Emotion Regulation Strategy Use and Posttraumatic Stress Disorder

by

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Abstract

A growing literature suggests that use of ER (ER) strategies, or efforts to affect the intensity, duration, or likelihood of experiencing a particular emotion is associated with posttraumatic stress disorder (PTSD). However, the existing literature is characterized by several important limitations, including examination of the association between individual strategies (e.g., thought suppression) in isolation rather than multiple strategies simultaneously, examination of PTSD at the syndrome level, and not controlling for negative affect, which has been hypothesized to inflate this association. This study sought to advance this literature by using latent variable modeling to examine the associations between use of seven ER strategies and five PTSD symptom clusters. Each strategy examined was associated with at least one PTSD symptom cluster. However, after controlling for negative affect, only experiential avoidance was associated with all PTSD symptom clusters. A number of measurement limitations and suggestions for future research are discussed.

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Introduction

A growing literature suggests that emotion regulation (ER), or efforts to affect the intensity, duration, or likelihood of experiencing a particular emotion (Gross, 1998), is associated with posttraumatic stress disorder (PTSD; see Kring & Sloan, 2010 for a review). Two of the core symptoms of PTSD, efforts to avoid trauma-related thoughts and behavioral avoidance of environmental trauma-related cues, are theorized to play a prominent role in the development and maintenance of the disorder. Information processing theory (Foa & Kozak, 1986; Foa, Steketee, & Rothbaum, 1989) emphasizes avoidance of trauma-related cues to avoid activating conditioned fear responses in that this avoidance results in paradoxical exacerbation of the fear network by preventing extinction. Within this definitional framework, avoidance of thoughts and situations associated with the traumatic event in order to affect the likelihood of experiencing a particular emotion constitute ER strategies. Therefore, information processing theory posits that PTSD is, at least in part, a disorder of ER in that use of these strategies is theorized to play an essential role in the development and maintenance of PTSD. In support of this theory, a number of longitudinal studies (Bardeen, Kumpala, & Orcutt, 2013; Kumpala, Orcutt, Bardeen, & Varkovitzky, 2011; Marx & Sloan, 2005; Nightingale & Williams, 2000) have demonstrated that several aspects of ER have been demonstrated to play important roles in the development and maintenance of PTSD.

ER is an umbrella label encompassing a number of related constructs. Several theoretical models have attempted to group aspects of ER. Among the most influential is Gross' process model (Gross, 1998). This model proposes that specific strategies used to regulate emotions (e.g., rumination) fall into five general categories by temporal sequence in the development and management of an emotion: situation selection (e.g., not attending an anxiety-provoking situation

in order to not become anxious), situation modification (e.g., steering a conversation away from emotionally-provocative topics), attentional deployment (e.g., distracting attention away from a distressing idea), cognitive change (e.g., trying to think about a distressing topic in a different way), and response modulation (e.g., breathing deeply to reduce anxiety). Another theoretical conceptualization of ER categorizes specific strategies as either adaptive or maladaptive (e.g., Aldao, Nolen-Hoeksema, & Schweizer, 2010) – strategies posited to function as protective factors against, and risk factors for psychopathology, respectively.

Several ER strategies, such as acceptance and positive reappraisal, have been conceptualized as adaptive based on empirical evidence suggesting that use of these strategies results in successful down-regulation of negative emotion and is positively associated with a host of desirable constructs such as self-esteem and life satisfaction (e.g., Campbell-Sills, Barlow, Brown, & Hoffmann, 1999; Gross & John, 2003). Acceptance involves the non-evaluative acknowledgment of affective experience (Baer, Smith, & Allen, 2004; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). According to the process model, acceptance is a form of response modulation; an adaptive response-focused ER strategy (Werner & Gross, 2009). Positive reappraisal is conceptualized as an adaptive, antecedent-focused form of cognitive change that involves thinking about an emotion-eliciting stimulus in a way that affects subjective emotional response (Gross, 1998).

Several other ER strategies, such as thought suppression, expressive suppression, experiential avoidance, and rumination have been conceptualized as maladaptive based on empirical evidence suggesting that use of these strategies results in unsuccessful down-regulation or even paradoxical exacerbation of negative emotion and is inversely associated with a host of desirable constructs such as self-esteem and life satisfaction (e.g., Butler et al., 2003; Gross &

John, 2003; Shipherd & Beck, 1999). Thought suppression is a form of attentional deployment that involves efforts to reduce the frequency of specific thoughts (Wegner et al., 1987). Expressive suppression is a form of response modulation, a response-focused strategy, which involves actively reducing outward displays of subjective emotional experience (Gross, 1998). Experiential avoidance is another form of response modulation that involves a general unwillingness to experience, and efforts to avoid unwanted subjective events such as thoughts and emotions (Bond et al., 2011; Hayes et al., 1996). Rumination is a form of attentional deployment, an antecedent-focused strategy that involves a passive pattern of perseverative focus on the cause and consequences of particular emotional experiences (McLaughlin & Nolen-Hoeksema, 2011).

Several studies have examined the association between ER strategy use and PTSD. With regard to strategies conceptualized as adaptive, such as acceptance and positive reappraisal, a small but growing literature suggests that use of these strategies is inversely associated with PTSD symptom severity. A number of studies have identified inverse relations such that greater use of acceptance is associated with less PTSD symptom severity (e.g., Thompson & Waltz, 2010; Vujanovic, Youngwirth, Johnson, & Zvolensky, 2009), and found that individuals without PTSD use acceptance more than individuals with PTSD (Frewen, Dozois, Neufeld, & Lanius, 2012). Additionally, a number of acceptance-based interventions (e.g., mindfulness-based stress reduction, tanscendental meditation) have been demonstrated to be effective in reducing PTSD symptom severity across civilian and veteran populations (e.g., Kearney, McDermott, Malte, Martinez, & Simpson, 2012; Rosenthal, Grosswald, Ross, & Rosenthal, 2011). Likewise, a number of studies examining use of positive reappraisal have identified inverse associations such that greater use of positive reappraisal is associated with less PTSD symptom severity among a

variety of samples (e.g., Boden, Bonn-Miller, Kashdan, Alvarez, & Gross, 2012; Eftekhari, Zoellner, & Vigil, 2009). Collectively, these findings indicate that use of acceptance and positive reappraisal is inversely associated with PTSD across populations.

Conversely, a rather expansive literature has demonstrated that use of a number of ER strategies conceptualized as maladaptive is positively associated with PTSD symptom severity. Several studies have found that greater use of thought suppression is associated with greater PTSD symptom severity (e.g., Rosenthal, Cheavens, Lynch, & Follette, 2006; Tull, Gratz, Salters, & Roemer, 2004; Vasquez, Hervas, & Perez-Sales, 2008) and that individuals with PTSD use thought suppression more than trauma-exposed individuals without PTSD (Amstadter & Vernon, 2008). Further, experimental studies have demonstrated that individuals with PTSD experience greater paradoxical increases in frequency of trauma-related thoughts when attempting to suppress them (Amstadter & Vernon, 2006; Shiperd & Beck, 1999) and experience greater subjective distress while attempting to do so (Beck, Gudmundsdottir, Palyo, Miller, & Grant, 2006; Shipherd & Beck, 1999) compared to trauma-exposed controls. With respect to expressive suppression, a positive association between use of expressive suppression and PTSD symptom severity has been found among a variety of samples (e.g., Eftekhari et al., 2009; Moore, Zoellner, & Mollenholt, 2008). In a longitudinal study, Nightingale and Williams (2000) found that expressive suppression was predictive of PTSD diagnostic status six weeks following exposure to a motor vehicle accident. Regarding use of experiential avoidance, a number of studies have found that greater use of experiential avoidance is associated with greater PTSD symptom severity among a variety of samples (e.g., Ehring & Quack, 2010; Hayes et al., 2004; Kashdan, Morina, & Priebe, 2009; Naifeh, Tull, & Gratz, 2012). Additionally, two longitudinal studies using student samples found that greater use of experiential avoidance was prospectively

predictive of PTSD symptom severity (Kumpala, Orcutt, Bardeen, & Varkovitzky, 2011; Marx & Sloan, 2005). As with other ER strategies conceptualized as maladaptive, a number of studies have found that greater use of rumination is associated with greater PTSD symptom severity (e.g., Chan, Ho, Tedeschi, & Leung, 2011; Hussain & Bhushan, 2011; Stockton, Hunt, & Joseph, 2011). Additionally, three longitudinal studies using community samples found that greater use of rumination is prospectively predictive of PTSD symptom severity (Birrer & Michael, 2011; Ehring, Frank, & Ehlers, 2008; Michael, Halligan, Clark, & Ehlers, 2007). Taken together, these findings indicate that use of these ER strategies conceptualized as maladaptive plays an important role in the development and maintenance of PTSD symptoms among trauma survivors.

To date, many studies examining the relation between particular aspects of ER and psychopathology have done so by examining individual strategies in isolation. This approach is limiting for two primary reasons. First, examining individual strategies in isolation does not allow for comparison between strategies in magnitude of association with dependent variables of interest. Second, ER research and existing measures of related constructs have been criticized for lack of conceptual clarity (e.g., Berking & Wupperman, 2012; Lewis, Zinbarg, & Durbin, 2010; Thompson, 1994). Specifically, self-report measures of ER vary in the emotion(s) they assess regulation of and, although the latent factor structures of individual measures have been examined during instrument development, the larger factor structure underlying use of multiple strategies remains largely unexamined (Aldao &Nolen-Hoeksema, 2010). Examining the underlying factor structure of ER strategy use would allow for examination of associations between the factors accounting for observed variance in self-report measures of ER and symptoms of PTSD.

Further, the much of existing research examining the association between ER and PTSD has examined PTSD at the syndrome level, rather than at the symptom cluster level. Confirmatory factor analyses have consistently demonstrated that PTSD consists of at least four correlated but distinct factors (e.g., King, Leskin, King, & Weathers, 1998; Simms, Watson, and Doebbeling, 2002). As with ER strategy use, examination of PTSD through latent variable modeling would allow for the examination of the underlying factors accounting for observed variance in self-report measurement of PTSD and provide valuable insight into particular symptoms of PTSD most strongly associated with specific ER strategies.

Lastly, one critique of the existing ER literature posits that some of the observed associations between ER and PTSD may be inflated by negative affect (Tull, Barrett, McMillan, & Roemer, 2007). Affect includes a variety of related constructs such as emotion and mood (Gross & Thompson, 2007), and consists of two distinct dimensions; positive and negative affect (Watson, Clark, & Tellegen, 1988). Negative affect includes a variety of forms of subjective distress such as irritability and guilt (Watson et al., 1988; Watson & Pennebaker, 1989). The tendency to experience negative affect is associated with both PTSD and aspects of ER (e.g., Tull et al., 2007), suggesting that this third variable may inflate the observed association between ER and PTSD. However, few studies in this area have examined this association while controlling for negative affect.

Study Aims

In an effort to advance this literature, this study aimed to examine the association between ER strategy use and PTSD symptoms in a manner that addresses several of the criticisms of the existing literature. First, this study aimed to examine the larger factor structure underlying use of multiple ER strategies. To accomplish this, competing measurement models of

ER strategy use were compared (see Table 1). The first hypothesized model (Model A; Aldao &
Nolen-Hoeksema, 2010) grouped all ER strategies into a one-factor solution. This model was
evaluated against three alternative models. The first alternative model (Model B; Aldao et al.,
2010) was a two-factor model in which thought suppression, expressive suppression, experiential
avoidance, and two dimensions of rumination load onto the latent construct of maladaptive ER
strategy use, and acceptance and positive reappraisal load onto the latent construct of adaptive
ER strategy use. A third model (Model C; Gross, 1998) categorized strategies into Gross'
original process model of ER, which categorizes both forms of rumination and thought
suppression as forms of attentional deployment, positive reappraisal as a form of cognitive
change, and acceptance, expressive suppression, and experiential avoidance as forms of response
modulation. Lastly, a fourth model (Model D) examined each strategy as its own first-order
factor.

The second aim of the study was to examine the underlying factor structure of PTSD.
Specifically, four proposed symptom cluster models were compared (see Table 2). The DSM-IV
three-factor model (American Psychiatric Association, 2000) was compared against the
emotional numbing four-factor model (King et al., 1998), the dysphoria alternative four-factor
model (Simms et al., 2002), and dysphoric arousal five-factor models (Elhai, Biehn, Armour,
Klopper, Frueh, & Palmieri, 2011). The third aim of the study was to examine the association
between the latent variables underlying ER strategy use and the latent variables corresponding to
the symptom cluster factors of PTSD. Lastly, the fourth aim of the current study is to examine
these associations while controlling for negative affect.

Method

Measures

A custom demographics questionnaire was used to collect gender, age, race, ethnicity, student, work, and marital status, and current prescription medication use information. Trauma exposure history was assessed using the Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000). The TLEQ assesses frequency of exposure to a number of traumatic events such as natural disasters, combat, and assault. This measure demonstrated adequate temporal stability and convergent validity with a clinician-administered version of the measure (Kubany et al., 2000). PTSD symptom severity was measured using the 17-item PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). This measure asks respondents to identify the degree to which they have experienced symptoms of posttraumatic stress in the past month on a 5-point Likert scale ranging from "not at all" to "extremely;" greater scores indicate greater severity of posttraumatic stress. The PCL has repeatedly demonstrated strong reliability and validity (for a review, see McDonald & Calhoun, 2010).

The 10-item negative affect subscale of the Positive and Negative Affect Schedule (PANAS-NA; Watson et al., 1988) was used to assess negative affect. The PANAS prompts respondents to identify the degree to which they have experienced a variety of positive and negative emotions during the past few weeks on a 5-item Likert scale ranging from "very slightly or not at all" to "extremely." The PANAS-NA is scored such that higher scores indicate greater negative affect.

The White Bear Thought Suppression Inventory (WBSI; Wegner & Zankos, 1994) is a 15-item self-report measure of thought suppression. The WBSI asks respondents to identify the degree to which they agree with a list of statements related to each construct on a 5-item Likert scale ranging from "strongly disagree" to "strongly agree" and is scored such that higher values are associated with greater use of thought suppression. The Ruminative Responses Scale (RRS;

Nolen-Hoeksema & Morrow, 1991) is a 22-item self-report measure of two dimensions of rumination; brooding and reflection (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Respondents are asked to identify the degree to which they utilize these strategies when feeling depressed on a four-point Likert scale ranging from "almost never" to "almost always." Each subscale is scored such that higher scores indicate greater use of rumination. Expressive suppression was measured using the respective 4-item subscale of the 10-item Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ asks respondents to rate the degree to which they agree with a list of statements related to each included construct on a seven-item Likert scale ranging from "strongly disagree" to "strongly agree" and is scored so that higher values indicate greater use of expressive suppression. The second version of the Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011) is a 10-item measure of experiential avoidance. Although initially developed with 10-items, the reduced 7-item one-factor scoring supported by the most recent psychometric data (Bond et al., 2011) was used in the current study. The AAQ-II asks respondents to select a rating on a 7-point Likert scale ranging from "never true" to "always true." Higher scores on the AAQ-II indicate less use of experiential avoidance.

The Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004) is a 39-item self-report measure of four dimensions of mindfulness; observing internal and external stimuli, non-judgmental describing, acting with awareness and focused attention, and accepting present experience without judgment. For the current study, acceptance was indexed using the 9-item accepting present experience without judgment subscale. The KIMS asks respondents to identify a rating on a 5-point Likert scale ranging from "never or very rarely true" to "very often or always true." This subscale is scored such that higher scores indicate greater use of acceptance.

Positive reappraisal was indexed using the respective 6-item subscale of the ERQ (Gross & John, 2003). Higher scores on this scale indicate greater use of positive reappraisal.

Participants & Procedure

For the purpose of this study, a convenience sample of undergraduate students was recruited. Undergraduate students age 18 and older enrolled in psychology courses at Auburn University were invited to participate in an online survey, for which they received extra-credit. Participants who consented were emailed a link to complete all included self-report measures online. Participants included in analyses endorsed exposure to at least one DSM-IV criterion A1 event. All procedures used were approved by the Auburn University Institutional Review Board (IRB).

Data Analytic Strategy

Measurement models of emotion regulation and PTSD symptom clusters presented in Tables 1 and 2 were tested using confirmatory factor analysis (CFA). Individual items were used as indicators for latent variables in each model compared. Because each of the included measures uses ordinal variables, parameters were estimated using Mean- and Variance-Adjusted Weighted Least Squares (WLSMV). Missing data was handled using pairwise deletion. Model fit was assessed using multiple indices; X^2, Tucker-Lewis index (TLI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). Although proposed fit statistics cutoffs outlined by Hu and Bentler (1999) and Kline (2005) were used (RMSEA $\leq$ .05, CFI and TLI $\geq$ .95), fit statistics were collectively evaluated for each model (Brown, 2006). Models were compared with chi-square difference testing for nested models using the DIFFTEST command in MPlus. For ER strategy use, measurement models A, B, and C were each compared against their parent model D. For PTSD symptom severity, the DSM-IV three-factor model, numbing four-

factor model, and dysphoria alternative four-factor model were each compared against their parent dysphoric arousal five-factor model. The associations between the latent variables of the best fitting measurement models of emotion regulation strategy use and PTSD symptom clusters were examined in structural models with and without including negative affect as an exogenous variable. All analyses were conducted in MPlus version 6 (Muthén & Muthén, 1998-2006).

In order for items in each CFA to be scored in a theoretically consistent direction, items from each measure of ER strategy use were all scored such that greater score is associated with poorer adjustment. Specifically, items on the WBSI, RRS, AAQ-II, and expressive suppression subscale of the ERQ were left in their original direction. All items of the accepting present experience without judgment subscale of the KIMS are reverse-scored on the original scale in order for greater scores to indicate greater use of acceptance; raw values on these items, rather than reverse-scored items were used. Additionally, the items corresponding to the positive reappraisal subscale of the ERQ were reverse-scored so that higher scores were associated with less use of positive reappraisal.

Results

Of the 322 participants who reported experiencing a stressful life event, 318 reported experiencing at least one criteria A1 event on the TLEQ. The most commonly reported worst events were sudden unexpected death of a friend or loved one (n = 98, 30%), motor vehicle accident (n = 46, 14%), and natural disaster (n = 26, 8%). Of the 318 participants who reported exposure to at least one traumatic event on the TLEQ, the majority identified as female (n = 243, 76.4%). Mean age of the sample was 20.68 (SD = 2.06, minimum = 18, maximum = 38). The majority of participants identified as Caucasian (n = 277, 87.1%) and the rest of participants

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identified as African American (n = 31, 9.7%), Asian American (n = 5, 1.6%), or other (n= 5, 1.6%).

Measurement Models

The first measurement model examined the factor structure underlying items on included self-report measures of emotion regulation strategy use by comparing four proposed models (see Table 1). None of the proposed measurement models resulted in excellent fit. The one-factor model A (X^2 = 7356.37, df = 1224, p<.001, CFI = .69, TLI = .67, RMSEA = .13, 90% CI = .13-.13), two-factor model B (X^2 = 6828.08, df = 1222, p<.001, CFI = .71, TLI = .70, RMSEA = .12, 90% CI = .12-.13), and three-factor model C (X^2 = 3762.78, df = 1221, p<.001, CFI = .87, TLI = .86, RMSEA = .08, 90% CI = .08-.09) did not result in adequate fit. However, the seven-factor model D (X^2 = 2523.52, df = 1203, p<.001, CFI = .93, TLI = .93, RMSEA = .06, 90% CI = .06-.06) resulted in adequate fit. Further, model D fit significantly better than models A (X^2 = 1502.88, df = 19, p <.001), B (X^2 = 1548.16, df = 21, p <.001), and C (X^2 = 511.62, df = 18, p <.001). As the best fitting measurement model of emotion regulation strategy use, the seven-factor model D was used in all subsequent analyses.

The second measurement model examined the factor structure underlying items related to PTSD symptoms on the PCL. None of the included models resulted in excellent fit. The DSM-IV three-factor model (X^2 = 4492.23, df = 116, p<.001, CFI = .96, TLI = .95, RMSEA = .10, 90% CI = .09-.11), numbing four-factor model (X^2 = 397.33, df = 113, p<.001, CFI = .97, TLI = .96, RMSEA = .09, 90% CI = .08-.10), and dysphoria four-factor model (X^2 = 332.57, df = 113, p<.001, CFI = .97, TLI = .97, RMSEA = .08, 90% CI = .07-.09) did not result in adequate fit. However, the dysphoric arousal five-factor model (X^2 = 252.84, df = 109, p<.001, CFI = .98, TLI = .98, RMSEA = .07, 90% CI = .06-.08) resulted in adequate fit. Results of chi square difference

tests indicated that the dysphoric arousal fit significantly better than the DSM-IV ($X^2 = 133.73$, $df = 7$, $p < .001$), numbing ($X^2 = 72.932$, $df = 4$, $p < .001$), and dysphoria models ($X^2 = 54.64$, $df = 4$, $p < .001$). As the best-fitting measurement model of PTSD symptoms, the dysphoric arousal five-factor model was used for subsequent analyses. Polychoric correlation coefficients among all included latent variables are presented in Table 3.

Structural Models

The first structural model regressed the five endogenous latent variables corresponding to PTSD symptom clusters on the seven exogenous latent variables corresponding to emotion regulation strategy use. Although this structural model resulted in excellent fit ($X^2 = 3372.23$, $df = 2144$, $p < .001$, CFI = .95, TLI = .94, RMSEA = .04, 90% CI = .04-.05), several associations between exogenous and endogenous latent variables appeared in reverse direction compared to the correlations. Given the strong associations observed among many of the exogenous variables in this model (see Table 3), these associations were likely the result of multicollinearity. Accordingly, separate structural models were run which regressed the five endogenous latent variables corresponding to PTSD symptom clusters on each of the seven exogenous latent variables corresponding to emotion regulation strategy use.

Within these individual models, associations between ER strategy use and PTSD symptom severity varied considerably by strategy (see Table 4, model 1). Each ER strategy examined was associated with at least one PTSD symptom cluster. Four included strategies, thought suppression, brooding rumination, experiential avoidance, and acceptance were significantly associated with every symptom cluster of PTSD. Reflective rumination was significantly associated with all symptom clusters with the exception of reexperiencing, expressive suppression was significantly associated with avoidance and emotional numbing

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symptoms such that greater use of these strategies was associated with greater symptom severity. Additionally, positive reappraisal was significantly associated with reexperiencing symptoms such that greater use of this strategy was associated with less symptom severity.

The next phase of analyses examined the associations between ER strategy use and PTSD symptom clusters while controlling for negative affect. Because of concerns raised about multicollinearity raised in the first model, separate structural models were run which regressed the five endogenous latent variables corresponding to PTSD symptom clusters on each of the seven exogenous latent variables corresponding to emotion regulation strategy use and the latent variable corresponding to negative affect. Negative affect was significantly associated with every symptom cluster of PTSD in each model (see Table 4, model 2). Within these models, only experiential avoidance was significantly associated with every PTSD symptom cluster such that greater use of this strategy was associated with greater symptom severity. However, thought suppression was associated with every symptom cluster except for reexperiencing such that greater use of this strategy was associated with greater PTSD symptom severity. Further, a number of other significant associations emerged such that greater use of these strategies was associated with greater PTSD symptom severity; brooding rumination with avoidance and dysphoric arousal symptoms, and both reflective rumination and expressive suppression with emotional numbing. Notably, acceptance and positive reappraisal were not significantly associated with any PTSD symptom cluster while controlling for negative affect.

Discussion

This study examined the association between use of a number of emotion regulation strategies and PTSD symptom clusters among a trauma-exposed student sample using latent variable modeling. Fit of four proposed measurement models of emotion regulation strategy use

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was examined using CFA; the best fitting model estimated the most parameters and allowed items on each of the seven included scales to load onto their respective, independent constructs. This model fit significantly better than the other models nested within it. Likewise, fit of four proposed measurement models of PTSD symptoms was examined using CFA; the best fitting model was the five-factor dysphoric arousal model which fit significantly better than the other models nested within it.

Results of the first set of structural models, examining the association between latent variables associated with emotion regulation strategy use and PTSD symptom clusters, demonstrated a significant association between each included emotion regulation strategy and at least one symptom cluster of PTSD. However, results varied considerably across strategies; thought suppression, brooding rumination, experiential avoidance, and acceptance were associated with every PTSD symptom cluster while other strategies (e.g., positive reappraisal) were only associated with specific symptom clusters. After entering negative affect into the models as an exogenous variable, only experiential avoidance was significantly associated with every PTSD symptom cluster. Significant associations were observed between thought suppression, brooding rumination, reflective rumination, and expressive suppression and specific PTSD symptom clusters. Use of acceptance and positive reappraisal was not significantly associated with any PTSD symptom clusters after controlling for negative affect.

That the best fitting measurement model of emotion regulation strategy use was that which posits each of the included strategies as their own independent factor warrants discussion. It is possible that the three other theoretically supported models did not fit the data well due to the measurements of emotion regulation strategy use in this study. Many existing self-report measures of emotion regulation strategy use do not specify a time frame for strategy use, vary in

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the emotion(s) they assess regulation of, and rely on respondent comprehension of complex, abstract constructs. Further, some scales rely exclusively on reverse-scored items (e.g., KIMS). Lastly, although there is an abundance of research examining the latent factor structure of individual scales, the larger factor structure underlying use of multiple strategies remains largely unexamined. Collectively, this suggests variance in emotion regulation strategy use may be explained by more parsimonious models, but measurements to successfully capture these behaviors are limited.

The consistent association between both experiential avoidance and thought suppression and PTSD symptoms across clusters, even after controlling for negative affect is noteworthy. This finding is consistent with previous research and suggests use of these two strategies is associated with severity of a variety of PTSD symptoms. Further, the significance of these associations even once negative affect was controlled for suggests a unique association between these strategies and PTSD symptoms beyond global distress. Accordingly, experiential avoidance and thought suppression may represent high value treatment targets among trauma-exposed populations with symptoms of PTSD.

Conversely, the finding that use of positive reappraisal and acceptance were not significantly associated with any PTSD symptom clusters while controlling for negative affect was surprising. In particular, the significant association between acceptance and every PTSD symptom cluster was reduced to non-significance once negative affect was controlled for. It is worthy of note that use of these strategies is associated with negative affect such that greater use is associated with less negative affectivity among the trauma-exposed sample. However, the present study suggests no unique association between these strategies and PTSD symptom clusters beyond global distress. Re-examination of these associations using clinician-

administered measurement may be warranted and may provide a more thorough investigation, particularly given the complexity of these constructs.

There was considerable variability in the associations between included emotion regulation strategies and PTSD symptom clusters. Without controlling for negative affect, four included strategies were associated with all PTSD symptom clusters while the remaining three were differentially associated with specific symptom clusters. Likewise, after controlling for negative affect, only one strategy (negative affect) was significantly associated with all PTSD symptom clusters, two strategies were not associated with any symptom clusters, and the remaining four were differentially associated with specific symptom clusters. Prior in this area has demonstrated significant associations between aspects of emotion regulation and all PTSD symptom clusters even after controlling for negative affect (e.g., Tull et al., 2007; Vujanovic et al., 2009). Present findings suggest the association between emotion regulation strategy use and PTSD symptom clusters varies according to the strategy. However, this study was the first in this area to examine PTSD symptoms using a measurement model with more than three factors.

A number of limitations of the current study should be noted. First, the study relied on self-report measures that were administered online. Further, this study relied on an undergraduate convenience sample and was predominantly Caucasian and female. Lastly, use of cross-sectional methodology does not allow for examination of the direction of the observed effects.

Future research on the relation between emotion regulation strategy use and PTSD would do well to focus on a few specific aspects of this association. First, thorough examination of the larger factor structure of emotion regulation strategy use will require assessment of these constructs with a measure on a consistent scale which assesses regulation of a specified emotion during a specified time-frame and utilizes items which make complex, abstract constructs (e.g.,

experiential avoidance) clear for respondents. It is possible that the larger factor structure underlying emotion regulation strategy use varies across emotions or even intensity of emotions (e.g., moderate vs. severe anxiety). To date, such a measure does not exist. Second, interactions of emotion regulation strategy use with other well-established predictors of PTSD symptoms (e.g., social support) may highlight methods for targeting specific strategy use among trauma exposed populations. Third, longitudinal examination of these associations would provide much greater insight. In particular, examining change in strategy use following trauma exposure and association of any such change with PTSD symptom severity would have the potential to inform early intervention efforts. Lastly, examination of changes in emotion regulation strategy use during and after treatment for PTSD has the potential to increase and sustain treatment outcomes.

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Appendix

Table 1

Measurement Models of Emotion Regulation

Scale Items	Model			
	A	B	C	D
KIMS-Acceptance	1	1	1	1
ERQ-Positive Reappraisal	1	1	2	2
RRS-Reflective Rumination	1	2	3	3
RRS-Brooding Rumination	1	2	3	4
WBSI-Thought Suppression	1	2	3	5
ERQ-Expressive Suppression	1	2	1	6
AAQ-II-Experiential Avoidance	1	2	1	7

Table 2

Measurement Models of Posttraumatic Stress Symptom Clusters

Symptom	Model			
	DSM-IV	Numbing	Dysphoria	Dysphoric Arousal
Intrusive thoughts	1	1	1	1
Nightmares	1	1	1	1
Reliving trauma	1	1	1	1
Emotional cue reactivity	1	1	1	1
Physiological cue reactivity	1	1	1	1
Avoidance of thoughts	2	2	2	2
Avoidance of reminders	2	2	2	2
Trauma-related amnesia	2	3	3	3
Loss of interest	2	3	3	3
Feeling detached	2	3	3	3
Feeling numb	2	3	3	3
Hopelessness	2	3	3	3
Difficulty sleeping	3	4	3	4
Irritability	3	4	3	4
Difficulty concentrating	3	4	3	4
Overly alert	3	4	4	5
Easily startled	3	4	4	5

Table 3

Emotion Regulation Strategy Use Measurement Model Standardized Loadings

Latent Variable	Item	Estimate	S.E.	R^2
Thought Suppression	WBSI_1	.63	.04	.39
	WBSI_2	.82	.02	.68
	WBSI_3	.79	.03	.62
	WBSI_4	.71	.03	.50
	WBSI_5	.72	.03	.51
	WBSI_6	.81	.02	.65
	WBSI_7	.74	.03	.54
	WBSI_8	.66	.03	.43
	WBSI_9	.75	.03	.57
	WBSI_10	.80	.02	.64
	WBSI_11	.74	.03	.55
	WBSI_12	.76	.03	.57
	WBSI_13	.85	.02	.72
	WBSI_14	.71	.03	.51
	WBSI_15	.81	.03	.65
Brooding Rumination	RRS_5	.66	.04	.44
	RRS_10	.87	.02	.75
	RRS_13	.67	.04	.45
	RRS_15	.89	.02	.79
	RRS_16	.90	.02	.81

Reflective Rumination	RRS_7	.71	.05	.50
	RRS_11	.92	.02	.84
	RRS_12	.41	.07	.17
	RRS_20	.80	.04	.65
	RRS_21	.83	.03	.70
Expressive Suppression	ERQ_2	.72	.04	.52
	ERQ_4	.56	.06	.31
	ERQ_6	.83	.03	.69
	ERQ_9	.79	.04	.62
Experiential Avoidance	AAQ_2	.79	.02	.62
	AAQ_3	.85	.02	.72
	AAQ_4	.87	.02	.76
	AAQ_5	.83	.02	.68
	AAQ_7	.82	.02	.67
	AAQ_8	.84	.02	.71
	AAQ_9	.85	.02	.72
Positive Reappraisal	ERQ_1r	.74	.02	.55
	ERQ_3r	.82	.02	.67
	ERQ_5r	.54	.04	.29
	ERQ_7r	.81	.02	.66
	ERQ_8r	.80	.02	.64
	ERQ_10r	.77	.02	.60
Acceptance	KIMS_4	.81	.03	.66

KIMS_8	.13	.06	.02
KIMS_12	.83	.02	.69
KIMS_16	.84	.02	.70
KIMS_20	.58	.04	.33
KIMS_24	.58	.04	.34
KIMS_28	.82	.02	.67
KIMS_32	.89	.02	.79
KIMS_36	.78	.03	.62

Table 4

Polychoric Correlations among Latent Variables

Factor	1	2	3	4	5	6	7	8	9	10	11	12
1. Thought Suppression	-	-	-	-	-	-	-	-	-	-	-	-
2. Brooding Rumination	.70*	-	-	-	-	-	-	-	-	-	-	-
3. Reflective Rumination	.58*	.76*	-	-	-	-	-	-	-	-	-	-
4. Expressive Suppression	.44*	.41*	.41*	-	-	-	-	-	-	-	-	-
5. Experiential Avoidance	.67*	.79*	.55*	.50*	-	-	-	-	-	-	-	-
6. Positive Reappraisal	-.16*	.07	.05	-.17*	.17*	-	-	-	-	-	-	-
7. Acceptance	.68*	.70*	.52*	.46*	.77*	.17*	-	-	-	-	-	-
8. Reexperiencing	.28*	.23*	.05	.10	.37*	.12*	.20*	-	-	-	-	-
9. Avoidance	.46*	.37*	.25*	.24*	.46*	-.01	.36*	.85*	-	-	-	-
10. Emotional Numbing	.42*	.36*	.31*	.28*	.49*	.09	.36*	.66*	.82*	-	-	-
11. Dysphoric Arousal	.48*	.40*	.27*	.11	.50*	.05	.38*	.76*	.73*	.87*	-	-
12. Anxious Arousal	.41*	.31*	.17*	.13*	.41*	.09	.33*	.64*	.71*	.67*	.74*	-
13. Negative Affect	.48*	.53*	.34*	.25*	.63*	.24*	.60*	.41*	.45*	.51*	.54*	.42*

Note. * $p < .05$.

Table 5

Parameter Estimates of the Associations between Emotion Regulation Strategy Use, Negative Affect, and PTSD Symptom Cluster Latent Variables

	Rxp.		Avd.		Nmb.		Dys.		Anx.	
Exogenous Variable(s)	Std.	Est.	Std.	Est.	Std.	Est.	Std.	Est.	Std.	Est.
Model 1										
Thought Suppression	.28*	.36	.47*	.56	.42*	.33	.48*	.59	.41*	.55
Model 2										
Thought Suppression	.11	.14	.33*	.40	.23*	.19	.29*	.36	.28*	.37
Negative Affect	.35*	.45	.29*	.35	.40*	.32	.40*	.49	.29*	.38
Model 1										
Brooding Rumination	.23*	.28	.37*	.42	.36*	.27	.40*	.48	.31*	.40
Model 2										
Brooding Rumination	.01	.02	.18*	.21	.12	.10	.16*	.19	.12	.16
Negative Affect	.40*	.54	.35*	.44	.45*	.37	.45*	.58	.35*	.50
Model 1										
Reflective Rumination	.05	.06	.25*	.29	.31*	.24	.26*	.33	.17*	.23
Model 2										
Reflective Rumination	-.10	-.12	.11	.12	.15*	.12	.10	.12	.03	.05
Negative Affect	.44*	.59	.41*	.52	.46*	.38	.50*	.65	.41*	.58
Model 1										
Expressive Suppression	.01	.11	.24*	.26	.28*	.20	.11	.12	.13	.16
Model 2										

Expressive Suppression	-.01	-.01	.14	.15	.16*	.12	-.03	-.03	.03	.04
Negative Affect	41*	.55	.42*	.52	.47*	.39	.54*	.71	.41*	.58

Model 1

Experiential Avoidance	.37*	.38	.46*	.44	.49*	.31	.52*	.51	.41*	.44

Model 2

Experiential Avoidance	.19*	.19	.29*	.28	.27*	.18	.29*	.29	.24*	.26
Negative Affect	.29*	.39	.26*	.34	.34*	.29	.35*	.46	.27*	.38

Model 1

Positive Reappraisal	.12*	.14	-.12	-.01	.09	.06	.05	.06	.09	.10

Model 2

Positive Reappraisal	.06	.03	-.12	-.13	-.04	-.03	-.08	-.09	-.02	-.02
Negative Affect	.40*	.55	.48*	.61	.52*	.44	.56*	.74	.42*	.61

Model 1

Acceptance	.20*	.22	.35*	.36	.36*	.24	.38*	.40	.33*	.38

Model 2

Acceptance	-.07	-.08	.13	.13	.07	.05	.09	.10	.12	.14
Negative Affect	.45*	.60	.37*	.46	.47*	.39	.48*	.62	.35*	.49

Note. Model 1 = Association between PTSD symptom clusters and individual strategy use.

Model 2 = Association between PTSD symptom clusters and individual strategy use with negative affect entered as an exogenous variable. Anx = Anxious Arousal; Avd = Avoidance; Dys = Dysphoric Arousal; Est. = Unstandardized Parameter Estimates; Nmb = Emotional Numbing; Rxp = reexperiencing; Std. = Standardized Parameter Estimates; *$p < .05$.