less often ($\chi^2 = 24.57, p < .001$), and having a Bachelor’s or Master’s degree less often than the community participants ($\chi^2 = 19.82, p = .001$). The average time since the index trauma
Table 5

Preliminary Analyses of Primary Measure Means and Standard Deviations by Race/Ethnicity

<table>
<thead>
<tr>
<th>Measure</th>
<th>Race/Ethnicity</th>
<th>White – Not Hispanic (n = 64)</th>
<th>White – Hispanic (n = 10)</th>
<th>Black (n = 5)</th>
<th>American Indian/Alaskan (n = 1)</th>
<th>Asian (n = 2)</th>
<th>More than one race (n = 8)</th>
<th>F(5, 84)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITQ CPTSD</td>
<td></td>
<td>9.56 (6.30)</td>
<td>12.50 (4.14)</td>
<td>13.00 (7.18)</td>
<td>12.00 (6.67)</td>
<td>9.50 (9.19)</td>
<td>9.00 (5.90)</td>
<td>0.70</td>
</tr>
<tr>
<td>ITQ PTSD</td>
<td></td>
<td>9.78 (6.44)</td>
<td>11.80 (6.01)</td>
<td>14.00 (9.86)</td>
<td>18.00 (6.67)</td>
<td>10.00 (4.95)</td>
<td>10.00 (2.83)</td>
<td>0.83</td>
</tr>
<tr>
<td>ERQ CR</td>
<td></td>
<td>27.05 (6.72)</td>
<td>28.90 (6.01)</td>
<td>32.80 (9.12)</td>
<td>28.00 (7.18)</td>
<td>25.50 (4.95)</td>
<td>30.88 (6.22)</td>
<td>1.13</td>
</tr>
<tr>
<td>ERQ ES</td>
<td></td>
<td>16.31 (4.38)</td>
<td>18.30 (3.43)</td>
<td>15.20 (7.26)</td>
<td>21.00 (2.12)</td>
<td>12.50 (2.12)</td>
<td>17.63 (5.01)</td>
<td>1.04</td>
</tr>
<tr>
<td>FREE flexibility</td>
<td></td>
<td>6.94 (1.75)</td>
<td>7.70 (1.01)</td>
<td>7.70 (2.06)</td>
<td>6.00 (2.06)</td>
<td>8.50 (0.88)</td>
<td>7.79 (1.76)</td>
<td>1.28</td>
</tr>
<tr>
<td>PFQ</td>
<td></td>
<td>85.78 (14.77)</td>
<td>80.80 (11.42)</td>
<td>83.00 (13.29)</td>
<td>58.00 (9.19)</td>
<td>86.50 (11.21)</td>
<td>85.88 (9.19)</td>
<td>0.98</td>
</tr>
<tr>
<td>CFI Alternatives</td>
<td></td>
<td>72.08 (9.04)</td>
<td>68.10 (11.60)</td>
<td>67.40 (8.32)</td>
<td>40.00 (2.12)</td>
<td>77.50 (12.39)</td>
<td>73.38 (12.39)</td>
<td>2.85*</td>
</tr>
<tr>
<td>CFI Control</td>
<td></td>
<td>34.50 (9.00)</td>
<td>32.00 (8.93)</td>
<td>27.80 (8.11)</td>
<td>29.00 (4.24)</td>
<td>24.00 (2.12)</td>
<td>35.25 (7.52)</td>
<td>1.22</td>
</tr>
<tr>
<td>PNS score</td>
<td></td>
<td>47.66 (7.11)</td>
<td>44.40 (7.01)</td>
<td>48.20 (7.85)</td>
<td>40.00 (4.95)</td>
<td>55.50 (4.95)</td>
<td>49.00 (8.82)</td>
<td>1.14</td>
</tr>
<tr>
<td>WCST perseverative errors standard score*</td>
<td></td>
<td>100.52 (19.07)</td>
<td>92.30 (26.62)</td>
<td>86.00 (9.54)</td>
<td>94.00 (33.23)</td>
<td>121.50 (18.79)</td>
<td>100.25 (18.79)</td>
<td>1.25</td>
</tr>
<tr>
<td>ln(TMT score)</td>
<td></td>
<td>3.10 (0.54)</td>
<td>3.36 (0.34)</td>
<td>3.43 (0.34)</td>
<td>3.33 (0.14)</td>
<td>3.23 (0.14)</td>
<td>3.05 (0.65)</td>
<td>0.75</td>
</tr>
<tr>
<td>DKEFS C-W</td>
<td></td>
<td>11.19 (2.50)</td>
<td>11.30 (2.00)</td>
<td>9.40 (3.51)</td>
<td>6.00 (0.00)</td>
<td>11.00 (0.00)</td>
<td>11.88 (2.36)</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Notes. ITQ = International Trauma Questionnaire, CPTSD = Complex posttraumatic stress disorder, PTSD = posttraumatic stress disorder, ERQ = Emotion Regulation Questionnaire, CR = Cognitive Reappraisal, FREE = Flexible Regulation of Emotional Expression, PFQ = Psychological Flexibility Questionnaire, CFI = Cognitive Flexibility Inventory, PNS = Personal Need For Structure, WCST = Wisconsin Card-Sorting Task, ln = natural log, TMT = Trail Making Test, DKEFS C-W = Delis-Kaplan Executive Function Scale Color-Word Interference. *p < .05. *Due to missing data, only 61 participants’ data were used to calculate the mean and standard deviation of the WCST perseverative errors standard score for the White – Not Hispanic group, and the degrees of freedom for the F test were 5 and 81 for this variable.
event was also significantly less on for the UCCS undergraduate participants \((M = 7.16, SD = 4.66)\) than for the community participants \((M = 14.06, SD = 13.10; t(91) = 2.88, p < .01)\). In regard to the main variables of interest for testing the hypotheses, the UCCS undergraduate students \((M = 12.59, SD = 5.89)\) had significantly higher scores on the PTSD symptom severity measure than the community participants \((M = 9.34, SD = 6.28; t(91) = -2.42, p = .02)\). The two groups were not significantly different from each other on any of the other measures.

**Hypothesis 1**

To test the first hypothesis (items from the measures of psychological flexibility, cognitive flexibility, and emotion regulation will converge and result in factors that comprise items from measures of multiple constructs rather than only items from measures of a singular construct), I first reviewed the correlation matrix in Table 2 in order to confirm that the measures of flexibility and emotion regulation were indeed correlated with each other. These included the following variables: (1) the ERQ Cognitive Reappraisal (CR) score, (2) the ERQ Expressive Suppression (ES) score, (3) the FREE flexibility score, (4) the PFQ score, (5) the CFI Alternatives score, (6) the CFI Control score, (7) the PNS score (8) the WCST perseverative errors standard score, (9) the natural log of the TMT score, and (10) the D-KEFS Color-Word Interference Condition 4 standard score.

Significant positive correlations emerged between several of the variables. The self-report measures of emotion regulation (ERQ CR score only), flexible use of emotion regulation strategies (FREE), psychological flexibility (PFQ), and cognitive flexibility (CFI Alternatives and Control scores) were almost significantly correlated with each
other \((r = .32-.53, p < .005)\). The only exception to this was a non-significant relationship between the FREE flexibility score and the CFI Control score. The PNS score was only significantly correlated with the ERQ ES score and the CFI Control score, and the ERQ ES score was only significantly correlated with the PNS score.

As for the neuropsychological assessment variables, the WCST perseverative errors score was positively correlated with PFQ total score and CFI Alternatives score \((p < .05)\). The TMT score and the DKEFS Condition 4 standard score were not significantly correlated with any of the self-report measures, but these variables were correlated with each other \((p < .05)\). No significant relationship emerged between the WCST perseverative errors score and the other two neuropsychological assessment variables.

Given that the ERQ ES score was correlated only with the PNS score, this score was removed from subsequent analyses. The ERQ CR score served as the self-report measure of emotion regulation for all subsequent analyses. Though the PNS correlated significantly with only one of the other measures, it is the only measure of the need for structure included, so it was retained in subsequent analyses.

**Principal Axis Factoring.** I proceeded to test my first hypothesis by conducting principal axis factoring (PAF) with direct oblimin rotation to determine whether the underlying factors comprise items from measures of multiple constructs rather than only items from measures of a singular construct. PAF is a form of exploratory factor analysis and is also known as “common factor analysis.” This technique can be used to summarize data, or determine how many factors represent a set of items, how items are related to each of the factors, and if factors are related to each other. This technique is considered to be more theory-driven than other forms of exploratory factor analysis, but still
appropriate when questions remain about how many and what factors underlie the data. Also, this extraction method statistically removes measurement error from the analyses, which other exploratory factor analysis methods, like principal component analysis, do not. Removing measurement error typically results in lower overall factor loadings, but the resulting factors reflect only the common variance of the items they underlie rather than being ‘contaminated’ by variance due to measurement error. Therefore, this statistical technique seemed appropriate for testing this hypothesis, which concerns the factor structure of the items that comprise the measures of emotion regulation, psychological flexibility, and cognitive flexibility.

**PAF Specifications and Assumptions.** Direct oblimin rotation was used given the high likelihood that the factors extracted from the data would be at least somewhat correlated with each other. In addition to the previously checked statistical assumptions, the factorability of the data was checked, or it was confirmed that the items entered into the model would likely “hang” together using three separate statistics. First, Bartlett’s test of sphericity should be significant, which indicates that the correlation matrix of the items included in the model is significantly different from the identity matrix, or a matrix in which none of the items correlate with each other. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO), which indicates the extent to which the variance in the items is explained by all of the other items included in the model, was also checked to confirm that it was equal to or greater than .60 (Kaiser, 1974). Finally, the communalities for each item, or the proportion of the variance of the item that is explained by all of the extracted factors, were reviewed to ensure that they were greater than or equal to .50. It is preferred that the communalities each be greater than or equal to .60 (Tabachnick &
Fidell, 2013), but .50 is also a commonly cited cutoff for this statistical test (Kaiser, 1974).

**PAF Model Modifications.** When all of the items that comprise the ERQ CR subscale, FREE, PFQ, CFI Alternatives and Control factors, and PNS as well as the three neuropsychological assessment variables were entered into the same model (total of 77 items), some of the statistical assumptions regarding factorability of the data were not met. Bartlett’s test of sphericity was significant ($p < .001$), but the model’s KMO was only .40, which is below the .60 cutoff desired for this statistic. Additionally, the DKEFS C-W Condition 4 score had an extraction communality below .50, suggesting that less than 50% of the variance of this item was explained by all of the extracted factors. Given the low KMO value and communality, factorability of the data was not confirmed for this first model.

The model was therefore re-run after removing the items with low communalities (total of 76 items). Bartlett’s test of sphericity remained significant ($p < .001$), and the KMO remained at .40. However, all of the item’s communalities were above .50. Given that two of the three statistical assumptions for factorability of the data were met, the indices of how many factors underlie the data were examined to determine if further modifications to the model could be made to increase factorability. The first index is how many eigenvalues are greater than one, as an eigenvalue indicates how many items are explained by a factor. An eigenvalue greater than one therefore indicates that a factor explains the variance for more than one item. The second index is a visual examination of the scree plot or graphical representation of the eigenvalues. The number of factors that underlie the data is typically equal to the number of data points that are above the “last
“steep drop” on the scree plot. Agreement between the number of eigenvalues greater than 1 and the number of factors suggested by a visual examination of the scree plot is desired.

When the eigenvalues for the second model were examined, 21 factors had eigenvalues greater than one, ranging from 1.01 to 15.19. The scree plot demonstrated a “steep drop” after only four factors, so the eigenvalues and scree plot were not in agreement. Given the inconclusiveness of these indices, I conducted a parallel analysis to determine the appropriate number of factors to extract from the data. Parallel analysis is a Monte Carlo simulation (Horn, 1965), which generates confidence intervals for each eigenvalue. Only extracting factors whose eigenvalues exceed the 95th percentile prevents over-extraction of factors. When the eigenvalues of the second model were compared to the 95th percentiles generated by the parallel analysis, the first seven eigenvalues exceeded the 95th percentile, suggesting that seven factors underlied the data and were statistically meaningful (or emerged beyond chance).

The model was thus re-run a third time limiting the number of extracted factors to seven as indicated by the parallel analysis. With this new parameter, Bartlett’s test of sphericity remained significant ($p < .001$), but the KMO remained at .40 given that the same 76 items remained in the model. The communalities for each item were re-examined, and 34 of the items’ communalities fell below the acceptable cutoff of .50 (see Table 6 for a list of the removed items). This large number of low communalities may have contributed to the low KMO value.

The model was re-run a fourth time excluding the items with the low communalities and limiting the number of extracted factors to seven. A total of 42 items remained in the model. Bartlett’s test of sphericity remained significant, and the KMO
Table 6

*Items Removed with Each Round of Principal Axis Factoring*

<table>
<thead>
<tr>
<th>PAF</th>
<th>Number of factors specified</th>
<th>KMO</th>
<th>Items removed due to extraction communalities &lt; .50</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NA</td>
<td>.40</td>
<td>DKEFS Color-Word Condition 4 scaled score</td>
</tr>
<tr>
<td>2</td>
<td>NA</td>
<td>.40</td>
<td>FREE 4: You receive a gift from a family member, but it’s a shirt you dislike. (Positive Expressive)</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>.40</td>
<td>FREE 5: Your friend is telling you about what a terrible day they had. (Negative Expressive)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 6: Your boss is complaining about a project you know little about and have no involvement with. (Negative Expressive)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 8: You’re attending the funeral of someone you don’t know. (Negative Expressive)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 9: While having dinner with a friend who has just recently lost their job, you receive a phone call stating you will get a raise. (Positive Concealment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 13: You are at a social event and the person you’re talking to frequently spits while they speak. (Negative Concealment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 14: You have just heard about the death of a close relative right before an important work meeting. (Negative Concealment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 15: You are on a first date at a restaurant having dinner, and a stranger spills their drink on you. (Negative Concealment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FREE 16: After you have a very irritating and stressful day, a sometimes-annoying neighbor stops by to say hello. (Negative Concealment)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 1: Reality is never absolute.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 2: In a situation of changeable reality, I am able to initiate the required changes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 3: When times are hard, even very hard, I am able to remember that there are better times ahead.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 4: Concepts may possess different meanings when perceived in different contexts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 8: I am an open person in comparison with others.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 9: Reality has many different aspects.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 10: I often find a change to be a challenge.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 12: I find it easy to acknowledge reality’s multiversity of manifestations, manifestations that may often be significantly divergent, or even conflict with one another.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 13: It is important to me to learn from each and every person.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PFQ 18: It is easy for me to think of ways of conduct that are very unconventional.</td>
</tr>
</tbody>
</table>
Table 6 (continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFQ 20</td>
<td>When given an assignment, I am able to come up with original ways of completing it, in comparison with how I used to approach it before.</td>
</tr>
<tr>
<td>CFI 1</td>
<td>I am good at “sizing up” situations. (Alternatives factor)</td>
</tr>
<tr>
<td>CFI 6</td>
<td>I seek additional information not immediately available before attributing causes to behavior. (Alternatives factor)</td>
</tr>
<tr>
<td>CFI 10</td>
<td>I am good at putting myself in others’ shoes. (Alternatives factor)</td>
</tr>
<tr>
<td>CFI 12</td>
<td>It is important to look at difficult situations from many angles. (Alternatives factor)</td>
</tr>
<tr>
<td>PNS 3</td>
<td>I enjoy having a clear and structured mode of life.</td>
</tr>
<tr>
<td>PNS 4</td>
<td>I like to have a place for everything and everything in its place.</td>
</tr>
<tr>
<td>PNS 5</td>
<td>I enjoy being spontaneous.</td>
</tr>
<tr>
<td>PNS 8</td>
<td>I hate to change my plans at the last minute.</td>
</tr>
<tr>
<td>PNS 9</td>
<td>I hate to be with people who are unpredictable.</td>
</tr>
<tr>
<td>PNS 11</td>
<td>I enjoy the exhilaration of being in unpredictable situations.</td>
</tr>
<tr>
<td>PNS 12</td>
<td>I become uncomfortable when the rules in a situation are not clear WCST perseverative errors standard score Natural log of (TMT B – TMT A)</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>ERQ 5</td>
<td>When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm.</td>
</tr>
<tr>
<td>FREE 7</td>
<td>A friend is talking about a break-up that you secretly think is a good thing. (Negative Expressive)</td>
</tr>
<tr>
<td>PFQ 5</td>
<td>There are usually many possible ways to do things.</td>
</tr>
<tr>
<td>CFI 8</td>
<td>I try to think about things from another person’s point of view.</td>
</tr>
<tr>
<td>PNS 2</td>
<td>I’m bothered by things that interrupt my daily routine.</td>
</tr>
<tr>
<td>PNS 6</td>
<td>I find that a well-ordered life with regular hours makes my life tedious.</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>PNS 10</td>
<td>I find that a consistent routine enables me to enjoy life more.</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>FREE 1</td>
<td>A friend wins an award for a sport that doesn’t interest you. (Positive Expressive)</td>
</tr>
<tr>
<td>FREE 2</td>
<td>A coworker gets a promotion and wants to talk about it. (Positive Expressive)</td>
</tr>
<tr>
<td>FREE 10</td>
<td>You are in a training session and you accidentally see a funny typo in the presenter’s slideshow. (Positive Concealment)</td>
</tr>
<tr>
<td>FREE 11</td>
<td>You’re a guest at a solemn religious ceremony and the person sitting next to you just whispered a funny joke. (Positive Concealment)</td>
</tr>
<tr>
<td>FREE 12</td>
<td>During a meeting with a supervisor, his/her phone unexpectedly begins to play an embarrassing ringtone. (Positive Concealment)</td>
</tr>
<tr>
<td>PFQ 7</td>
<td>In a disagreement there are always numerous possible solutions — You just have to find them.</td>
</tr>
</tbody>
</table>
Table 6 (continued)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PFQ 17: When I encounter difficulties in achieving a goal, I am able to try numerous different solutions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFI 2: I have a hard time making decisions when faced with difficult situations. (Control factor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFI 13: When in difficult situations, I consider multiple options before deciding how to behave. (Alternatives factor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFI 16: I consider all the available facts and information when attributing causes to behavior. (Alternatives factor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFI 17: I feel I have no power to change things in difficult situations. (Control factor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNS 1: It upsets me to go into a situation without knowing what I can expect from it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNS 7: I don’t like situations that are uncertain.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>.86</td>
</tr>
<tr>
<td>FREE 3: A friend is talking about a great date she had the other night. (Positive Expressive)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>.86</td>
</tr>
<tr>
<td>PFQ 11: I think of myself as a person who is attentive to a variety of different messages and ideas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>.87</td>
</tr>
</tbody>
</table>

Notes. PAF = Principal Axis Factoring, KMO = Kaiser-Meyer-Olkin test of sampling adequacy, DKEFS = Delis-Kaplan Executive Function Scale, FREE = Flexible Regulation of Emotional Expression, PFQ = Psychological Flexibility Questionnaire, CFI = Cognitive Flexibility Inventory, PNS = Personal Need For Structure, WCST = Wisconsin Card-Sorting Task, TMT = Trail Making Test, ERQ = Emotion Regulation Questionnaire.

was now .79, which is “middling” and indicated that the data was indeed factorable (Kaiser, 1974). However, six of the item communalities were still below .50 (Table 6).

Thus these items were removed from the model and it was re-ran with a total of 36 items. Bartlett’s test was significant, and the KMO value increased to .81, which is a “meritorious” (Kaiser, 1974). One more item had an extraction communality below .50, so the model was re-run a sixth time with the item removed. Bartlett’s test of sphericity remained significant, and the KMO value remained “meritorious” at .81, so the indices of how many factors underlie the data were examined. The first seven eigenvalues were greater than one, but the scree plot suggested only four factors. The disagreement
between these two indices warranted a second parallel analysis. A comparison of the
eigenvalues of the modified model and the 95th percentiles generated by the second
parallel analysis indicated that four factors underlied the data.

Thus, the model was rerun, limiting the number of extracted factors to four as
indicated by the parallel analysis. Bartlett’s test for this model was significant, and the
KMO value remained at .81. However, the communalities for 13 of the items fell below
the acceptable cutoff of .50. These items were removed and the model re-ran twice more
when two more items with low communalities emerged.

Final PAF Model. The final model included 20 items and was limited to four
extracted factors. Bartlett’s test of sphericity was significant, and the KMO value was
“meritorious” at .87 (Kaiser, 1974). The item extraction communalities ranged from .51
to .85. Given that all three of these statistics indicated factorability of the data, I
proceeded to examine the indices of how many factors underlie the data. The eigenvalues
for the four specified factors ranged from 1.55 to 7.48. Cumulatively, the four factors
explained 71% of the variance in the data. A visual examination of the scree plot also
supported the extraction of four factors.

Given the agreement between these two indices, the pattern matrix was examined
to determine which items loaded onto the extracted factors. The pattern matrix displays
each item’s explained variance after shared variance between the factors has been
removed. Therefore, items are more likely to load strongly on only one extracted factor in
the pattern matrix than in the other matrices included in a PAF output. See Table 7 for
each item’s factor loadings on the four extracted factors. In sum, each factor comprised
items from a specific scale. Factor 1 comprised items from the ERQ having to do with
### Table 7

*Factor Loadings for Final Principal Axis Factoring with Direct Oblimin Rotation and Four Specified Factors*

<table>
<thead>
<tr>
<th>Item</th>
<th>Emotion Regulation</th>
<th>Psychological Flexibility</th>
<th>Cognitive Flexibility – Alternatives</th>
<th>Cognitive Flexibility – Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERQ 10: When I want to feel less negative emotion, I change the way I’m thinking about the situation.</td>
<td>-.95</td>
<td>.02</td>
<td>-.17</td>
<td>.02</td>
</tr>
<tr>
<td>ERQ 7: When I want to feel more positive emotion, I change the way I’m thinking about the situation.</td>
<td>-.84</td>
<td>-.06</td>
<td>.04</td>
<td>-.01</td>
</tr>
<tr>
<td>ERQ 8: I control my emotions by changing the way I think about the situation I’m in.</td>
<td>-.83</td>
<td>.02</td>
<td>-.01</td>
<td>.04</td>
</tr>
<tr>
<td>ERQ 3: When I want to feel less negative emotion (such as sadness or anger), I change what I’m thinking about.</td>
<td>-.73</td>
<td>-.09</td>
<td>.10</td>
<td>.07</td>
</tr>
<tr>
<td>ERQ 1: When I want to feel more positive emotion (such as joy or amusement), I change what I’m thinking about.</td>
<td>-.70</td>
<td>.04</td>
<td>.15</td>
<td>-.13</td>
</tr>
<tr>
<td>CFI 15: I am capable of overcoming the difficulties in life that I face.</td>
<td>-.49</td>
<td>.33</td>
<td>-.01</td>
<td>.15</td>
</tr>
<tr>
<td>PFQ 15: I feel ready to accept future changes.</td>
<td>.05</td>
<td>.85</td>
<td>-.05</td>
<td>.03</td>
</tr>
<tr>
<td>PFQ 19: I feel open to changes.</td>
<td>.01</td>
<td>.75</td>
<td>.06</td>
<td>.10</td>
</tr>
<tr>
<td>PFQ 6: I am open to experiencing the different and the exceptional.</td>
<td>.00</td>
<td>.74</td>
<td>-.09</td>
<td>.02</td>
</tr>
<tr>
<td>PFQ 16: At times I can make significant decisions, based on my need to change.</td>
<td>.11</td>
<td>.72</td>
<td>.14</td>
<td>-.07</td>
</tr>
<tr>
<td>PFQ 14: I recognize myself as someone who is able to change his/her position and modify him/herself accordingly.</td>
<td>-.15</td>
<td>.63</td>
<td>.13</td>
<td>.06</td>
</tr>
<tr>
<td>CFI 3: I consider multiple options before making a decision.</td>
<td>.05</td>
<td>-.09</td>
<td>.90</td>
<td>-.04</td>
</tr>
<tr>
<td>CFI 20: I consider multiple options before responding to difficult situations.</td>
<td>.03</td>
<td>.00</td>
<td>.86</td>
<td>.09</td>
</tr>
</tbody>
</table>
Table 7 (continued)

<table>
<thead>
<tr>
<th>CFI</th>
<th>Description</th>
<th>Factor Loadings</th>
<th>Error Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFI 18:</td>
<td>When I encounter difficult situations, I stop and try to think of several ways to resolve it.</td>
<td>.01 .07 .72 .03</td>
<td></td>
</tr>
<tr>
<td>CFI 5:</td>
<td>I like to look at difficult situations from many angles.</td>
<td>.09</td>
<td>.07</td>
</tr>
<tr>
<td>CFI 14:</td>
<td>I often look at a situation from different viewpoints.</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>CFI 4:</td>
<td>When I encounter difficult situations, I feel like I am losing control.</td>
<td>.09</td>
<td>-</td>
</tr>
<tr>
<td>CFI 7:</td>
<td>When encountering difficult situations, I become so stressed that I cannot think of a way to resolve the situation.</td>
<td>.00</td>
<td>.03</td>
</tr>
<tr>
<td>CFI 11:</td>
<td>When I encounter difficult situations, I just don't know what to do.</td>
<td>.03</td>
<td>-</td>
</tr>
<tr>
<td>CFI 9:</td>
<td>I find it troublesome that there are so many different ways to deal with difficult situations.</td>
<td>.05 .13 .06 .70</td>
<td></td>
</tr>
</tbody>
</table>

Notes. Salient item loadings (>.50) for each factor are boldface and listed in decreasing magnitude order for each factor. Factor loadings are from the Pattern Matrix. ERQ = Emotion Regulation Questionnaire, CFI = Cognitive Flexibility Inventory, PFQ = Psychological Flexibility Questionnaire.

changing how one thinks about something and one item from the CFI Control factor.

Factors 2 included items from the PFQ. Factors 3 and 4 comprised items from the CFI – Factor 3 represented the Alternatives factor of this measure, and Factor 4 represented the Control factor.

Finally, the factor correlation matrix was examined to determine how strongly correlated the extracted factors were to each other. The interfactor correlations ranged from -.34 to .44 (Table 8). The first hypothesis was primarily not supported with the exception of one item from the CFI Control factor, which loaded most strongly on the factors comprised of items from the ERQ.

Hypothesis 2

Correlations in Table 2 show bivariate relationships between CPTSD symptom severity and measures of flexibility. CPTSD symptom severity was significantly negatively correlated with the ERQ CR score ($r = -.33$, $r^2 = .09$, $p = .001$), the FREE
Table 8

*Interfactor Correlations*

<table>
<thead>
<tr>
<th>Factor</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 Emotion Regulation</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F2 Psychological Flexibility</td>
<td>-.28</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>F3 Cognitive Flexibility – Alternatives</td>
<td>-.34</td>
<td>.44</td>
<td>-</td>
</tr>
<tr>
<td>F4 Cognitive Flexibility – Control</td>
<td>-.30</td>
<td>.44</td>
<td>.20</td>
</tr>
</tbody>
</table>

flexibility score ($r = -.30, r^2 = .09, p = .004$), and the CFI Control score ($r = -.43, r^2 = .16, p < .001$). Effect sizes for these measures were in the medium range. Additionally, it had a negative, though non-significant relationship with small effect sizes with the PFQ score ($r = -.16, r^2 = .03, p = .13$) and the CFI Alternatives score ($r = -.16, r^2 = .03, p = .12$). The PNS, in which higher scores indicate poorer flexibility, was not significantly correlated with CPTSD symptom severity ($r = .08, r^2 = .006, p = .45$). The majority of neuropsychological measures showed no relationship with CPTSD: WCST perseverative errors standard score ($r = -.02, r^2 < .001, p = .89$), and DKEFS Condition 4 scaled score ($r = -.17, r^2 = .03, p = .11$). In contrast, TMT B – TMT A was significantly positive correlated ($r = .23, r^2 = .05, p = .02$) with CPTSD symptom severity.

**Hierarchical Multiple Regression.** Next, a hierarchical multiple regression was conducted to test which of the measures of psychological flexibility and cognitive flexibility exhibited a significant relationship with CPTSD symptom severity, even when controlling for emotion regulation and PTSD symptom severity. The first step of the multiple regression included PTSD symptom severity as the sole predictor, and the ERQ CR score was added in the second step. The third step included the eight remaining measures of flexibility: (1) FREE flexibility score, (2) PFQ score, (3) CFI Alternatives score, (4) CFI Control score, (5) PNS score, (6) WCST perseverative errors standard
score, (7) natural log of the TMT score, and (8) the DKEFS Condition 4 scaled score.

The outcome variable was ITQ CPTSD symptom severity (Table 9).

Table 9

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>(R^2)</th>
<th>(R^2) change</th>
<th>(F) change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ITQ PTSD symptom severity</td>
<td>0.60</td>
<td>0.08</td>
<td>.62</td>
<td>7.36***</td>
<td>.38</td>
<td>.38</td>
<td>54.12***</td>
</tr>
<tr>
<td>2</td>
<td>ITQ PTSD symptom severity</td>
<td>0.55</td>
<td>0.08</td>
<td>.57</td>
<td>6.76***</td>
<td>.42</td>
<td>.04</td>
<td>5.80*</td>
</tr>
<tr>
<td></td>
<td>ERQ CR score</td>
<td>-0.18</td>
<td>0.07</td>
<td>-.20</td>
<td>-2.41*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ITQ PTSD symptom severity</td>
<td>0.53</td>
<td>0.08</td>
<td>.55</td>
<td>6.68***</td>
<td>.57</td>
<td>.15</td>
<td>3.30**</td>
</tr>
<tr>
<td></td>
<td>ERQ CR score</td>
<td>-0.09</td>
<td>0.08</td>
<td>-.10</td>
<td>-1.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FREE flexibility score</td>
<td>-0.74</td>
<td>0.31</td>
<td>-.21</td>
<td>-2.38*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PFQ score</td>
<td>0.07</td>
<td>0.04</td>
<td>.17</td>
<td>1.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFI Alternatives score</td>
<td>0.10</td>
<td>0.06</td>
<td>.16</td>
<td>1.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFI Control score</td>
<td>-0.24</td>
<td>0.06</td>
<td>-.35</td>
<td>-3.82***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PNS score</td>
<td>-0.09</td>
<td>0.07</td>
<td>-.11</td>
<td>-1.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WCST perseverative errors standard score</td>
<td>-0.00</td>
<td>0.02</td>
<td>-.01</td>
<td>-.011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ln(TMT score)</td>
<td>1.88</td>
<td>0.88</td>
<td>.17</td>
<td>2.15*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DKEFS C-W Condition 4 scaled score</td>
<td>-0.04</td>
<td>0.19</td>
<td>-.02</td>
<td>-.023</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. \(SE\) = standard error of \(B\), ITQ = International Trauma Questionnaire, PTSD = posttraumatic stress disorder, ERQ = Emotion Regulation Questionnaire, CR = Cognitive Reappraisal, FREE = Flexible Regulation of Emotional Expression, PFQ = Psychological Flexibility Questionnaire, CFI = Cognitive Flexibility Inventory, PNS = Personal Need For Structure, WCST = Wisconsin Card-Sorting Task, ln = natural log, TMT = Trail Making Test, DKEFS C-W = Delis-Kaplan Executive Function Scale Color-Word Interference. *\(p < .05\), **\(p < .01\), ***\(p < .001\).

All of the predictors together explained 57% of the variance in CPTSD symptom severity. In the first step, PTSD symptom severity explained 38% of the variance in CPTSD symptom severity. When emotion regulation was added in the second step, an additional 4% of the variance was explained, \(F(1, 87) = 5.80, p = .02\). In the final step, the flexibility measures explained an additional 15% of the variance in CPTSD symptom severity, \(F(9, 78) = 3.30, p = .003\). The FREE flexibility score \((p = .02)\), the CFI Control
score \( p < .001 \), and the natural log of the TMT score \( p = .04 \) emerged as significant predictors of CPTSD symptom severity in addition to PTSD symptom severity \( p < .001 \).

The ERQ CR score was significant in the second step of the multiple regression \( p = .02 \), but it was no longer significant in the final step of the model \( p = .27 \). The PFQ score, CFI Alternatives score, PNS score, WCST perseverative errors standard score, and the DKEFS Condition 4 scaled score were not significant predictors of CPTSD symptom severity. Thus, the second hypothesis was partially supported. I hypothesized that all of the measures of flexibility would be significant predictors of CPTSD symptom severity, but only some of the measures (FREE Flexibility score, CFI Control score, and TMT score) were significant in the final step of the multiple regression.

**Exploratory Research Question**

The intent of the original exploratory research question of this thesis was to compare the model fit of two multiple regression models with latent factors predicting CPTSD symptom severity to see which model best fit the data. The predictors in the first multiple regression model would have been the latent factors generated by the analyses conducted to test Hypothesis 2, or the factors that emerged when all of the items measuring emotion regulation, psychological flexibility, and cognitive flexibility were entered into a PAF analysis. It was expected that these latent factors would comprise items from multiple measures of emotion regulation and flexibility. The outcome variable was to be a latent factor representing CPTSD symptom severity. The predictors in the second model would have been latent factors that represented each measure of emotion regulation, psychological flexibility, and cognitive flexibility individually, and the outcome would have been a latent factor representing CPTSD symptom severity as in the
first model. These predictor latent factors would have differed from the predictors utilized in the first model because they would not be composed of items from multiple measures, but rather only items from a single measure of emotion regulation or flexibility.

This research question was left unexplored because the two latent factor models that would have been compared for the exploratory research question would have been almost identical given the results of the PAF conducted to test Hypothesis 1. Each of the four factors that emerged from the PAF only included items from a single emotion regulation or flexibility measure with the exception of one CFI Control item that loaded on two factors other than the factor containing the other CFI items. With this one exception, this is the factor structure that was supposed to be represented by the second latent factor model. Thus, the two latent factor models compared for the exploratory research question would have been identical, thus making this analysis irrelevant.

**Secondary Analyses**

Given the results of testing Hypothesis 2, I investigated whether the flexibility measures significantly associated with CPTSD symptom severity were uniquely predictive of CPTSD symptom severity, or if they also significantly predicted PTSD symptom severity. Part of the purpose of this investigation was to identify potential underlying mechanisms of CPTSD symptoms. If these same underlying mechanisms are also significantly associated with PTSD symptom severity, then the mechanisms specific to the development and maintenance of CPTSD symptoms remain unknown.

To investigate this, I conducted a hierarchical multiple regression similar to that used to test Hypothesis 2, but with PTSD and CPTSD symptom severity reversed as
predictor and outcome variables. The eight flexibility variables, emotion regulation
variable, and CPTSD symptom severity were entered as predictors (10 total) across three
steps, and PTSD symptom severity served as the outcome variable (Table 10).
Altogether, the predictors explained 48% of the variance in PTSD symptom severity.
CPTSD symptom severity explained a significant amount of the variance in PTSD
symptom severity in all three steps of the regression ($p < .001$). The addition of the ERQ
CR score in the second step ($F(1, 87) = 0.15, p = .70$) did not significantly increase the
amount of the variance in PTSD symptom severity explained by the predictors. The
addition of the flexibility measures in the third step ($F(8, 79) = 1.77, p = .10$) also did not
significantly increase the amount of variance in PTSD symptom severity explained.

Finally, I conducted a multiple regression using structural equation modeling
(SEM) with the eight flexibility measures and emotion regulation measure as predictors
and both PTSD symptom severity and CPTSD symptom severity as the outcome
variables. This final model would have allowed one to observe within a single model the
predictive value of each flexibility measure for both PTSD and CPTSD symptom
severity. Multiple fit indices indicated that the model did not fit the data well, $\chi^2 =
152.68, \text{df} = 29, p < .001, \text{CFI} = .18, \text{TLI} = -.28, \text{RMSEA} = 1.74 (90\% \text{ CI: 1.01 to 1.89})$.
Thus, the model was rejected and left uninterpreted.
Table 10

*Stepwise Multiple Regression Analysis Predicting PTSD Symptom Severity*

<table>
<thead>
<tr>
<th>Step</th>
<th>Predictor</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>R²</th>
<th>ΔR²</th>
<th>F change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ITQ CPTSD symptom severity</td>
<td>0.64</td>
<td>0.09</td>
<td>.62</td>
<td>7.36***</td>
<td>.38</td>
<td>.38</td>
<td>54.12***</td>
</tr>
<tr>
<td>2</td>
<td>ITQ CPTSD symptom severity</td>
<td>0.63</td>
<td>0.09</td>
<td>.61</td>
<td>6.76***</td>
<td>.38</td>
<td>.00</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>ERQ CR score</td>
<td>-0.03</td>
<td>0.08</td>
<td>-.03</td>
<td>-0.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ITQ CPTSD symptom severity</td>
<td>0.68</td>
<td>0.10</td>
<td>.66</td>
<td>6.68***</td>
<td>.48</td>
<td>.09</td>
<td>1.77</td>
</tr>
<tr>
<td></td>
<td>ERQ CR score</td>
<td>0.03</td>
<td>0.09</td>
<td>.03</td>
<td>0.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FREE flexibility score</td>
<td>0.44</td>
<td>0.36</td>
<td>.12</td>
<td>1.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PFQ score</td>
<td>-0.10</td>
<td>0.05</td>
<td>-.23</td>
<td>-2.14*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFI Alternatives score</td>
<td>-0.13</td>
<td>0.07</td>
<td>-.20</td>
<td>-1.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CFI Control score</td>
<td>0.11</td>
<td>0.08</td>
<td>.15</td>
<td>1.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PNS score</td>
<td>0.12</td>
<td>0.08</td>
<td>.14</td>
<td>1.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WCST perseverative errors standard score</td>
<td>0.02</td>
<td>0.03</td>
<td>.08</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ln(TMT score)</td>
<td>-1.35</td>
<td>1.01</td>
<td>-.12</td>
<td>-1.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DKEFS C-W Condition</td>
<td>-.14</td>
<td>.22</td>
<td>-.06</td>
<td>-0.64</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHAPTER V
DISCUSSION

The goal of this investigation was to understand the role that psychological and cognitive flexibility play in the development and maintenance of CPTSD symptoms. To do so, it was important to see if and how psychological and cognitive flexibility are related to the construct of emotion regulation. Emotion regulation has been a prominent topic in the research on CPTSD because it is thought to be an underlying mechanism for the disorder. However, deficits in emotion regulation do not always account for the pervasive dysregulation that individuals with CPTSD experience and report, so other possible explanations for the development of this disorder need to be explored. Deficits in psychological and cognitive flexibility have each been associated with negative post-trauma outcomes, including more severe PTSD symptoms. Thus, flexibility could potentially be an underlying mechanism of CPTSD and possibly a more comprehensive one than emotion regulation has proven to be. Both self-report measures and neuropsychological assessments were used to measure flexibility, as some of the effects of trauma may be beyond people’s conscious awareness and only identifiable by objective tests like neuropsychological assessments. In a sample of 93 trauma-exposed participants, the primary findings were the following:

1) Self-report measures of psychological flexibility, cognitive flexibility, and emotion regulation and neuropsychological tests of cognitive flexibility were often significantly correlated with one another (small to medium correlations), but the
factors underlying these measures contain only items from a specific measure rather than items from multiple measures (e.g., a few items from a measure of psychological flexibility and a few items from a measure of emotion regulation).

2) Of an array of measures that assessed psychological flexibility, cognitive flexibility, and emotion regulation, the flexible use of emotion regulation strategies (the FREE), a facet of cognitive flexibility having to do with how in control one feels under stress (the Control factor of the CFI), and a neuropsychological task of cognitive flexibility (TMT B-A score) significantly predicted CPTSD symptom severity, even when controlling for PTSD symptom severity. None of these variables were also significant predictors of PTSD symptom severity. Only a self-report measure of psychological flexibility (PFQ) was a significant predictor of PTSD symptom severity.

**Relationships between Psychological Flexibility, Cognitive Flexibility, and Emotion Regulation**

The first goal of this study was to understand how different constructs that are all potentially measuring different aspects of flexibility are related to each other. I expected that the factors underlying psychological flexibility, cognitive flexibility, and emotion regulation would overlap with each other, but this idea was not supported. The measures of flexibility and emotion regulation appeared to have four separate underlying factors, as each factor comprised only items from one measure or factor. These were the measure of emotion regulation (ERQ), the measure of psychological flexibility (PFQ), the items reflecting one’s ability to generate multiple alternatives or solutions in difficult situations (the Alternatives factor of the CFI), and items reflecting how in control one feels under
stress (the Control factor of the CFI). One item from the CFI Control factor did not
cluster with other items from that measure, but this was the only exception to the pattern.
None of the three neuropsychological assessment variables were retained in the final
factor analysis due to less than 50% of each variable’s variance being explained by the
extracted factors.

These results suggest that emotion regulation, psychological flexibility, and
cognitive flexibility are indeed separate constructs. This may be important for researchers
to consider when including psychological or cognitive flexibility in their investigations.
Additionally, the term “flexibility” appears to encompass a broad array of constructs. A
majority of the items entered into the factor analysis were from measures purported to
assess psychological or cognitive flexibility, but the measures did not overlap in
meaningful ways. This supports Kashdan and Rottenberg’s (2010) conclusion that
psychological flexibility is a multidimensional construct that is difficult to fully capture
with one measurement tool. Future researchers should select measures carefully in order
to ensure that the questionnaires or tests chosen truly assess the construct(s) that the
researchers intend to measure and best fit the purpose of the investigation.

As for potential measurement issues, it is possible that this analysis was
underpowered if the traditionally recommended minimum of 200 participants is indeed
necessary to ensure a stable factor structure in exploratory factor analysis (Cattell, 1978;
Guilford, 1954). However, according to de Winter et al.’s (2009) calculations, between
78 and 99 participants are needed to obtain a stable 4-factor model like the one that
emerged from the factor analysis. Given the final sample size of 93, the 4-factor model
could be a fair representation of the underlying structure of the data. However, as with
any novel research idea, this analysis should be retested in the future using a larger sample size to see if the same factor structure emerges or if changing the sample size has a significant effect on the outcome.

**Complex PTSD and Psychological and Cognitive Flexibility**

The other goal of this study was to investigate whether measures of psychological and cognitive flexibility were associated with CPTSD symptom severity, even when accounting for the effects of ER and PTSD symptom severity. This hypothesis was partially supported. Three of the measures of flexibility, including both self-report and neuropsychological assessment variables, accounted for a significant portion of the variance in CPTSD symptom severity. Specifically, flexible regulation of emotion (FREE), how in control one feels under stress (the CFI Control factor), and the Trail Making Test significantly predicted CPTSD symptom severity. Furthermore, these constructs did not significantly predict PTSD symptom severity, which supports the idea that these flexibility measures are uniquely associated with CPTSD symptom severity.

**Why These Flexibility Variables?** The three flexibility measures that were significant predictors of CPTSD symptom severity encapsulate different facets of flexibility.

*An Emotional Dimension of Flexibility.* The FREE was created in order to capture the flexibility necessary to regulate emotions effectively (Burton & Bonanno, 2016). The creators of the measure described that learning a variety of emotion regulation skills was not sufficient – One must be able to flexibly switch between these skills and understand which skill will be most appropriate in a given situation in order to truly regulate emotions effectively. This measure may represent an emotional dimension of flexibility.
A Cognitive Dimension of Flexibility. The Trail Making Test, on the other hand, represents a more cognitive dimension of flexibility deficits related to CPTSD symptoms. Though trail making tests are seemingly simple tasks, they have been shown to involve several cognitive abilities, including attention, working memory, fluid intelligence, and processing speed in addition to cognitive flexibility (e.g., Salthouse, 2011; Strauss, Sherman, & Spreen, 2006). However, the use of TMT B – TMT A as the variable of cognitive flexibility lessens the impact of other cognitive abilities, particularly processing speed, involved in this measure. Subtracting the time taken to complete TMT A from the time taken to complete TMT B is a means of controlling for processing speed abilities by accounting for how long it takes a participant to visually scan and sequence a single set of stimuli. The other objective measures of cognitive flexibility used in this investigation, the WCST perseverative errors standard score and the DKEFS Condition 4 scaled score, do not directly control for the impact of these other cognitive domains, most notably working memory and inhibitory control. Thus, TMT may be the only “true” measure of cognitive flexibility, or at least the closest of the three neuropsychological tasks. TMT’s significance as a predictor of CPTSD symptom severity lends support to the idea that there is a cognitive/neurocognitive component to the inflexibility seen in this disorder. Future research should attempt to replicate this finding to determine whether TMT is a viable way to detect cognitive inflexibility in individuals suffering from CPTSD.

Self-Reported Cognitive Flexibility. Additionally, a self-report measure of cognitive flexibility, the Control factor of the CFI, was significantly associated with CPTSD symptom severity. The authors of the CFI hypothesized that if a person perceives difficult situations to be uncontrollable, they will be less likely to generate or consider
alternative solutions and more likely to engage in ruminative thought patterns (Dennis & Vander Wal, 2010). This conceptualization of inflexibility is quite different from the type of flexibility assessed by the FREE, and the two types of inflexibility would be expected to have different consequences for the person engaging in each one. As both of these scales were uniquely associated with CPTSD symptom severity, the inflexibility associated with CPTSD may be multifaceted and not able to be captured by a single measure of flexibility.

Potential Role of Self-Efficacy. On the surface, the significance of the three flexibility variables supports the idea that inflexibility is uniquely relevant to the development and maintenance of CPTSD symptoms. However, upon closer observation, the two self-report measures associated with CPTSD do not represent “classic” or “pure” definitions of flexibility, and findings might reflect what else is being measured, namely, flexibility specifically as it pertains to self-control or self-efficacy.

When taking a closer look at the items that make up the significant flexibility measures, it is possible that coping self-efficacy, or a person’s perception of their ability to cope with stressful or threatening situations, plays a role in these findings (Bandura, 1988). The measure of flexible emotion regulation used in this investigation asks respondents “how well you would be able” to engage in specific forms of emotion regulation, which requires respondents to assess their own ability to use emotion regulation strategies flexibly. Participants would not only have to use emotion regulation strategies in a flexible manner, but also believe they can use emotion regulation strategies flexibly in order to score themselves highly on the FREE. Similarly, the items that comprise the self-report measure of cognitive flexibility assess a person’s beliefs about
the controllability of their environment, which may be influenced by their perception of their personal ability to manage difficult situations.

Though self-efficacy was not investigated as part of this study, it could play a role in how psychologically or cognitively flexible a person is and also the development of CPTSD symptoms. Self-efficacy has already been shown to play an important role in the development and maintenance of PTSD symptoms (Benight & Bandura, 2004). Thus, future research should investigate if and how self-efficacy is related to psychological and/or cognitive flexibility and what role self-efficacy plays in the development of CPTSD symptoms specifically.

A Small, But Unique Relationship. Although flexibility was a significant and unique predictor of CPTSD symptom severity, the flexibility measures in this investigation accounted for only 15% of the variance in CPTSD symptom severity. Some would argue that this is not extremely meaningful when looking at the larger picture of predictors of clinical symptomatology. However, the fact that the flexibility measures uniquely predicted CPTSD symptom severity is important, as few constructs have been associated specifically with CPTSD symptoms to date. For example, more severe or chronic trauma histories are associated with CPTSD symptoms, but the experience of trauma is not unique to the development of CPTSD symptoms and is actually required to receive a diagnosis of PTSD (Brewin et al., 2017; Cloitre, Garvert, Brewin, Bryant, & Maercker, 2013). Greater emotion regulation difficulties and functional impairment have been associated with CPTSD, but emotion regulation difficulties and functional impairment are still observed in individuals with PTSD even if they are more severe in individuals who meet the criteria for CPTSD (Cloitre, Miranda, Stovall, McClough, &
Han 2005; Jerud et al., 2014; Powers et al., 2017). Flexibility may therefore be a construct that helps to distinguish between individuals displaying only the symptoms of PTSD and those displaying the additional symptoms of CPTSD, and likely experiencing greater functional impairment.

**The Role of Emotion Regulation.** Interestingly, the ER variable no longer accounted for a significant portion of the variance in CPTSD symptom severity once the flexibility variables were considered. ER has played a large role in theories of CPTSD symptom development and maintenance and treatments for the symptoms that characterize this diagnosis, so it was unexpected that the ER variable in this investigation was not a significant predictor of CPTSD symptom severity in the final regression model.

These findings could suggest that deficits in psychological and cognitive flexibility, rather than ER specifically, underlie the development and maintenance of CPTSD symptoms. Given that ER accounted for a significant amount of the variance in CPTSD symptom severity when PTSD symptom severity was the only other predictor but became non-significant when flexibility measures were added, it is possible that difficulty regulating emotions is not an underlying mechanism of CPTSD symptoms, but rather a symptom of more pervasive psychological and/or cognitive inflexibility. ER deficits may be one of the more easily recognizable signs of underlying inflexibility and thus most easily reported in clinical settings and captured by self-report measures used regularly in psychological research. However, the results of this investigation suggest that ER does not capture the breadth of the dysregulation experienced by individuals with CPTSD symptoms. Alternatively, it could be about how flexibly and adaptively one can use emotion regulation strategies. Experimental studies or interventions that aim to either
increase the quantity of emotion regulation strategies or increase the flexibility with which these strategies are used could help clarify which one of these approaches is most important when the goal is to decrease CPTSD symptom severity.

It is also possible that the measure of emotion regulation used in the current investigation does not adequately capture the construct of emotion regulation as it pertains to CPTSD. The subscale of the ERQ used in the final analyses, the cognitive reappraisal subscale, consists of items that describe the ability to “cognitively chang[e] the meaning of emotionally evocative stimuli” (Ochsner & Gross, 2005, p. 242). The distillation of emotion regulation into this one cognitive skill may be too narrow and not capture the breadth of emotion dysregulation present in individuals suffering from CPTSD symptoms. Emotion dysregulation in CPTSD is seen as one of many symptoms that result when self-regulatory capacities are compromised (Cloitre et al., 2009). In light of this conceptualization, it is possible that other measures of emotion regulation, like the NMRS, are more appropriate for the study of emotion dysregulation in CPTSD. The NMRS was developed based on the idea that people employ behavioral and cognitive strategies in order to self-regulate their affect (Catanzaro & Mearns, 1990). The NMRS could be more relevant to the study of CPTSD symptoms than the ERQ since it specifically captures underlying affective self-regulation. Future research should employ other, or multiple, measures of emotion regulation to see if the same results emerge.

Clinical Implications

Though the treatment of CPTSD as defined in the ICD-11 has not been empirically tested given the recent creation of the diagnosis, the results of multiple clinical trials have demonstrated that developing emotion regulation skills is an important
part of treatment for individuals exposed to complex trauma and presumably experiencing CPTSD symptoms (Cloitre, Koenen, Cohen, & Han, 2002; Cloitre et al., 2011; Ford, Steinberg, & Zhang, 2011). However, it is possible that the development of emotion regulation skills has been effective because it helps clients to develop greater psychological or cognitive flexibility in one area of functioning, which then generalizes to other areas of their functioning. If this is the case, then there may be other forms of inflexibility besides emotion dysregulation that can be targeted in therapy.

The results of this investigation suggest that perhaps the target of therapy should not simply be the development of emotion regulation skills, but also helping clients to use those skills flexibly in a variety of contexts and situations. Developing the capacity to adapt to changing and/or challenging circumstances may drive people’s recovery from Complex PTSD. Learning and using emotion regulation skills may be important to this process of change, but not the end goal of treatment. This idea is supported by the smaller effect sizes seen in clinical trials of skills training-only interventions with individuals exposed to complex trauma (Bradley & Follingstad, 2003; Zlotnik et al., 1997). Current treatments for PTSD do not necessarily place an emphasis on the development of flexibility, but this may be an important focus of emerging treatments for CPTSD.

Cognitive flexibility, especially in the realm of becoming easily overwhelmed when under stress and losing sight of one’s ability to problem solve, may be particularly relevant to CPTSD symptom development and maintenance. This variable emerged as significant in the form of both self-report responses and neuropsychological assessment performance, and it may therefore be an important target of clinical interventions for CPTSD. This idea is supported by the results of a randomized clinical trial testing the
effectiveness of an online neurocognitive intervention for PTSD. Ben-Zion and colleagues (2018) found that the participants in the intervention group demonstrated significantly larger improvements in cognitive flexibility and lower PTSD symptoms compared to the control group post-training, and there was a significant correlation between these outcomes. Although this intervention targeted PTSD symptoms rather than CPTSD symptoms, the results demonstrate that cognitive flexibility cannot only be targeted by clinical interventions, but that changes in this cognitive domain are associated with clinically significant outcomes for trauma-exposed individuals, some of whom may have qualified for the CPTSD diagnosis at the beginning of the study. More research is needed to expand this line of research and apply it specifically to the diagnosis of CPTSD.

**Future Research**

Though this investigation provides preliminary support for the above ideas, more research is needed to confirm the results of this investigation and expand upon its implications. Replication of the current analyses with a larger sample size than used here is also warranted. It is possible that the factors identified via the PAF will emerge with a larger sample, confirming that the constructs of psychological flexibility, cognitive flexibility, and emotion regulation are indeed separate constructs. But it is also possible that a larger sample, or simply a different sample, could have a unique pattern of results. A larger sample size would also allow for more sophisticated statistical analyses, such as SEM using latent factors. This type of analysis would remove error variance from the factor structure, improving one’s ability to observe the true factor structure underlying the data.
Longitudinal research is also needed in order to determine whether emotion regulation is actually the result of an underlying psychological and/or cognitive inflexibility or if a different type of relationship exists between these constructs. Cross-sectional studies, like the present investigation, are important for establishing that the hypothesized relationship indeed exists. However, conclusions about the directionality of this relationship cannot be drawn without data collected at multiple time points to show how these variables change over time and in relation to one another. Also, if psychological and/or cognitive flexibility is shown to be central to the development and maintenance of CPTSD symptoms through longitudinal research, then clinical research will be necessary to develop and test the effectiveness of interventions that aim to increase psychological and/or cognitive flexibility.

Additionally, it could help to further investigate what is actually being measured by the self-report questionnaires and neuropsychological assessments purportedly measuring cognitive flexibility and/or psychological flexibility. The current study demonstrated that these measures are not necessarily capturing the same constructs, even in the case of a construct like cognitive flexibility. This construct has been written about extensively within the fields of neuropsychological assessment and more general psychological research, but the self-report and neuropsychological assessment measures of this construct are not necessarily well related to each other as demonstrated by the lack of significant correlations between these measures in the current investigation (with the exception of a significant correlation between the CFI Alternatives factor and WCST perseverative errors standard score). It is still unclear why there is not more overlap in the measurement of these constructs that are all related to “flexibility” based on face validity.
of the measures. This study also only used certain measures of psychological and cognitive flexibility for the sake of feasibility, so including additional measures not included in the current study (i.e., Cognitive Flexibility Scale, Acceptance and Action Questionnaire) could also help to clarify what is occurring with the measurement of these constructs.

Limitations

The sample size used in this study limited the types of analyses that could be conducted as well as the research questions that could be answered satisfactorily. Future studies should employ larger sample sizes in order to avoid this limitation and confirm that the findings are not specific to the current sample.

It is also still in question whether the results of this study will generalize to other samples. Approximately one third of the sample was recruited from a Western, mid-sized public university. The inclusion of this many college-aged participants may limit the generalizability of the results. However, previous research comparing different recruitment sources for trauma-related studies has found that undergraduate populations did not differ significantly from a sample of trauma-exposed participants recruited via Amazon’s Mechanical Turk on mean level of PTSD symptoms or correlations between PTSD symptom severity and common trauma-related constructs (Engle, Talbot, & Samuelson, 2019). Though measures of psychological/cognitive flexibility and emotion regulation were not included in this comparison study, there is nothing to suggest that the same patterns could not be found for the relationships of these constructs to the symptoms of PTSD/CPTSD.
Additionally, the majority of other ICD-11 CPTSD studies published to date have studied populations exposed to specific types of trauma (i.e., interpersonal violence, childhood physical or sexual abuse, war-exposed civilians), but the current study uses a mixed-trauma sample. It is possible that the current sample is more similar to the general population than specific-trauma samples. However, this does not guarantee that other mixed-trauma populations or individuals exposed to a specific type of trauma will display the same pattern of results. More research is needed to determine if the results generalize to other samples of trauma-exposed individuals or if different patterns emerge depending on the population being studied.

Although this investigation included a large array of measures of cognitive and psychological flexibility, the list was not exhaustive. For example, other commonly used measures, such as the Acceptance and Action Questionnaire (AAQ; Bond et al., 2011), the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), or the Negative Mood Regulation Scale (NMRS; Catanzaro & Mearns, 1990), were not included in the study in order to minimize participant burden. The measures chosen may also not have adequately assessed the constructs of interest. For instance, the ERQ assesses the use of only two emotion regulation strategies, which lends to the brevity of the measure. However, there are other operationalizations of emotion regulation that extend beyond this two-part conceptualization. As previously discussed, it is possible that other measures of emotion regulation more fully capture the construct as it applies to individuals experiencing CPTSD symptoms. Future research should examine whether the present results can be replicated with the use of other common measures of emotion regulation, psychological flexibility, and cognitive flexibility.
As previously mentioned, this study was cross sectional, which limits the types of research questions that can be answered and the conclusions that can be drawn about the directionality of the relationships examined. Given that part of the purpose of this investigation was to establish that a relationship exists between measures of flexibility and CPTSD symptom severity, a cross-sectional design was acceptable. However, more complex research designs will be necessary to answer more nuanced questions about the relationship between these psychological phenomena and the potential benefits of clinical interventions designed to decrease the severity of CPTSD symptoms.

Finally, the CPTSD diagnosis and the measures used to operationalize the criteria of this diagnosis are relatively new. Thus, little research has been published on the CPTSD diagnosis or use of the ITQ. Firstly, this limits the evidence available for determining whether the results of the current investigation make sense in light of previously published research. Secondly, the criteria for the CPTSD diagnosis continues to change and evolve as more research is published. That being the case, the results of the current investigation are specific to the current definition and operationalization of CPTSD. If the criteria or operationalization changes in the future, then this research may need to be repeated in order to confirm whether the results remain even with a revised version of the CPTSD criteria.

**Conclusion**

This study provides preliminary support for the idea that deficits in psychological and cognitive flexibility do more to explain the pervasive dysregulation observed in individuals suffering from the symptoms of CPTSD than ER alone. Further research is needed to confirm and expand upon these findings, especially longitudinal research that
can clarify the directionality of the relationships observed between flexibility and emotion regulation. If further supported, the results of this study could have significant clinical implications. The development of flexible emotional expression and cognitive flexibility may need to be specific targets of future interventions for CPTSD symptoms.
REFERENCES


APPENDIX

IRB APPROVAL

University of Colorado
Colorado Springs

Institutional Review Board (IRB) for the Protection of Human Subjects

Date: 12/6/2018
IRB Review: APPROVED

IRB PROTOCOL NO.: 19-077
Protocol Title: Street and Trauma Assessment Research Study
Principal Investigator: Kristin Samuels
Faculty Advisor if Applicable:
Application: New Application
Type of Review: Expedited
Risk Level: No more than Minimal Risk
Renewal Review Level (If changed from original approval) if Applicable: Expedited
This Protocol involves a Vulnerable Population: NA (No Vulnerable Population)
Expires: 5 December 2019
*Note: if exempt: If there are no major changes in the research, protocol does not require review on a continuing basis by the IRB. In addition, the protocol may match more than one review category not listed.
Externally funded: Funding Pending
OSP #: 84710
Sponsor: Society for Military Psychology (Division 19)

Thank you for submitting your Request for IRB Review. The protocol identified above has been reviewed according to the policies of this institution and the provisions of applicable federal regulations. The review category is noted above, along with the expiration date, if applicable.

Once human participant research has been approved, it is the Principal Investigator’s (PI) responsibility to report any changes in research activity related to the project:
- The PI must submit all protocol, recruitment, advertising, and consent form amendments/revocations to the IRB for approval.
- The IRB must approve these changes prior to implementation.
- Changes in funding status must be reported to the IRB as quickly as possible to ensure funding requirements are met.
- If you are a student, note that it is required to include the IRB approval letter to the library when you submit the dissertation/thesis.
- The PI must promptly inform the IRB of all unexpected serious adverse (within 24 hours). All unexpected adverse events must be reported to the IRB within 1 week (see 45CFR46.107). Failure to comply with these federally mandated responsibilities may result in suspension or termination of the project.
- Renew study with the IRB at least 10 business days prior to expiration.
- Notify the IRB when the study is complete

If you have any questions, please contact Research Compliance Program Director in the Office of Sponsored Programs and Research Integrity at 719-255-3903 or irb@uccs.edu.

Thank you for your concern about human subject protection issues, and good luck with your research.

Sincerely yours,
Deborah J. Kang
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UCCS IRB Chair

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