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Emotion Dysregulation as a Mediator of the Relationship between PTSD and Alcohol Misuse

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EMOTION DYSREGULATION AS A MEDIATOR OF THE RELATIONSHIP BETWEEN PTSD AND ALCOHOL MISUSE

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Abstract

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Both posttraumatic stress disorder (PTSD) and substance misuse, which are highly comorbid, have been linked to emotion dysregulation. In this investigation, facets of emotion dysregulation were examined as potential mediators between PTSD symptoms and alcohol misuse in a sample of 139 combat Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn veterans (45% African American; 89% men). The Impulse Control Difficulties facet mediated the relationship between PTSD symptoms and alcohol misuse for men. No significant mediating relationships were found for women, possibly due to the small number of women in the sample. Although the full scale of emotion dysregulation did not mediate the relationship between PTSD symptoms and alcohol misuse for the full sample or for either gender, the results highlight the link between PTSD symptoms, impulsivity, and alcohol misuse.

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Introduction

Posttraumatic stress disorder (PTSD) is a debilitating disorder characterized by distress and difficulties in daily functioning including diminished ability to work, relationship problems, and other co-occurring disorders. PTSD is often comorbid with a wide range of mental and physical health issues. For example, among those with PTSD approximately one third to one half experience a lifetime major depressive episode (Blanco et al., 2013; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Of particular relevance to this investigation are substance use disorders, which are among the most frequently comorbid conditions, with epidemiological studies showing that about one third to one half of individuals with lifetime PTSD also have lifetime substance or alcohol dependence (AD; Blanco et al., 2013; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Individuals with comorbid PTSD and AD endorse more severe PTSD than those with PTSD only or AD only, characterized by higher levels of PTSD symptoms, a higher likelihood of using substances to alleviate PTSD symptoms, and a higher number of lifetime psychiatric co-morbidities (Blanco et al., 2013). A recent topic of interest is emotion dysregulation (Gratz & Roemer, 2004), which has been linked to both higher levels of PTSD symptoms (Ehring & Quack, 2010) and alcohol misuse (Fox, Hong, & Sinha, 2008).

PTSD and Alcohol Misuse

In clinical samples of individuals seeking treatment for substance use disorders, there are typically high rates of trauma exposure and PTSD. Read, Brown, & Kahler

(2004) found that in a sample of individuals receiving substance treatment, 95% reported a history of trauma and 41% met criteria for current PTSD. Furthermore, those individuals with PTSD reported more years of problematic substance use than the individuals without PTSD. Alcohol misuse is associated with various negative consequences and behaviors including missed work or school, relationship problems, engaging in potentially risky or hazardous situations, and physical illnesses. Regarding treatment, it has been found that individuals with co-morbid PTSD and substance use disorders fare worse than those with only substance dependence. In a sample of veterans receiving treatment for substance use disorder, those with PTSD had lower levels of abstinence and higher levels of depression than those without the disorder (Norman, Tate, Wilkins, Cummins, & Brown, 2010).

Various causal pathways have been suggested to explain the high rates of co-occurring PTSD and alcohol misuse, and "self-medication" is often noted as an important aspect of the relationship between PTSD and substance misuse (Leeies, Pagura, Sareen, & Bolton, 2010; Simpson, Stappenbeck, Varra, Moore, & Kaysen, 2012). Many studies suggest that alcohol use may function as a coping mechanism for individuals who have difficulty regulating negative emotional states that result from PTSD symptoms such as hypervigilance or numbing (Gil-Rivas, Prause, & Grella, 2009; Ouimette, Coolhart, Funderburk, Wade, & Brown, 2007; Waldrop, Back, Verduin, & Brady, 2007). This explanation does not elucidate why some individuals with PTSD would adopt alcohol misuse as a form of coping while others do not. Recent research on the construct of emotion dysregulation might offer some insight.

Emotion Dysregulation

Gratz and Roemer (2004) identified several dimensions of emotion dysregulation: nonacceptance of emotions, which includes a tendency to have negative secondary emotional responses to one's negative emotions, or nonaccepting reactions to one's distress; difficulties engaging in goal-direct behavior, which includes problems concentrating and completing tasks when experiencing negative emotions; impulse control difficulties, defined as difficulty staying in control of one's behavior when experiencing negative emotions; lack of emotional awareness, which is defined as inattention to, and lack of awareness of emotional responses; limited access to emotion regulation strategies, which includes the belief that there is little that one can do to regulate emotions well once one is upset; and lack of emotional clarity, which reflects the idea that individuals are unknowing and unclear about their emotions. Gratz and Roemer's Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) measures these six dimensions of emotion dysregulation. Although the concept of emotion dysregulation has been researched within adult populations for over two decades (Gross & Thompson, 2007), the DERS was created to provide a specific definition of emotion dysregulation so that researchers may determine how it relates to psychopathology. Emotion dysregulation is implied in many types of psychopathology such as anxiety disorders (Campbell-Sills & Barlow, 2007; Gross & Muñoz, 1995) and alcohol abuse (Sher & Grekin, 2007). Despite the similarity of emotion dysregulation and negative affect, studies have found that the two are in fact separate constructs. For example, Salsman and Linehan (2012) found that certain dimensions of emotion dysregulation specifically contributed to features of borderline personality disorder after controlling for negative affect in a sample of college students. In another study examining

emotion dysregulation and disordered eating, difficulties in emotion regulation contributed to disordered eating such as emotional overeating beyond the contribution of negative affect in a sample of individuals with binge eating disorder (Gianini, White, & Masheb, 2013). It is possible that high levels of these emotion dysregulation dimensions, in the presence of the considerable distress associated with PTSD lead to substance misuse.

PTSD and Alcohol Misuse Among Veterans

Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn (OEF/OIF/OND) veterans are at risk for developing problematic alcohol use, particularly if they are experiencing PTSD. Within a sample of OEF/OIF veterans presenting to a VA primary care clinic, 39.1% screened positive for PTSD and 26.5% screened positive for hazardous drinking (McDevitt-Murphy et al., 2010), while a larger epidemiological sample of OEF/OIF veterans found the rates to be 13.9% and 39%, respectively (Eisen et al., 2012). Within the primary care sample, 15.9% screened positive for both PTSD and alcohol misuse (McDevitt-Murphy et al., 2010). According to the National Center for PTSD, among veterans receiving care at Veterans Health Administration (VHA) in 2011, 24.9% of those diagnosed with a substance use disorder were also diagnosed with PTSD. There is evidence that PTSD resulting from combat deployments may in fact lead to alcohol misuse. Jacobson et al. (2008) looked at alcohol misuse following combat deployments using the Millennium Cohort Study, which sought to determine the long-term effects of combat deployments. In a sample of over 48,000 OEF/OIF veterans, those with a diagnosis of PTSD post-combat were significantly more likely than those without

PTSD to engage in new-onset problematic alcohol use, defined by binge drinking and experiencing negative consequences as a result of drinking.

Emotion Dysregulation and PTSD

Difficulties in emotion regulation, also referred to as emotion dysregulation, have been linked to both PTSD and alcohol misuse. In a study of trauma survivors from the community, posttraumatic stress symptom severity was correlated with each dimension of emotion dysregulation as defined by the DERS (Ehring & Quack, 2010). In a sample of college students, posttraumatic stress symptom severity was associated with all dimensions of emotion dysregulation other than lack of emotional awareness. Individuals who scored above a cutoff suggestive of meeting PTSD criteria had significantly higher levels of emotion dysregulation than those below the cutoff (Tull, Barrett, McMillan, & Roemer, 2007). A study of college students found that those with probable PTSD had higher levels of emotion dysregulation than those without a history of trauma and than those with a trauma history but no PTSD (Weiss, Tull, Davis, et al., 2012). Furthermore, the students with a history of trauma but no PTSD were significantly less likely to endorse difficulties with impulse control when distressed and limited access to emotion regulation strategies than the individuals with probable PTSD. Some theorize that pathological disruptions in self-regulation, which is defined as an individual's efforts to change behavioral and emotional responses and is a similar construct to emotion regulation, play an important role in PTSD (Batten, Orsillo, & Walser, 2005; Ehlers & Clark, 2000). Kashdan, Breen, and Julian (2010) studied within a veteran sample how daily "strivings" (defined as the foundation for their daily decisions and behaviors) were related to PTSD. Daily strivings were measured with an open-ended format and veterans

were given instructions to describe eight strivings defined as "an objective you are typically trying to accomplish or attain," and an example of a striving such as "trying to avoid feeling inferior to others." Veterans with PTSD endorsed more strivings related to emotion regulation, described as those "intended to eliminate, reduce, strategically maintain or increase the experience of any emotional experience" than those without PTSD, yet there were no direct benefits to this (Kashdan, Breen, and Julian, 2010). It should be noted that some treatments for PTSD focus on affect regulation to reduce posttraumatic symptoms (Ford & Russo, 2005; Levitt & Cloitre, 2005)

Interestingly, only one study has examined emotion dysregulation and PTSD longitudinally. In this study, undergraduate college women originally completed a measure of emotion dysregulation and posttraumatic stress symptoms prior to a mass campus shooting. Post-shooting the women completed measures again twice, and a reciprocal model was found in which emotion dysregulation and posttraumatic stress symptoms each influenced one another (Bardeen, Kumpula, & Orcutt, 2013). For example, pre-shooting emotion dysregulation influenced post-shooting posttraumatic stress symptoms, and this trend persisted for the two post-shooting assessments. Pre-shooting posttraumatic stress symptoms contributed to post-shooting emotion dysregulation, although post-shooting posttraumatic stress symptoms at the second time point did not contribute to emotion dysregulation at the third time point.

Emotion Dysregulation and Alcohol Misuse

Emotion dysregulation has also been linked to alcohol misuse. In a study comparing individuals who recently began substance use treatment to a group of social drinkers who were not in treatment, those with alcohol dependence had worse emotion

regulation skills than the social drinkers. For those who completed treatment, improvements in awareness and clarity of emotional experience were made while impulse control difficulties persisted (Fox, Hong, & Sinha, 2008). Another study of individuals seeking substance abuse treatment used a prospective design. It was found that lower baseline emotion regulation skills were associated with worse response to treatment and that worse emotion regulation skills at end-of-treatment predicted post-treatment alcohol use, even after researchers controlled for other variables related to emotion regulation (Berking et al., 2011). Another similar line of research has found emotion dysregulation to be related to alcohol-related negative consequences such as getting in fights or trouble with the police, although researchers did not assess for amount of alcohol consumed (Magar, Phillips, & Hosie, 2008). This suggests that poorer emotion regulation skills may affect the manner in which individuals drink alcohol but not necessarily the level of consumption.

PTSD, Emotion Dysregulation, and Alcohol Misuse

One prior study has examined PTSD, emotion regulation, and alcohol misuse in a sample of active-duty Iraq war soldiers with and without PTSD (Klemanski, Mennin, Borelli, Morrissey, & Aikins, 2012). This study found that emotion dysregulation partially mediated the relationship between PTSD and depression, poor social adjustment, and trauma-related depersonalization but not alcohol misuse. Other studies have looked at similar constructs to the current study; for example, Weiss, Tull, Viana, et al., (2012) found relationships between PTSD, emotion dysregulation, and impulsivity. In a study looking at individuals in treatment for substance use disorders, those with PTSD endorsed more impulsive behaviors than those without PTSD. Emotion dysregulation

mediated the relationship between PTSD and impulsive behaviors, suggesting that those with PTSD may engage in impulsive behaviors such as substance use due to having poor emotion regulation (Weiss, Tull, Viana, Anestis & Gratz, 2012).

Present Study

Given that PTSD and alcohol misuse commonly co-occur and both have been positively associated with emotion dysregulation, the present research will examine whether emotion dysregulation mediates the relation between PTSD and alcohol misuse in a sample of combat veterans. We will use a multidimensional measure of emotion regulation to investigate different facets of this construct.

Hypotheses

a. PTSD symptoms will be positively correlated with the six facets of emotion dysregulation.

b. PTSD symptoms will be positively correlated with alcohol misuse.

c. The six facets of emotion dysregulation will be positively correlated with alcohol misuse.

d. The full scale of emotion dysregulation will mediate the relationship between PTSD and alcohol misuse. Veterans with lower levels of PTSD will show lower levels of emotion dysregulation, and in turn lower levels of alcohol misuse. For those veterans with higher PTSD severity, they will endorse higher levels of emotion dysregulation and therefore higher alcohol misuse.

Method

Participants

Data were collected from 139 participants recruited from Veterans Affairs Medical Center (VAMC) sites. Participants presented to a variety of clinics as part of their initial appointment at the VAMC seeking a variety of medical services. The sample was predominantly male (n = 119; 88.8%) and ranged in age from 21 to 66 (M = 34.99, SD = 10.07). The sample was ethnically diverse, with 44.6% identifying as African American (n = 62), 41.0% Caucasian (n = 57), and the remainder identifying as multiethnic (4.3%, n = 6), Asian (0.7%; n = 1), Hispanic (0.7%; n = 1), Native American (0.7%; n = 1), and (7.9%; n = 11) not specifying their ethnicity. Participants reported an average of 3.31 years (SD = 2.45) home since their most recent deployment. The average length of deployment was 16.64 months (SD = 11.52). Almost half of the participants reported multiple deployments (n = 60; 43.2%): 82 (70.7%) reported an OEF deployment, 86 (73.5%) reported an OIF deployment, and 11 (9.2%) reported an OND deployment.

Procedure

The data for these analyses came from a larger study that examines readjustment and coping in veterans returning from OEF, OIF, and OND combat deployments. The Institutional Review Boards of The University of Memphis and the Memphis Veterans Affairs Medical Center (VAMC) approved all procedures.

Measures

Posttraumatic Stress Disorder Symptoms. The PTSD Checklist-Military (PCL-M; Weathers et al., 1993) was used to assess PTSD symptoms for the past month. The PCL-M is a brief 17-item measure that screens for PTSD using the DSM-IV criteria

(APA, 2001) related to military experience. Items are rated on a scale of 1 (*Not At All)* to 5 (*Extremely*), with cumulative scores ranging from 17 to 85. Sample items included "Repeated, disturbing memories, thoughts, or images of a stressful military experience?" and "Feeling jumpy or easily startled?" The PCL has shown excellent internal consistency ($\alpha = .94$) and high convergent validity ($r = .93$) with the Clinician Administered PTSD Scale (CAPS; Blake et al., 1990) in a sample of individuals who experienced a recent trauma (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). A review of the literature found that it has been validated within different veteran populations (i.e. Vietnam, Gulf War), showing high internal consistency ($\alpha > .80$), adequate test-rest reliability after 2 to 3 days ($r > .70$), and had a kappa of .64 with the PTSD section of the SCID (Wilkins, Lang, & Norman, 2011). The alpha for the PCL-M in the current sample was .97.

Emotion Dysregulation. Emotion dysregulation was measured with the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The six subscales of the measure assessed different domains of emotion dysregulation: Nonacceptance of Emotional Responses Difficulties Engaging in Goal-Directed Behavior, Impulse Control Difficulties, Lack of Emotional Awareness, Limited Access to Emotion Regulation Strategies, and Lack of Emotional Clarity. Items were measured on a scale from 1 (*Almost Never*; 0-10%) to 5 (*Almost Always*; 90-100%). Sample items from this measure include "I have no idea how I am feeling," "When I'm upset, I start to feel very bad about myself," "When I'm upset, I feel out of control," "When I'm upset, I acknowledge my emotions," "When I'm upset, I know that I can find a way to eventually feel better," and "When I'm upset, it takes me a long time to feel better."

In two samples of undergraduate college students, Gratz and Roemer (2004) found that the DERS had good internal consistency ($\alpha = .93$), high test-retest reliability ($p_1 = .88$) as well as adequate construct and predictive validity. The DERS has also been translated and validated in five other languages (Côté, Gosselin, & Dagenais, 2013; Hervás & Jódar, 2008; Mitsopoulou, Kafetsios, Karademas, Papastefanakis, & Simos, 2013; Ruganci & Gençöz, 2010; Sighinolfi, Pala, Chiri, Marchetti, & Sica, 2010). The DERS has been validated in adolescents and showed high internal consistency ($\alpha = .93$) (Weinberg & Klonsky, 2009). The alpha for the current sample was .96.

Alcohol Misuse. The Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) is a 10-item measure that is used to screen for alcohol use disorders. The measure assesses three domains of alcohol use: hazardous alcohol use, dependence symptoms, and harmful alcohol use. Eight questions on the AUDIT assess current and past year alcohol use, while two of the questions ask if problems occurred within the past year or over a year ago. Sample items from this measure include "How many drinks containing alcohol do you have on a typical day when you are drinking?," "How often during the last year have you had a feeling of guilt or remorse after drinking?, and "How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?" Possible AUDIT scores range from 0 to 40, with higher scores more indicative of alcohol misuse. The development and evaluation of the AUDIT spanned over 20 years, and it has been shown to accurately measure alcohol related risk across different cultures, ages, and genders (Allen, Litten, Fertig, & Babor, 1997; Babor, Higgens-Biddle, Saunders, & Monteiro; Saunders, Aasland, Amundsen, & Grant, 1993). In a large review of existing

studies using the AUDIT among a variety of populations including patients at the Veterans Affairs, hazardous drinkers, college students, and emergency department visitors, de Meneses-Gaya, Zuardi, Loureiro, and Crippa (2009) found that the AUDIT yielded strong test-retest reliability as well as excellent sensitivity and specificity values when compared to other instruments that measure alcohol misuse. The alpha for this sample was .86.

Data Analysis Plan

Prior to conducting analyses, the distributional properties of all variables were inspected. Using recommendations outlined by Tabachnick and Fidell (2007), outliers that fall outside 3.29 standard deviations below or above the sample mean were corrected by assigning the first outlier a value one unit higher or lower than the most extreme value within the distribution. Bivariate relationships were analyzed between PTSD symptoms, emotion dysregulation, and alcohol misuse. Next, we used a mediational model using bootstrapping, which makes no assumptions about the sampling distribution of the indirect effect (Hayes, 2009). Following procedures outlined by Hayes (2013) using the PROCESS Macro, analyses were conducted to determine whether emotion dysregulation mediates the relationship between PTSD severity and alcohol misuse. A nonparametric bootstrap method of 5,000 samples using a confidence interval of 95% was used test the indirect effect of PTSD on alcohol misuse through the pathway of emotion dysregulation subscales.

Results

Descriptive Statistics and Correlations

Participants obtained an average score of 48.70 (*SD* = 19.74) on the PCL-M, with 65 (46.8%) scoring at or above a score of 50, which is the recommended cut-off score that indicates a probable diagnosis of PTSD for combat survivors (Weathers et al., 1993). The AUDIT average score was 5.44 (*SD* = 6.80), and 34 (24.5%) scored at or above the recommended cut-off score of 8 that indicates hazardous alcohol use (Babor, Higgins-Biddle, Saunders, & Montiero, 2001). Participants endorsed an average score of 87.24 (*SD* = 28.89) on the DERS. The maximum score that may be obtained on the DERS is 180, while the minimum is 36. This is a higher average score than Gratz and Roemer (2004) reported in their validation study of the DERS using a college sample (77.99 for women and 80.66 for men).

Next, correlations between the measures were calculated (shown in Table 1). The PCL-M and the AUDIT were significantly correlated with each other (r = .29). The PCL-M also demonstrated significant moderate to high associations with all subscales of DERS: Nonacceptance of Emotional Responses (r = .40, $p < .001$), Difficulties Engaging in Goal Directed Behavior (r = .61, $p < .001$), Impulse Control Difficulties (r = .65, $p < .001$), Lack of Emotional Awareness (r = .43, $p < .001$), Limited Access to Emotion Regulation Strategies (r = .72, $p < .001$). AUDIT score was significantly associated with four subscales of the DERS: Impulse Control Difficulties (r = .30, $p < .01$), Lack of Emotional Awareness (r = .20, $p < .01$), Limited Access to Emotion Regulation Strategies (r = .22, $p < .01$), but was not associated with Nonacceptance of Emotional Responses (r = .01, $p > .05$) or Difficulties Engaging in Goal Directed Behavior (r = .16,

p > .05). Correlations between PTSD symptom clusters (re-experiencing, avoidance and numbing, and hypervigilance), DERS subscales, and AUDIT were also examined. As shown in Table 1 all PTSD symptom clusters were positively associated with DERS subscales, although some DERS subscales (Nonacceptance of Emotional Responses) were less strongly correlated with the PTSD symptom clusters (r = .31 - .41) while others were more strongly correlated (Limited Access to Emotion Regulation Strategies; r = .61 - .75). The AUDIT was significantly positively correlated with each PCL cluster score (r = .25 - .31).

Emotion Dysregulation Facets as Mediators of the Relationship Between PTSD and Alcohol Misuse

Next, the emotion dysregulation subscales were tested as mediators between the pathway of PCL-M and AUDIT with age as a covariate (because age was significantly correlated with both PCL-M and AUDIT). As shown in Table 4, PTSD did not indirectly influence alcohol misuse through the pathway of emotion dysregulation. The same is true for the six subscales of emotion dysregulation.

The sample was then split by gender to determine whether different patterns appeared to exist for women and men respectively. We first examined correlations between PCL-M and AUDIT by gender to determine whether there were relationships between these variables for both men and women. While there was a significant and positive relationship between PCL-M and AUDIT for men (r = .35, p < .001), there was not a significant relationship between these two variables for women (r = -.10, p = .73).

We next examined whether emotion dysregulation full scale and subscales mediated the relationship between PCL-M and AUDIT for men and women. For men (n

= 110), Impulse Control Difficulties significantly mediated between PCL-M and AUDIT, while controlling for age (*B* = .07, *SE* = .04, 95% CI = .01 - .16). No other DERS subscales mediated the relation between PCL-M and AUDIT. These results are displayed in Table 5. We also conducted a reverse mediation analysis to test whether Impulse Control Difficulties mediated the relation between AUDIT and PCL-M for men, with AUDIT as the independent variable and PCL-M as the dependent variable. Impulse Control Difficulties showed to be a significant mediator between AUDIT and PCL-M scores. There were no significant mediators for women (*n* = 15; shown in Table 6).

To determine if there were differences between individuals who had a score of at least 1 on the AUDIT, which suggests at least occasional drinking (as opposed to complete abstinence from alcohol), we conducted mediation analyses for individuals who scored above a zero on the AUDIT (shown in Table 7). Similar to our findings from the full sample, Impulse Control Difficulties remained as the only significant mediator between PCL-M and AUDIT (*B* = .09, *SE* = .05, 95% CI = .01 - .19) among drinkers. We conducted a reverse mediation for this subsample to determine if Impulse Control Difficulties mediated the relation between AUDIT and PCL-M, and we found that Impulse Control Difficulties remained a significant mediator of this relation.

Discussion

This study examined aspects of emotion dysregulation as potential mediators of the relation between PTSD symptoms and alcohol misuse in a sample of OEF/OIF/OND combat veterans recruited from a Veterans Affairs Medical Center. This study tested the relations between PTSD symptoms (including symptom clusters), emotion dysregulation dimensions, and alcohol misuse. This study also examined the mediating effects of

emotion dysregulation dimensions on the association between PTSD symptoms and alcohol misuse for the entire sample, as well as men and women separately.

There was a relationship between PTSD symptoms, emotion dysregulation subscales, and alcohol misuse, in that individuals with higher PTSD symptoms endorsed higher emotion dysregulation and alcohol misuse. PTSD and alcohol misuse were moderately associated. PTSD symptoms were moderately to strongly associated with emotion dysregulation subscales, with Impulse Control Difficulties and Limited Access to Emotion Regulation Strategies having the strongest association with PTSD symptoms. Interestingly, the associations between PTSD symptoms and emotion dysregulation were much stronger than the associations between emotion dysregulation and alcohol misuse. In fact, two of the emotion dysregulation facets (Nonacceptance of Emotional Responses and Difficulties Engaging in Goal Directed Behavior) were not significantly correlated with alcohol misuse. These findings related to alcohol misuse and emotion dysregulation are somewhat inconsistent with previous research (Berking et al., 2011; Fox, Hong, & Sinha, 2008), although many of the studies examining these two constructs have used a sample of treatment seekers or individuals with identified alcohol problems while this sample consisted of a full range of alcohol use, including both alcohol users and abstainers.

The multiple mediators analyses revealed that after controlling for age, no emotion dysregulation subscales mediated the relation between PTSD symptoms and alcohol misuse in the full sample. Age was significantly associated with alcohol misuse, such that younger individuals had higher levels of alcohol misuse than older individuals. Because no significant findings were revealed using the full sample, analyses were run

with the sample split by gender to determine whether differences existed between men and women. We found that for women no emotion dysregulation subscales mediated the relation between PTSD symptoms and alcohol misuse, although this finding may have been obscured due to a small sample of 15 individuals. For men, Impulse Control Difficulties significantly mediated the relationship between PTSD symptoms and alcohol misuse. The other subscales (Nonacceptance of Emotional Responses, Difficulties Engaging in Goal Directed Behavior, Lack of Emotional Awareness, Limited Access to Emotion Regulation Strategies, and Lack of Emotional Clarity) did not significantly mediate the relation between PTSD symptoms and alcohol misuse. These findings suggest that for male combat veterans of the OEF/OIF/OND era, high impulsivity may partially explain the association between PTSD symptoms and alcohol misuse. It is possible that PTSD symptoms, and perhaps particular symptoms of hypervigilance or reexperiencing, may lead to impulsivity as an emotional coping strategy in male combat veterans, and that this may be manifested in excess drinking. We did not have longitudinal data with which to fully examine this causal chain, but this remains a hypothesis for future research.

We also examined the multiple mediators model on individuals who endorsed any items on the AUDIT (compared to individuals who did not currently drink or have any history of alcohol misuse), and we found that Impulse Control Difficulties remained as the only significant mediator between the relation of PTSD symptoms and alcohol misuse. Interestingly, when we conducted the reverse mediation analysis for both men and individuals who endorsed any items on the AUDIT, with alcohol misuse as the independent variable and PTSD as the dependent variable, Impulse Control Difficulties

still appeared to mediate this relationship. While this provides less support for the causal direction we propose, there is still ample evidence providing support for the directional relationship of PTSD symptoms leading to alcohol misuse. The significance of the reverse mediation analysis is noted as a limitation to the study, and future research should examine these relationships temporally.

This research indicates that impulse control difficulties when emotionally upset are an important part of the link between PTSD symptoms and alcohol misuse. These findings are consistent with other research that has linked trauma, impulsivity and alcohol misuse (Marshall-Berenz, Vujanovic, & MacPherson, 2011; Weiss, Tull, Anestis, & Gratz, 2013). Much of the past literature has focused on a definition of impulsivity that includes sensation seeking, lack of perseverance of behaviors, urgency, and lack of premeditation, while this study's definition of impulsivity included experiencing difficulty remaining in control of behaviors when emotionally upset. Our results are consistent with research that found in a sample of individuals seeking treatment for substance use disorder, those with PTSD were found to show higher levels of negative urgency, defined as the tendency to engage in impulsive behaviors when upset, as well as overall higher emotion dysregulation (Weiss, Tull, Anestis, & Gratz, 2013). Our findings also relate to a study that found that in a trauma-exposed sample, distress tolerance mediated the relation between impulsivity and alcohol-use coping motives, suggesting that inability to tolerate distress may explain the relation between impulsivity and drinking to cope (Marshall-Berenz, Vujanovic, & MacPherson, 2011).

In addition to looking at PCL total score, we also examined the different symptom clusters of PTSD. Our analyses revealed that reexperiencing, avoidance and numbing,

and hypervigilance symptoms were moderately to strongly correlated with all dimensions of emotion dysregulation and moderately correlated with alcohol misuse. Further examination of the correlations between emotion dysregulation subscales and PTSD symptom clusters showed that Impulse Control Difficulties and Limited Access to Emotion Regulation Strategies were most strongly correlated with all PTSD symptom clusters. Nonacceptance of Emotional Responses and Lack of Emotional Awareness showed the weakest correlations with PTSD symptom clusters. All three PTSD symptom clusters showed a fairly wide range of correlation strengths with all emotion dysregulation subscales.

To summarize our findings, this study provides further evidence that emotion dysregulation is related to both PTSD and alcohol misuse. This sample of OEF/OIF/OND veterans appeared to show elevated difficulties with emotion regulation, and this emotion dysregulation seemed to be related to both PTSD symptoms and alcohol misuse. All emotion dysregulation subscales were significantly positively associated with PTSD symptoms, and four emotion dysregulation subscales were significantly positively associated with alcohol misuse. Further examination of the link between PTSD symptoms, emotion dysregulation, and alcohol misuse revealed that one of the six emotion dysregulation subscales mediated the relation between PTSD symptoms and alcohol misuse for men, while no relations existed for women. This relation existed for individuals who reported any score above a zero on the AUDIT as well. These analyses provide evidence that emotion dysregulation is related to both PTSD symptoms and alcohol misuse, but by and large emotion dysregulation does not link the two together. Individuals with PTSD symptoms may have greater difficulties with emotion regulation,

but such difficulties do not always lead to alcohol misuse. These analyses also show that individuals with higher emotion dysregulation may endorse higher scores on the AUDIT, but this does not indicate that they are likely to have higher PTSD symptoms. When looking at the relation between emotion dysregulation subscales as mediators between PTSD symptoms and alcohol misuse, Impulse Control Difficulties was the only subscale that mediated this relation, but this was true only for men. This research provides evidence that difficulties controlling impulses when upset is especially important for men with PTSD symptoms, and these difficulties could lead to alcohol misuse. Impulse Control Difficulties appear to be more important than other facets of emotion dysregulation, such as lack of awareness and clarity of emotions, difficulties accomplishing goal-directed behaviors when upset, and lacking emotion regulation strategies.

There were several limitations to the current research that should be considered when interpreting these results. These data are cross-sectional in nature, which limits the ability to draw causal inferences. This is especially important in interpreting the current results, given the potential bi-directionality of the relations among PTSD, emotion regulation, and alcohol misuse. Future research should examine these relationships longitudinally, especially to determine whether individuals with high emotion dysregulation are more likely to develop future PTSD and alcohol misuse. The use of self-report measures also limits the ability to draw conclusions about individuals who meet diagnostic criteria for PTSD. This concern is tempered by the fact that the PCL-M has shown exceptional psychometric characteristics in a broad range of populations (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Bollinger, Cuevas, Vielhauer,

Morgan, & Keane, 2008; Wilkins, Lang, & Norman, 2011). Eight questions on the AUDIT were focused on past year alcohol misuse, while the last two questions asked about lifetime alcohol misuse. Given that many of the veterans in this sample had been home from deployment for longer than one year, it is possible that they had previously experienced alcohol problems after their combat deployment but had since recovered. Another limitation of the current research was small number of women in the sample. Although the number of female veterans is rapidly increasing (National Center for Veterans Analysis and Statistics, 2011), this sample did not have a large enough number to permit a fully powered test of our hypotheses within women specifically. Future research should examine these same constructs with a larger female sample to determine whether there are differences in the relations among PTSD symptom severity, emotion dysregulation, and alcohol misuse. Because the co-occurrence of alcohol dependence is lower in women than men with PTSD (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995), it is possible that these relationships may not exist.

These results suggest that impulsivity may be associated with more severe PTSD symptoms in men, and this impulsivity could be part of the pathway that leads to alcohol misuse. This suggests that for men with co-occurring PTSD and alcohol misuse, interventions should be targeted not only at PTSD but impulsivity as well. Teaching distressed individuals strategies for controlling impulses when distressed may help those with PTSD and alcohol misuse as these domains may be related. Individuals with PTSD may have difficulties planning long-terms goals, concentrating, and completing tasks. The frustration and distress associated with these symptoms may lead to impulse control difficulties and alcohol misuse. Considering these results, it may be beneficial for

clinicians to assess for PTSD symptom severity in recently returned combat veterans to prevent future problematic alcohol use.

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Appendix A

Table 1

Correlations Between PTSD Severity, Emotion Dysregulation, and Alcohol Misuse

	AUDIT	PCL-M	PCL-B	PCL-C	PCL-AVOID	PCL-NUMB	PCL-D
ACCEPT	.01	.40**	.31**	.41**	.30**	.44**	.39**
GOALS	.16	.61**	.48**	.63**	.55**	.61**	.62**
IMPULSE	.30*	.65**	.58**	.66**	.59**	.64**	.60**
AWARE	.20*	.43**	.39**	.42**	.38**	.40**	.42**
STRATEGIES	.22*	.72**	.61**	.75**	.64**	.75**	.66**
CLARITY	.26**	.63**	.53**	.64**	.52**	.67**	.61**
AUDIT	--	.29**	.31**	.27**	.30**	.23**	.26**

Note. ACCEPT = Nonacceptance of Emotional Responses; GOALS = Difficulties Engaging in Goal-Directed Behavior; IMPULSE = Impulse Control Difficulties; AWARE = Lack of Emotional Awareness; STRATEGIES = Limited Access to Emotion Regulation Strategies; CLARITY = Lack of Emotional Clarity; AUDIT = Alcohol Use Disorder Identification Test; PCL-M = PTSD Checklist Military Version; PCL-B = PTSD re-experiencing symptoms; PCL-C = PTSD Avoidance and Numbing Symptoms; PCL-AVOID = PTSD Avoidance Symptoms; PCL-NUMB = PCL Numbing Symptoms; PCL-D = PTSD Hypervigiliance Symptoms
*p < .01. **p < .001.

Table 2

Descriptive Statistics on PTSD Severity, Emotion Dysregulation, and Alcohol Misuse for Men (n = 116)*

	Mean	Standard Deviation	Maximum Possible
PCL-M	47.81	19.66	85
AUDIT	5.82	7.03	40
DERS TOTAL	84.61	27.16	180
ACCEPT	12.10	5.26	30
GOALS	14.10	5.22	25
IMPULSE	12.66	6.05	30
AWARE	17.39	5.76	30
STRATEGIES	17.33	7.48	40
CLARITY	11.19	4.59	25

Note. PCL-M = PTSD Checklist Military Version; AUDIT = Alcohol Use Disorder Identification Test; DERS TOTAL = Difficulties in Emotion Regulation Total; ACCEPT = Nonacceptance of Emotional Responses; GOALS = Difficulties Engaging in Goal-Directed Behavior; IMPULSE = Impulse Control Difficulties; AWARE = Lack of Emotional Awareness; STRATEGIES = Limited Access to Emotion Regulation Strategies; CLARITY = Lack of Emotional Clarity.
* *n's* varied from 110-116 due to missing data

Table 3

Descriptive Statistics on PTSD severity, Emotion Dysregulation, and Alcohol Misuse for Women (n = 15)

	Mean	Standard Deviation	Maximum possible
PCL-M	55.33	19.78	85
AUDIT	2.73	3.35	40
DERS TOTAL	104.40	35.57	180
ACCEPT	16.73	8.39	30
GOALS	16.67	6.95	25
IMPULSE	16.20	7.77	30
AWARE	18.47	6.02	30
STRATEGIES	22.73	10.43	40
CLARITY	13.60	4.85	25

Note. PCL-M = PTSD Checklist Military Version; AUDIT = Alcohol Use Disorder Identification Test; DERS TOTAL = Difficulties in Emotion Regulation Total; ACCEPT = Nonacceptance of Emotional Responses; GOALS = Difficulties Engaging in Goal-Directed Behavior; IMPULSE = Impulse Control Difficulties; AWARE = Lack of Emotional Awareness; STRATEGIES = Limited Access to Emotion Regulation Strategies; CLARITY = Lack of Emotional Clarity

Table 4

Summary of Mediation Analysis for the Full Sample (5,000 bootstrap samples).

Independent Variable (IV)	Mediating variable (M)	Dependent variable (DV)	Coefficient	SE	95% CI
PCL-M	AWARE	AUDIT	-.01	.01	-.04 to .02
PCL-M	IMPULSE	AUDIT	.06	.04	-.02 to .14
PCL-M	GOALS	AUDIT	-.01	.02	-.06 to .03
PCL-M	NONACCEPTANCE	AUDIT	-.02	.02	-.06 to .01
PCL-M	CLARITY	AUDIT	.05	.03	-.02 to .02
PCL-M	STRATEGIES	AUDIT	-.03	.06	-.15 to .08

Note. PCL-M = PTSD Checklist Military Version; AUDIT = Alcohol Use Disorder Identification Test; AWARE = Lack of Emotional Awareness; IMPULSE = Impulse Control Difficulties; GOALS = Difficulties Engaging in Goal-Directed Behavior; ACCEPT = Nonacceptance of Emotional Responses; CLARITY = Lack of Emotional Clarity; STRATEGIES = Limited Access to Emotion Regulation Strategies.

Table 5

Summary of Mediation Analysis for Men (5,000 bootstrap samples).

Independent Variable (IV)	Mediating variable (M)	Dependent variable (DV)	Coefficient	SE	95% CI
PCL-M	AWARE	AUDIT	-.01	.01	-.04 to .02
PCL-M	IMPULSE	AUDIT	.07	.04	.01 to .16
PCL-M	GOALS	AUDIT	-.02	.02	-.07 to .02
PCL-M	NONACCEPTANCE	AUDIT	-.02	.02	-.07 to .01
PCL-M	CLARITY	AUDIT	.05	.03	-.01 to .11
PCL-M	STRATEGIES	AUDIT	-.03	.06	-.01 to .14

Note. PCL-M = PTSD Checklist Military Version; AUDIT = Alcohol Use Disorder Identification Test; AWARE = Lack of Emotional Awareness; IMPULSE = Impulse Control Difficulties; GOALS = Difficulties Engaging in Goal-Directed Behavior; ACCEPT = Nonacceptance of Emotional Responses; CLARITY = Lack of Emotional Clarity; STRATEGIES = Limited Access to Emotion Regulation Strategies.

Table 6

Summary of Mediation Analysis for Women (5,000 bootstrap samples).

Independent Variable (IV)	Mediating variable (M)	Dependent variable (DV)	Coefficient	SE	95% CI
PCL-M	AWARE	AUDIT	-.25	.49	-1.45 to .95
PCL-M	IMPULSE	AUDIT	-.26	.42	-1.28 to .77
PCL-M	GOALS	AUDIT	.15	.40	-.83 to 1.13
PCL-M	NONACCEPTANCE	AUDIT	.17	.43	-.87 to 1.22
PCL-M	CLARITY	AUDIT	-.20	.57	-1.60 to 1.12
PCL-M	STRATEGIES	AUDIT	-.30	.43	-1.34 to .75

Note. PCL-M = PTSD Checklist Military Version; AUDIT = Alcohol Use Disorder Identification Test; AWARE = Lack of Emotional Awareness; IMPULSE = Impulse Control Difficulties; GOALS = Difficulties Engaging in Goal-Directed Behavior; ACCEPT = Nonacceptance of Emotional Responses; CLARITY = Lack of Emotional Clarity; STRATEGIES = Limited Access to Emotion Regulation Strategies.

Table 7

Summary of Mediation Analysis for Drinkers (5,000 bootstrap samples).

Independent Variable (IV)	Mediating variable (M)	Dependent variable (DV)	Coefficient	SE	95% CI
PCL-M	AWARE	AUDIT	.01	.02	-.03 to .05
PCL-M	IMPULSE	AUDIT	.09	.05	.01 to .19
PCL-M	GOALS	AUDIT	-.04	.03	-.12 to .01
PCL-M	NONACCEPTANCE	AUDIT	-.02	.02	-.08 to .01
PCL-M	CLARITY	AUDIT	.03	.04	-.04 to .11
PCL-M	STRATEGIES	AUDIT	-.03	.07	-.17 to .10

Note. PCL-M = PTSD Checklist Military Version; AUDIT = Alcohol Use Disorder Identification Test; AWARE = Lack of Emotional Awareness; IMPULSE = Impulse Control Difficulties; GOALS = Difficulties Engaging in Goal-Directed Behavior; ACCEPT = Nonacceptance of Emotional Responses; CLARITY = Lack of Emotional Clarity; STRATEGIES = Limited Access to Emotion Regulation Strategies.

DEPARTMENT OF VETERANS AFFAIRS
INSTITUTIONAL REVIEW BOARD
Memphis Veterans Affairs Medical Center
1030 Jefferson Avenue
Memphis, TN 38104

DATE:	April 4, 2014
TO:	Meghan McDevitt-Murphy, PhD Principal Investigator
FROM:	Timmy Edwards, Pharm.D. Memphis VAMC Institutional Review Board Chair
PROTOCOL TITLE:	[376856-5] Understanding health, adjustment, health behavior, and healthcare use in OEF/OIF Veterans (STRIVE II)
SUBMISSION TYPE:	Amendment/Modification
REVIEW TYPE:	Administrative Review
RISK DETERMINATION:	Minimal Risk
ACTION:	APPROVED
EFFECTIVE DATE:	March 26, 2014

Your requested modification to the above named protocol was reviewed and **approved** by the Memphis VAMC Institutional Review Board's designated reviewer on March 26, 2014 via expedited review procedures as authorized by ***38 CFR 16.110(b) and 45 CFR 46.110(b).*** The convened IRB was notified of this approval during the March 26, 2014 IRB meeting. Neither you nor any of the identified co-investigators participated in the review and decision-making.

The following documents were reviewed:

- Abstract/Summary - Abstract.docx (UPDATED: 02/6/2014)
- Amendment/Modification - Request to Modify an Approved Human Study1 (1).doc (UPDATED: 02/6/2014)
- Other - expedited review request (UPDATED: 02/6/2014)
- Other - key personnel (UPDATED: 02/6/2014)
- VA - R&D Request to Review Research Proposal - VA - R&D Request to Review Research Proposal (UPDATED: 02/11/2014)

The Memphis VAMC Institutional Review Board reminds you of several important requirements:

1. The procedures and interventions must be those described in the approved protocol.
2. Any changes to, or deviations from, the protocol must be proposed to the IRB in writing as a modification to the approved project via IRBNet and must be approved before changes are implemented.
3. In the continuing review process, you will be required to submit to the Memphis VAMC Research Compliance Officer a copy of the signed informed consent document for each study participant enrolled since the last Memphis VAMC IRB review and a copy of the complete study enrollment log.
4. You are required to maintain a current personnel log of all staff that interact with subjects or have access to subject private, identifiable information. All study personnel must be credentialed, privileged, and current on required education.

5. You are required to submit Deviations/Violations, Serious Adverse Events, and DSMBs reports per timeframes defined in IRB SOP Reporting Requirements.
6. All Clinical Trials must be registered with: http://www.clinicaltrials.gov.
7. Please ensure subjects receive a copy of the handout entitled, "Volunteering in Research".

The IRB will notify the R&D of IRB approval of this amendment/modification. The proposed changes may be implemented upon IRB approval.

If you have any questions, please contact the IRB Office.

Timmy Edwards, Pharm.D.