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Examining the moderating effects of anger between the latent factors of posttraumatic stress disorder and depression

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entitled

Examining the Moderating Effects of Anger Between the Latent

Factors of Posttraumatic Stress Disorder and Depression

by

Tory A. Durham

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

Master of Arts Degree in Psychology

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May 2015

An Abstract of

Examining the Moderating Effects of Anger Between the Latent
Factors of Posttraumatic Stress Disorder and Depression

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Tory A. Durham

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

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The University of Toledo

May 2015

The purpose of the present study was twofold. First, further investigation of the

DSM-5 posttraumatic stress disorder (PTSD) model is needed given the recent

publication of *DSM-5* and minimal amount of empirical investigation as of yet (Elhai,

Miller, et al., 2012; Friedman, Resick, Bryant, & Brewin, 2011; Koffel, Polusny, Arbisi,

& Erbes, 2012; Miller et al., 2012). Second, I investigated the moderating effect of anger

between specific latent factors of PTSD and somatic and non-somatic depression.

Comorbidity rates between PTSD and major depression run as high as 48-55% (Elhai,

Grubaugh, Kashdan, & Frueh, 2008; Kessler, Sonnega, Bromet, & Hughes, 1995); these

striking rates give rise to the importance of the present study. No studies to date have

investigated anger as a possible moderator despite the high prevalence of anger in

individuals with PTSD and depression independently. The present study was conducted

using University of Toledo undergraduate students. Following a prescreen questionnaire,

subjects completed the following measures online within a secure web platform:

demographics questionnaire, the Stressful Life Events Screening Questionnaire (SLESQ),

the Posttraumatic Stress Disorder Checklist (PCL), the Patient Health Questionnaire (PHQ) and the Dimensions of Anger Reactions (Bremner, Southwick, Darnell, & Charney). For the analyses, two confirmatory factor analyses (CFA) were conducted to investigate model fit for the *DSM-5* PTSD model and the PTSD dysphoria model. In addition, three moderation analyses were conducted to investigate (1) if anger moderates the relationship between PTSD's dysphoria factor and somatic depression, (2) if anger moderates the relationship between PTSD's dysphoria factor and non-somatic depression and (3) if anger moderates the relationship between PTSD's hyperarousal factor and somatic depression. Results and implications are discussed.

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Chapter I

Literature Review

Introduction

      Posttraumatic stress disorder (PTSD) is a complicated disorder. Diagnostic

criteria for PTSD include being exposed either directly or indirectly to actual or

threatened death, serious injury or compromised bodily integrity (American Psychiatric

American Psychiatric Association, 2013). The aforementioned criteria must be met

before a diagnosis of PTSD can be assigned and what constitutes a traumatic event can be

seen as somewhat ambiguous (Long & Elhai, 2009). Also adding to the complexity of the

disorder is the significant comorbidity between PTSD and other mental disorders

(Kessler et al., 1995). Specifically, and relevant to the present study, comorbidity rates of

depression and PTSD have been demonstrated to be as high as 48-55% based on large-

scale epidemiological studies (Elhai, Grubaugh, et al., 2008; Kessler et al., 1995). Current

investigations are exploring underlying mechanisms that possibly contribute to these high

comorbidity rates.

      Also highly prevalent in individuals with PTSD is anger. Within the context of

PTSD, anger leads to many negative outcomes such as poor treatment response, negative

therapist-patient relationships, poor physical health and broader negative affect

(Chemtob, Novaco, Hamada, Gross, & Smith, 1997; Foa, Riggs, & Gershuny, 1995;

Lasko, Gurvits, Kuhne, & Orr, 1994; McHugh, Forbes, Bates, Hopwood, & Creamer,

2012; Quimette, Cronkite, Prins, & Moos, 2004; Raab, Mackintosh, Gros, & Morland,

2013; Teten et al., 2010). Anger and irritability also represent one of the symptoms of

PTSD. Despite the striking relationship between PTSD and depression, and between

PTSD and anger separately, few studies have examined the relationship and co-occurrence of PTSD, depression and anger together (Hellmuth, Stappenbeck, Hoerster, & Jakupcak, 2012; Raab et al., 2013) and those that did were flawed.

The purpose of the present study was to more concisely examine the moderating relationship of anger between the latent factors of PTSD and depression. A four-factor model of PTSD and the proposed two-factor model of depression were utilized. First to be discussed in this document is the current factor models of PTSD, anger and depression. Empirical evidence explaining the comorbidity between PTSD and depression, PTSD and anger and anger and depression is then presented followed by a synthesis of the empirical and theoretical evidence to support anger as a moderator between PTSD's latent factors and depression. Finally, the CFA and moderation results are presented as well implications, limitations and future directions.

PTSD's Factor Structure

Two models in the literature most commonly represent the factor structure of PTSD beyond *DSM-IV*'s three-factor model (American Psychiatric Association, 2000): a four-factor emotional numbing model (King, Leskin, King, & Weathers, 1998) and a four-factor dysphoria model (Simms, Watson, & Doebbeling, 2002). The *DSM-IV-TR* model organizes PTSD's symptoms into three clusters based on *DSM-IV-TR*'s current symptom clusters: re-experiencing, effortful avoidance and emotional numbing, and hyperarousal. The re-experiencing symptom cluster includes intrusive thoughts, trauma related nightmares, reliving the trauma, emotional cue reactivity and physiological cue reactivity. The effortful avoidance and numbing symptom cluster includes avoidance of thoughts about the trauma, avoidance of reminders, trauma-related amnesia, loss of

interest, feeling detached, feeling numb and hopelessness. Finally, we have the hyperarousal symptom cluster, which includes difficulty sleeping, irritability, difficulty concentrating, being overly alert and being easily startled. Minimal evidence has been found to support the aforementioned three-factor model (Baschnagel, O'Connor, Colder, & Hawk, 2005; reviewed in Elhai & Palmieri, 2011; reviewed in Yufik & Simms, 2010), prompting researchers to search for a better-fitting model.

A four-factor emotional numbing model was developed (King et al., 1998) based on prior empirical evidence suggesting that the avoidance and emotional numbing symptom clusters are statistically distinct (Asmundson, Stapleton, & Taylor, 2004; Foa et al., 1995). The emotional numbing model separates the avoidance and numbing symptom cluster into two separate factors. The avoidance factor consists of two criteria: avoidance of thoughts and avoidance of reminders. The numbing factor consists of trauma related amnesia, loss of interest, feeling detached, feeling numb and hopelessness. Empirical support for this model has been evidenced in both the general population and trauma-exposed samples (reviewed in Elhai & Palmieri, 2011).

Another model, the dysphoria model (Simms et al., 2002), is an extension of the emotional numbing model. It combines three of *DSM-IV-TR* PTSD's hyperarousal symptoms (difficulty sleeping, irritability/anger and difficulty concentrating) with the emotional numbing symptoms (as outlined above) proposed by King et al. (1998) to create a unique dysphoria factor. This model is founded on theory that suggests a major component of PTSD, and other mood and anxiety disorders, is distress and dysphoria (reviewed in Elhai & Palmieri, 2011; reviewed in Watson, 2005; reviewed in Watson, 2009). Results from several studies indicate the dysphoria model has good fit

(Baschnagel et al., 2005; Elklit & Shevlin, 2007; E. D. Krause, Kaltman, Goodman, & Dutton, 2007; Lancaster, Melka, & Rodriguez, 2009) based on college samples. It actually appears to have a slightly better fit than the emotional-numbing model based on a meta-analysis (Yufik & Simms, 2010) and thus is the target of many empirical studies. See Table 1.1 for a comparison across models.

Table 1.

PTSD model comparisons

PTSD symptom	DSM-IV-TR	Model Emotional Numbing	Dysphoria
B3: Intrusive thoughts	R	R	R
B4: Nightmares	R	R	R
B5: Reliving trauma	R	R	R
B6: Emotional cue reactivity	R	R	R
B7: Physiological cue reactivity	R	R	R
C1: Avoidance of thoughts	A/N	A	A
C2: Avoidance of reminders	A/N	A	A
C3: Trauma-related amnesia	A/N	N	D
C4: Diminished interest	A/N	N	D
C5: Feeling detached	A/N	N	D
C6: Inability to experience positive emotions	A/N	N	D
C7: Sense of foreshortened future	A/N	N	D
D1: Difficulty sleeping	H	H	D
D2: Anger	H	H	D
D3: Difficulty concentrating	H	H	D
D4: Overly alert	H	H	H
D5: Easily startled	H	H	H

Note. R = reexperiencing; A = avoidance; D = dysphoria; N = numbing; H = hyperarousal

With the recent release of *DSM-5*, and its introduction of structural changes to PTSD, further investigation of this model will be one of the focuses of the present study. Regarding structural changes in diagnostic criteria, Criterion A2 was removed completely in *DSM-5*. Criterion A2 specified that, in conjunction with experiencing a traumatic event, a response of fear, helplessness or horror was required. The diagnostic utility of

this criterion was insufficient (Elhai, Miller, et al., 2012), prompting removal. No significant changes were introduced for the re-experiencing symptom cluster in *DSM-5*. *DSM-IV-TR*'s avoidance and numbing symptom cluster has been broken up into two separate criteria: avoidance and negative alterations in mood and cognition. The new avoidance symptom cluster reflects the dysphoria model's avoidance factor. The new negative alterations in mood and cognition symptom cluster include emotional numbing symptoms from PTSD in *DSM-IV-TR* (as outlined above) as well as two new symptoms of dysphoria (feeling detached, inability to experience positive emotions). In addition, a symptom of recklessness has been added to the alterations in arousal and reactivity symptom cluster. The present study compared the model fit for the Dysphoria model and the *DSM-5* model. See Table 2 for model a comparison relevant to the present study.

Concurrent in the literature is that four-factor models demonstrate better fit than one-, two-, and three-factor models of PTSD (Baschnagel et al., 2005). The new *DSM-5* model closely reflects the empirically supported emotional-numbing model. Though modern studies suggest the four-factor *DSM-5* PTSD model demonstrates good fit (Biehn, Elhai, et al., 2013; Contractor et al., 2014; Elhai, Miller, et al., 2012; Keane et al., 2014; LeBeau et al., 2014; Liu et al., 2014; Miller et al., 2012; Tsai et al., in press), when tested using college and veteran samples.

Table 2.

DSM-5 adjusted dysphoria model versus the DSM-5 model

	Model	
PTSD Symptom	Dysphoria	*DSM-5*
B1: Intrusive thoughts	R	R
B2: Nightmares	R	R
B3: Reliving trauma	R	R
B4: Emotional cue reactivity	R	R
B5: Physiological cue reactivity	R	R
C1: Avoidance of thoughts	A	A
C2: Avoidance of external reminders	A	A
D1: Trauma-related amnesia	D	NAMC
D2: Negative beliefs	D	NAMC
D3: Distorted blame	D	NAMC
D4: Persistent negative emotional state	D	NAMC
D5: Lack of interest	D	NAMC
D6: Feeling detached	D	NAMC
D7: Inability to experience positive emotions	D	NAMC
E1: Irritability/anger	D	AAR
E2: Recklessness	H	AAR
E3: Hypervigilance	H	AAR
E4: Easily startled	H	AAR
E5: Difficulty concentrating	D	AAR
E6: Difficulty sleeping	D	AAR

Note. R = reexperiencing; A = avoidance; D = dysphoria; NAMC = negative alterations in mood and cognition; H = hyperarousal; AAR = alterations in arousal and reactivity

Anger's Factor Structure

Anger as a psychological construct is also under considerable debate in the field. Two discrepancies in particular make anger difficult to define and research. First, distinguishing between anger, aggression and hostility has proven difficult both theoretically and empirically (Cox & Harrison, 2008; Eckhardt, Norlander, & Deffenbacher, 2004). Secondly, whether anger should be regarded as a one-dimensional or multidimensional construct is in question. In regard to distinguishing between anger, aggression and hostility, the most common proposition posits the following: hostility is an attitudinal construct, aggression involves overt displays of behavior, and anger is an

emotional state (reviewed in Eckhardt et al., 2004). Despite these conceptual distinctions widely accepted in the literature, anger tends to be defined in various ways. Hereafter, anger will be defined as a negative affective state in which cognitive distortions and misappraisals are experienced and physiological changes occur (Kassinove & Sukhodolsky, 1995). Although it would appear both hostility and anger involve emotional and physiological responses, Eckhardt et al. (2004) proposes that angry affect is the result of previous hostility. The contingencies that separate anger, aggression and hostility are seemingly weak but the separation of the three constructs is apparent in the literature and the aforementioned definition need be applied.

In regard to the proposed dimensions of anger, the construct was originally broadly classified as an emotional state (Berkowitz, 1990; Chemtob et al., 1997) and was simplistically understood as having both adaptive and maladaptive value (Novaco, 1976). However, more modern views of anger portray the construct as being multidimensional (See Figure 1.1; reviewed in Cox & Harrison, 2008; reviewed in Eckhardt et al., 2004). Specifically, some researchers posit that anger contains affective, behavioral and cognitive components (Cox & Harrison, 2008; Eckhardt & Deffenbacher, 1995; Eckhardt et al., 2004; Kassinove & Sukhodolsky, 1995). Although research often demonstrates that these dimensions are highly correlated, some still believe that they should be treated as distinct components (reviewed in Cox & Harrison, 2008). The affective dimension reflects the emotional component of the construct (Cox & Harrison, 2008). By definition it is what people often refer to as anger itself. The behavioral component encompasses the overt behaviors that are a result of the emotional component (Cox & Harrison, 2008). This component is often interchangeably referred to as aggression. The cognitive

component involves negative cognitive appraisals. This dimension is often difficult to discriminate from the affective component and is often referred to as hostility in the literature (Cox & Harrison, 2008). One could consider that teasing apart these dimensions would simplify the definition of anger but it is plain to see that this also adds to the perplexity of anger.

The aforementioned breakdown is well established in the literature (reviewed in Eckhardt et al., 2004) and is often used as the conceptual groundwork to empirically investigate anger within a PTSD context (Galovski, Elwood, Blain, & Resick, 2013; A. D. Marshall et al., 2010; Meffert et al., 2008; Murphy, Taft, & Eckhardt, 2007; Owens, Chard, & Cox, 2008). However, it is also widely accepted to empirically investigate anger as a one-dimensional construct (Dyer et al., 2009; Hellmuth et al., 2012; Jakupcak et al., 2007; Kulkarni, Porter, & Rauch, 2012; Kunst, Winkel, & Bogaerts, 2011; Vrana, Hughes, Dennis, Calhoun, & Beckham, 2009). It has proven to be a quite difficult task teasing apart the different components of anger, particularly given the high correlations among anger, hostility and aggression and among the cognitive, affective and behavioral components (Cox & Harrison, 2008). Given the complexity surrounding differentiation, the present study investigated anger as a one-dimensional construct using a measure previously supporting unidimensionality (Forbes et al., 2014).

Depression's Factor Structure

There are few empirical investigations regarding depression's factor structure (Elhai, Contractor, et al., 2012). Measures mapping directly onto major depression's diagnostic criteria are often utilized to examine depression's factor structure (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al.,

2013). A widely used measure for examining depression's factor structure is the Patient

Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001), which is

formatted to map directly onto the *DSM-IV* criteria for a major depressive episode. The

PHQ-9 is similarly well-suited for *DSM-5* major depression, given the consistency

between *DSM-IV* and *DSM-5* major depression criteria. Using the PHQ-9, results from

exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) suggest

depression either reflects one dimension (Baas et al., 2011; Cameron, Crawford, Lawton,

& Reid, 2008; Dum, Pickren, Sobell, & Sobell, 2008; Kalpakjian et al., 2009) or two

dimensions (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan,

Slembarski, Liberzon, et al., 2013; Elhai, Contractor, et al., 2012; J. S. Krause,

Bombardier, & Carter, 2008; J. S. Krause, Reed, & McArdle, 2010; Richardson &

Richards, 2008). The two-dimensional factor structure of depression is better supported

in the literature, particularly from studies using CFA (Baas et al., 2011; Biehn,

Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al.,

2013; J. S. Krause et al., 2008), which are more robust and less error-prone than studies

using EFA.

The two PHQ-9 depression factors indicated by CFA are somatic and non-

somatic/affective items (see Table 3.). The following five items characterize the somatic

factor: increase or decrease in appetite, changes in sleep, psychomotor disturbances,

feelings of fatigue or loss of energy, and difficulty concentration. The non-somatic or

affective factor consists of the following four items: anhedonia, feelings of worthlessness

or guilt, depressed mood, and suicidal thoughts. Given the considerable amount of

empirical support for the two-factor model (Biehn, Contractor, Elhai, Tamburrino, Fine,

Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013; Elhai, Contractor, et al., 2012; J. S. Krause et al., 2008; J. S. Krause et al., 2010; Richardson & Richards, 2008), the present study focused on the discrete somatic and non-somatic factors of depression.

Table 3.

Depression's two-factor model

Symptom	Factor
1. Depressed Mood	Non-somatic
2. Loss of interest or pleasure	Non-somatic
3. Weight loss/gain or increase/decrease in appetite	Somatic
4. Insomnia or hypersomnia	Somatic
5. Psychomotor agitation or retardation	Somatic
6. Fatigue or loss of energy	Somatic
7. Feelings of worthlessness or guilt	Non-somatic
8. Diminished concentration or indecisiveness	Somatic
9. Recurrent thoughts of death of suicide	Non-somatic

PTSD and Anger

Several theoretical perspectives have been proposed to address the relationship between PTSD and anger. More broadly, it has been posited that a range of negative internal states increases the possibility for an anger response (Berkowitz, 1993; Eckhardt & Deffenbacher, 1995). Some specific states known to increase an anger response, and relevant to anger's role in PTSD, are illness, stress, anxiety and fatigue (Berkowitz, 1990; Eckhardt & Deffenbacher, 1995). By definition, a trauma is a stressor and PTSD as a diagnosis is a form of anxiety, and therefore can be seen as a precursor to anger. Another theory to be discussed later also specifically proposes PTSD as a precursor to anger (Chemtob et al., 1997), a notion that has considerable influence on the present study.

One may speculate that the relationship between PTSD and anger is due to anger being a symptom of PTSD. However, it appears to be more complicated than that; when

anger-related items on PTSD measures are removed, a strong relationship between PTSD and anger persists (Novaco & Chemtob, 2002). Likewise, although a recent meta-analysis conducted by Olatunji, Ciesielski, and Tolin (2010) demonstrated that anger did not show specificity to PTSD but was related to other anxiety disorders as well (e.g., generalized anxiety disorder, panic disorder, obsessive-compulsive disorder). However, anger demonstrated more specificity to PTSD than other anxiety disorders (Olatunji et al., 2010).

One other theory explaining the relationship between PTSD and anger, and one that is influential on the present hypotheses, is the anger regulatory deficits model proposed by Chemtob et al. (1997). This theory indicates that a survival mode response to a threatening situation is adaptive. Some important characteristics of the survival mode response are: in context the survival mode response is adaptive, it is triggered by a traumatic event, it activates anger structures and it occurs before other cognitive processes (Chemtob et al., 1997). If the activated survival mode functioning becomes somewhat of a learned behavior, this can be maladaptive outside of the appropriate context. Empirical applications of this theory have been demonstrated extensively in the extant literature using community and veteran samples (e.g. Badour & Feldner, 2013; Morland, Love, Mackintosh, Greene, & Rosen, 2012; Novaco, Swanson, Gonzalez, Gahm, & Reger, 2012).

PTSD and Depression

With as many as 48-55% of individuals with a PTSD diagnosis also meeting criteria for major depression (Elhai, Grubaugh, et al., 2008; Kessler et al., 1995) several theories have been proposed to explain these striking comorbidity rates. One such theory

is the symptom overlap theory (Spitzer, First, & Wakefield, 2007), which speculates several symptoms of PTSD are similar to depressive symptoms and thus amplify the comorbidity of the two constructs. The symptom overlap theory suggests that because PTSD and major depression share three symptoms (difficulty concentrating, sleep difficulties, and anhedonia), the overlapping symptoms have a profound influence on comorbidity rates. However, recent studies have shown that this theory may be too simplistic. Ultimately, similar to the unsupported notion of anger as a symptom of PTSD contributing to the high comorbidity, removing the overlapping items does not significantly reduce comorbidity rates between PTSD and major depression (Elhai, Grubaugh, et al., 2008; Ford, Elhai, Ruggiero, & Frueh, 2009; Grubaugh, Long, Elhai, Frueh, & Magruder, 2010).

Another proposal to explain the high comorbidity rates is a theory suggesting there are possible common underlying dimensions between mood and anxiety disorders (Watson, 2005). The current *DSM* nosology categorizes mood and anxiety disorders separately. However there is theoretical and empirical evidence to suggest that this is not an appropriate categorization. As such, Watson (2005) proposes the quantitative hierarchal model. This model specifies that although each disorder within the current mood and anxiety categorization also has its own component/s of specificity, a general negative affect component is representative of a broad common underlying dimension. Recent studies empirically support the idea of an underlying general distress component using veteran samples (reviewed in Elhai, Carvalho, et al., 2011; Gros, Simms, & Acierno, 2010; Watson, 2005).

Other studies utilizing college, veteran and community samples have demonstrated that it may be specific factors of PTSD that account for the comorbidity between PTSD and depression, but results from these studies appear to be incongruent. Although some studies have shown that it is PTSD's dysphoria factor that accounts for the relationship between PTSD and depression (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013; Elhai, Contractor, Palmieri, Forbes, & Richardson, 2011; Forbes et al., 2011; Gootzeit & Markon, 2011; Simms et al., 2002), other studies have demonstrated that dysphoria may not explain the relationship (Forbes et al., 2012; Marshall, Schell, & Miles, 2010; Miller et al., 2010). Some studies have also demonstrated that it may be PTSD's emotional numbing symptom cluster that explains the comorbidity (Asmundson, Stein, & McCreary, 2002; Hellmuth et al., 2012; Kashdan, Elhai, & Frueh, 2006; Palmieri, Marshall, & Schell, 2007). More recently, the arousal factor of PTSD has also demonstrated a discrete relationship with depression (Baker, Norris, Jones, & Murphy, 2009; Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, I., et al., 2013; Hellmuth et al., 2012; Perez, Abrams, Lopez-Martinez, & Asmundson, 2012). These discrepant results necessitate further investigation and shed light on the importance of investigating other possible constructs (e.g., anger) that may be influential on the comorbidity between PTSD and depression.

Anger and Depression

The relationship between anger and depression is understudied and therefore underrepresented in the literature. Most of what is known about the relationship is theoretical. One theory, proposed by Kassinove and Sukhodolsky (1995), suggests that

anger can lead to negative self-evaluation, while others suggest low self-esteem and disruptions in interpersonal relations can result from anger Those symptoms are strikingly similar to symptoms of depression. Anger is also related to rumination (Eckhardt & Deffenbacher, 1995), negative expectations about the future, and negative judgments of what others are thinking (Kassinove & Sukhodolsky, 1995). People vary in their expression of anger; some may express anger through avoidance, yelling, sulking and/or making snide comments (Kassinove & Sukhodolsky, 1995). Another known consequence of anger is dissociative feelings (Kassinove & Sukhodolsky, 1995). Conceptually, several of the aforementioned characteristics related to anger (e.g. sulking, ruminating and avoidance) may lead to depressed mood.

Although these theories lay the conceptual groundwork for empirically investigating possible relationships between anger and depression, this topic is underrepresented empirically in the extant literature. Despite the few studies that have investigated this topic being somewhat exploratory (Hellmuth et al., 2012; Raab et al., 2013), a relationship between the constructs was found. Specifically, depression within the context of PTSD has been shown to increase levels of anger (Raab et al., 2013). However, this finding is not informative as to why PTSD and depression are so highly comorbid and thus prompted the initiation of present study.

PTSD, Anger and Depression

Although explanations for the relationship between PTSD and depression are abundant in the literature, there are very few theoretical models and empirical investigations that account for the possible role of anger in this relationship. One model which does, proposed by Berkowitz (1990), is the cognitive-neoassociationistic model.

This model posits a chain-like reaction of associative networks that link negative affect and anger related feelings. Specifically, an unpleasant event occurs (e.g. a traumatic event), and as a result, unpleasant feelings surface (e.g. depression) and memories are triggered that are possibly associated with anger and/or aggression (Berkowitz, 1990). One study in particular has found support for the cognitive-neoassociationistic model (Raab et al., 2013).

A study conducted by Raab et al. (2013) investigated major depressive disorder as a mediator between the latent factors of PTSD and anger. However, this study was not without flaws. Although there is a theoretical underpinning for choosing to investigate depression as the mediator, it is far more informative to investigate causal mechanisms to explain the relationship between PTSD and depression (rather than PTSD and anger), given the high comorbidity between PTSD and depression in addition to the lack of clarity regard what is contributing to this high comorbidity. In addition, the authors investigated the mediating relationship cross-sectionally, which is inappropriate for this type of analysis. Time is a critical component for meditational analyses; specifically the independent variable should precede the dependent variable in order to suggest causal mechanisms. The authors did not accommodate these requirements and thus the results must be interpreted with caution. The flaws in the aforementioned study will be accounted for in the present study by testing moderation instead.

Although anger has never been explicitly investigated as a moderator of the PTSD-depression relationship, a few studies in the extant literature may suggest that this would be the next logical step. Specifically these studies found that anger-related constructs moderated the relations between PTSD and other forms of mental health and

physical health problems. For example, a recent study demonstrated that hostility

moderated the relationship between PTSD and cardiovascular response (Vrana et al.,

2009). Hostility has also been demonstrated to moderate the relationship between PTSD

and physiological reactivity (Beckham et al., 2002). Given the high correlations between

anger, hostility and aggression (Cox & Harrison, 2008), one can speculate that anger

could moderate relations between PTSD and negative outcomes besides those solely

related to physical health.

       Although the aforementioned studies did not investigate PTSD using its latent

factors, it would be advantageous to do so and is ultimately proposed in the present study.

Investigating PTSD at the latent level allows researchers to examine the dysphoria factor

in a new light. Despite generally inclusive results, the dysphoria factor seems to

demonstrate more specificity with depression than the other factors of PTSD (Biehn,

Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al.,

2013; Elhai, Contractor, et al., 2011; Forbes et al., 2011; Gootzeit & Markon, 2011;

Simms et al., 2002). In addition, anger has shown specificity to the dysphoria factor

(Raab et al., 2013). The aforementioned illustrations have had considerable influence on

the present hypotheses.

Present Study Aims and Hypotheses

       The present study specifically investigated the moderating relationship of anger

between PTSD's latent factors and somatic and non-somatic depression using the new

DSM-5 diagnostic criteria for PTSD. The purpose of the present study was ultimately to

uncover a new mechanism that may be contributing to the high comorbidity rates

between PTSD and depression, a topic that is currently under considerable debate. By

investigating anger as a moderating variable, the present study also hoped to clarify

which latent factor of PTSD is most related to somatic and non-somatic depression, a

topic that is also poorly understood at present. Given the somewhat discrepant results

regarding which model best represents the factor structure of PTSD, this study used CFA

to investigate model fit for the two most empirically support and relevant models: the

dysphoria model and the *DSM-5* model.

It is important to recognize the discrepancy regarding investigation of these three

constructs. Specifically to be addressed is the notion that PTSD and depression are

diagnoses while anger is not. To clarify this discrepancy, the following conceptualization

behind the moderation analyses was used: individuals who are high in specified factors of

PTSD and high in emotive anger should present with more depressive symptoms than

individuals not high in either constructs.

First, it was hypothesized that the *DSM-5* model would demonstrate slightly better

fit than the dysphoria model based on empirical evidence that indicates the proposed

factors load well onto the *DSM-5* model (Biehn, Elhai, et al., 2013; Contractor et al.,

2014; Elhai, Miller, et al., 2012; Keane et al., 2014; LeBeau et al., 2014; Liu et al., 2014;

Miller et al., 2012; Tsai et al., in press). For subsequent analyses, I intended to use the

dysphoria model because it is most relevant to the emotional distress inherent in anger

and depression (Simms et al., 2002; Watson, 2005, 2009). Second, based on theory

accounting for the relationship between anger and depression (Kassinove & Eckhardt,

1995), it was hypothesized that anger would moderate the relationship between PTSD's

dysphoria factor and somatic and non-somatic depression. Despite the conflicting results

regarding what factor of PTSD is more or less related to depression, this hypothesis was

also based on more recent empirical research suggesting dysphoria may account for the high comorbidity (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013; Elhai, Contractor, et al., 2011). Finally, it was hypothesized that anger would moderate the relationship between hyperarousal and depression's somatic factor based on prior empirical research suggesting hyperarousal may be more related to somatic depression than other symptoms of PTSD (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013) and based on empirical evidence suggesting anger has a significant relationship with the arousal factor of PTSD (Raab et al., 2013).

The proposed study is important for several reasons. First, very few studies have investigated the new *DSM-5* diagnostic criteria and model (Carmassi et al., 2013; Elhai, Miller, et al., 2012; Kilpatrick et al., 2013; Koffel et al., 2012; Stein et al., 2014). Secondly, this is the first study to examine the moderating relationship of anger between PTSD's latent factors and depression. Thus far, discrepant results indicate that the true explanation for the high comorbidity is not yet known. Considering the high comorbidity between PTSD and depression, investigating moderating variables can only aid in our understanding of these high rates. Lastly, considering anger associated with PTSD is related to many negative outcomes such as poor treatment responses, poor physical health and aggressive tendencies (e.g., poor treatment responses, poor physical health and aggressive tendencies; Raab et al., 2013), understanding these mechanisms can allow clinicians to target these mechanisms in treatment or as prevention strategies.

Chapter II

Methods

Procedure and Participants

The population I investigated was psychology undergraduate students at the University of Toledo (UT). A recent study found that 59% of subjects selected from a comparable undergraduate population had experienced a traumatic event (Elhai, Miller, et al., 2012). In addition, the same study also demonstrated approximately 4.8 to 9.2% of subjects would likely qualify for a probable PTSD diagnosis (Elhai, Miller, et al., 2012). The diagnostic criteria used in the aforementioned study were in accord with *DSM-5*. The study ultimately demonstrated one is likely to find a significant trauma-exposed sample among undergraduates. According to Elhai and Palmieri (2011) many studies do not recruit an adequate number of subjects to conduct CFAs. Based on the recommendations from Elhai and Palmieri (2011), given the typical statistical fit of PTSD's factor structure, only 132 subjects would typically be needed for 80% power in a PTSD CFA. In the present study, I aimed to recruit 300 trauma-exposed subjects which is a generously sized sample for the CFAs.

Subjects were recruited via the University's Sona Systems webpage. Screening criteria was included on the Sona Systems prescreen to ensure that only subjects who had been exposed to a qualifying traumatic event would participate in the study (the screening questionnaire to be used is detailed below). After recruitment via Sona Systems, subjects were directed to a PsychData web survey to fill out web surveys. PsychData is a company that provides a platform for data to be collected online in a very secure environment. PsychData meets IRB standards for conducting ethical and confidential research.

PsychData uses Secure Socket Layer encryption to protect users' data. In addition, once the subject has completed the survey, the webpage automatically closed. This prevents someone else from accessing the subject's data in the event the subject forgets to close the web browser. The data obtained through PsychData was downloaded into the statistical software of the investigators choosing. Only the primary investigator and the supervisor had access to the data.

Instrumentation

Demographic Survey. Information regarding the subjects' gender, age, ethnicity, education, relationship status, employment, and household income were collected.

Structured Clinical Interview for DSM-IV (SCID) PTSD Trauma Screen. The SCID is a structured diagnostic interview to assess for several Axis I and Axis II disorders (First, Spitzer, Gibbon, & Williams, 2002). Specifically, the PTSD module inquires about exposure to a traumatic event and provides examples of potential traumas. The SCID PTSD trauma screen is a single question that is used to screen for trauma exposure. Only subjects who endorsed trauma exposure on this prescreen question were eligible for participation in the study. The SCID PTSD trauma screen demonstrate 75.6% sensitivity, 67.4% specificity and 73.9% overall diagnostic power in a primary care patient sample and 65.5% sensitivity, 87.2% specificity and 72.3% overall diagnostic power in an undergraduate sample (Elhai, Franklin, & Gray, 2008).

Stressful Life Events Screening Questionnaire (SLESQ). The SLESQ (Goodman, Corcoran, Turner, Yuan, & Green, 1998) is a 13-item self-report measure assessing for lifetime exposure to a traumatic event. The measure presents 12 broad categories of trauma exposure, all of which meet Criterion A of *DSM-IV* PTSD's diagnostic criteria. A

modified version of the SLESQ was used in the present study. A question inquiring about repeated or extreme exposure to gruesome or horrific details of trauma and inquiry as to whether or not the trauma was experienced through electronic media or one's occupation was added to be consistent with the new diagnostic criteria. This modified SLESQ has been used in a previous study (Elhai, Miller, et al., 2012). If subjects endorsed more than one trauma, they were asked to designate their most distressing trauma for later inquiry of PTSD symptoms. The SLESQ has demonstrated good test-retest reliability with a median kappa of .73 (Goodman et al., 1998). The measure also demonstrated good convergent and concurrent validity (r = .77) with a longer, more extensive, interview of trauma exposure (Goodman et al., 1998).

PTSD Checklist for DSM-5 (PCL-5). The PCL (Weathers, Litz, Herman, Huska, & Keane, 1993) is a self-report measure assessing severity of PTSD symptoms. The questions on the PCL have recently been adapted to map directly onto *DSM-5*'s symptom criteria for PTSD (Weathers et al., 2013). Subjects were asked to indicate the amount of distress each symptom has caused them over the past month on a five-point Likert-type scale (0 = "*Not at all*" to 4 = "*Extremely*"). Test re-test reliability for the original PCL has been demonstrated to be quite high (.96) in Vietnam veterans (reviewed in McDonald & Calhoun, 2010). The PCL demonstrated high correlations with other measures of PTSD (e.g., Mississippi Scale for Combat Related PTSD *r* = .85 and *r* = .93) and clinician administered interviews (e.g., Clinician Administered PTSD Scale, *r* = .79) demonstrating good validity for the measure (reviewed in McDonald & Calhoun, 2010). The PCL has also demonstrated good internal consistency in an undergraduate sample with Cronbach's alpha coefficients of .94 for PCL total score, .85 for re-experiencing, .85

for avoidance and .87 for hyperarousal (Ruggiero, Del Ben, Scotti, & Rabalais, 2003). Good convergent validity was demonstrated in a college sample with high correlations (r > .75) between the PCL, the Impact of Event Scale (Olatunji et al.), and the Mississippi Scale for PTSD-Civilian version (MS-C; Ruggiero et al., 2003).

Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 is a 9-item self-report measure assessing depressive symptoms over the past two weeks. However, the measure was modified so that subjects were instructed to complete the questionnaire based on depressive symptoms over the past month to ensure consistency with the PCL-5. Although originally created for *DSM-IV*'s diagnostic criteria, questions on the PHQ-9 map directly onto *DSM-5*'s diagnostic criteria for a major depressive episode due to no changes being implemented for major depression in *DSM-5*. The PHQ-9 uses a four-point Likert-type scale (0 = "*Not at all*" to 3 = "*Nearly every day*") to assess severity of depressive symptoms. Internal consistency for the PHQ-9 ranged from .86 to .89 (Kroenke et al., 2001). Construct validity was demonstrated by a decrease in depression severity being correlated with an increase in functional status, decrease disability days, health care visits and difficulty attributed to symptoms (Kroenke et al., 2001).

Dimensions of Anger Reactions (DAR-5). The DAR-5 (Forbes et al., 2014; Forbes et al., 2004) is a 5-item self-report measure that was used to assess the subjects' dimensions of anger reactions. The DAR-5 primarily measures anger toward others. Although the measure does not assess for the different factors of anger (i.e. anger in, anger out, state anger, trait anger) the ambiguities surrounding these distinctions make the DAR suitable. The DAR-5 uses a six-point Likert-type scale (0 = "*Not at all*" to 5 = "*Very much*"). Spearman correlations between the DAR and an item on the PCL

measuring anger and irritability were .53 and .52 at intake and .71 and .70 at follow-up demonstrating the DAR measures a similar yet distinct construct (Forbes et al., 2004). Internal consistency for the DAR has been demonstrated to be high with Cronbach's alpha of .91 at intake and .94 at follow-up (Forbes et al., 2004). The DAR-5 has recently demonstrated good internal consistency with item-total correlations ranging from .72 to .89, and good discriminant validity with the Hospital Depression Scale (Forbes et al., 2014).

Analysis

Exclusion Criteria and Sample Characteristics. Five-hundred fifty-two subjects completed the measures. Of the 552 participants, 298 (53.9%) were omitted from analyses for not endorsing a trauma on the SLESQ. This exclusion was to obtain an exclusively trauma-exposed sample. Five additional subjects were omitted for endorsing witnessed trauma as their worst trauma but whereby the exposure was only through electronic media, which does not fulfill *DSM-5* PTSD Criterion A. Finally, two subjects were excluded for missing more than half of the items on the PCL, PHQ-9 and DAR. The resulting effective sample sized used for the primary analyses was 247.

The effective sample had a mean age of 19.65 ($SD = 2.88$) and ranged from 18 to 37 years old. The majority of subjects identified as female ($n = 176$, 71.3%). Most were employed part-time ($n = 121$, 49.0%), were unemployed students ($n = 80$, 32.4%) or employed full-time ($n = 32$, 13.0%). Subjects primarily identified as single ($n = 205$, 83.0%), living with a significant other ($n = 31$, 12.6%), married ($n = 8$, 3.2%), or divorced, separated or widowed ($n = 3$, 1.2%). Most identified their race or ethnicity

(using non-mutually exclusive categories) as Caucasian (*n* = 181, 73.3%), African-American (*n* = 53, 21.5%), Hispanic or Latino (*n* = 24, 9.7%) or Asian (*n* = 14, 5.7%).

CFAs. Confirmatory factor analysis is a method of factor analysis that is used to test whether or not a specified model is comprised of latent or unobserved variables. In CFA, the model tested is specified a priori as opposed to EFA in which the model is determined empirically post hoc. CFA is thus superior to EFA in that the model is based on prior empirical research and/or theory. After data were collected, a number of fit statistics were obtained to determine if the correlations among observed variables fit the hypothesized model specification.

In the present study, two CFAs were conducted using Mplus 7.1 software (Muthén & Muthén, 2012). First, the dysphoria model was examined, adjusting for *DSM-5* PTSD criteria. Second, the *DSM-5* PTSD model was examined. For both of the CFAs, residual error covariances and factor variances were fixed to zero and 1, respectively. Data obtained were treated as ordinal using a polychoric covariance matrix and probit coefficients for factor loadings, given that both measures have five or fewer response options and thus are better conceptualized ordinally. Elhai and Palmieri (2011) proposed that variables should be treated ordinally under these circumstances in addition to when sampling college student or non-clinical samples. Weighted least squares estimation with a mean and variance-adjusted chi-square (WLSMV) was used, the preferred method of estimation for ordinal data (Flora & Curran, 2004; Wirth & Edwards, 2007). Missing data were estimated using a pairwise present approach.

In CFA, Bayesian Information Criterion (BIC) values or chi-square statistics are used to compare which model better fits the data. In the present analyses, chi-square

statistics could not be used for the model comparisons because the models are non-nested within one another. This means that the models are not subsets of one another. As such, BIC values were obtained by re-computing the analyses using maximum likelihood (ML) estimation. A difference of 10 points indicates strong support that the model with the lower BIC value has significantly better fit (Kass & Raftery, 1995).

Several goodness-of-sit statistics were used to determine how well the specified model fits the obtained data. Specifically, the model chi-square test, root mean square error of approximation (RMSEA), comparative fit index (CFI) and Tucker-Lewis index (TLI) were used. A chi-square value of or near zero indicates the statistical model fits the data well; however this criterion is influenced by sample size. Therefore, I primarily emphasized other goodness of fit values. For the RMSEA value the following benchmarks are proposed to determine how well the model fits the data: .06 or less indicates a well-fitting model, a value between .06 and .08 indicates reasonable model fit and a value of .10 or high indicates poor fit. CFI and TLI values greater than .90 indicate a reasonably good fitting model while values of .95 or higher indicate excellent model fit.

Moderation Analyses. A moderation analysis was conducted to investigate whether or not anger, as measured by the DAR-5, moderates the relationship between specific factors of PTSD (i.e., dysphoria, arousal) and somatic and non-somatic depression. Conceptually speaking, a moderator is a variable that is expected to alter the strength of a causal relationship between two other variables (i.e. the dependent and independent variables; Wu & Zumbo, 2008). Relevant to the present study, these analyses were used to demonstrate the hypothesis that individuals who are higher in anger and dysphoria would demonstrate more somatic and non-somatic depression.

Additionally, if individuals are high in anger and hyperarousal, it was expected that they would demonstrate more somatic depression.

Statistically speaking, a moderator is an interaction effect within multiple regression (Wu & Zumbo, 2008). Essentially, the dependent variable has its own effect on the independent variable, and the moderator variable similarly has its own effect on the independent variable. Moderation represents the interaction term of the dependent and moderator variables.

Specifically, the present study investigated three moderation analyses: (1) if anger moderates the relationship between PTSD's dysphoria factor and somatic depression, (2) if anger moderates the relationship between PTSD's dysphoria factor and non-somatic depression and, (3) if anger moderates the relationship between PTSD's arousal factor and somatic depression.

Chapter III

Results

Descriptive Statistics

The average PCL score was 26.23 (SD = 19.18). The average DAR-5 score was 9.63 (SD = 4.83). The average PHQ-9 score was 7.81 (SD = 5.91). The following diagnostic algorithm, proposed by Cook, Thompson, Coyne, and Sheikh (2003) (but adapted here for DSM-5), was used to determine potential PTSD diagnosis: at least one reexperiencing, one avoidance, two NAMC and two AAR symptoms must have been rated two or higher for a possible PTSD diagnosis. As such, 41.29% of the trauma-exposed subset of the sample would likely meet a PTSD diagnosis.

Most commonly reported traumas included: having a family member or close friend die from homicide, suicide or accident (n = 124, 50.2%), being in a life threatening accident (n = 80, 32.4%), having been physically harmed by someone (n = 78, 31.6%) and physically being forced to have intercourse (n = 55, 22.3%). For the most distressing trauma, most commonly reported experiences included: having a family member or close friend died from homicide, suicide or accident (n = 115, 46.6%), being in a life threatening accident (n = 22, 8.9%), having a life-threatening illness (n = 18, 7.3%), and having been physically harmed by someone (n = 18, 7.3%). The most commonly reported most distressing traumas did not differ for Caucasians versus Non-Caucasians, χ^2(11, N = 247) = 9.93, p = .537.

CFAs

Results from the CFAs indicate a well-fitting DSM-5 PTSD emotional numbing model, χ^2(164, N = 247) = 490.367, p < .001, CFI = .969, TLI = .964, RMSEA = .090 (CI

= .081 - .099), BIC = 13668.214. The dysphoria model fit well, $\chi^2(164, N = 247) =$

495.936, $p < .001$, CFI = .965, TLI = .964, RMSEA = .091 (CI = .081 - .100), BIC =

13681.818. In comparing BIC values, the emotional numbing model demonstrated

significantly better fit than the dysphoria model. Nonetheless, as discussed above,

because of the role of PTSD's dysphoria in anger and depression (Simms et al., 2002;

Watson, 2005, 2009), the dysphoria model was used in subsequent analyses. Table 4

displays the factor loadings for the dysphoria and emotional numbing models.

Table 4

Emotional numbing and dysphoria models' factor loadings

	Dysphoria		Emotional numbing	
PTSD Symptom	Factor	Factor loading	Factor	Factor loading
B1: Intrusive thoughts	R	.860	R	.860
B2: Nightmares	R	.812	R	.811
B3: Reliving trauma	R	.840	R	.840
B4: Emotional cue reactivity	R	.869	R	.870
B5: Physiological cue reactivity	R	.808	R	.808
C1: Avoidance of thoughts	A	.911	A	.911
C2: Avoidance of external reminders	A	.934	A	.934
D1: Trauma-related amnesia	D	.508	NAMC	.521
D2: Negative beliefs	D	.833	NAMC	.852
D3: Distorted blame	D	.762	NAMC	.777
D4: Persistent negative emotional state	D	.875	NAMC	.895
D5: Lack of interest	D	.817	NAMC	.835
D6: Feeling detached	D	.868	NAMC	.887
D7: Inability to experience positive emotions	D	.887	NAMC	.905
E1: Irritability/anger	D	.790	AAR	.818
E2: Recklessness	D	.796	AAR	.825
E3: Hypervigilance	H	.892	AAR	.824
E4: Easily startled	H	.842	AAR	.862
E5: Difficulty concentrating	D	.869	AAR	.895
E6: Difficulty sleeping	D	.799	AAR	.820

Note. R = reexperiencing; A = avoidance; NAMC = negative alterations in mood and cognitions; AAR = alterations in arousal and reactivity; d = dysphoria; H = hyperarousal

The anger model fit well, $\chi^2(5, N = 247) = 12.952, p < .001$, CFI = .997, TLI = .994, RMSEA = .080 (CI = .027 - .135). The depression model fit well, $\chi^2(26, N = 247) = 103.711, p < .001$, CFI = .970, TLI = .959, RMSEA = .110 (CI = .088 - .133). Finally, a combined model of the dysphoria model of PTSD, depression and anger demonstrated good fit, $\chi^2(506, N = 247) = 1023.360, p < .001$, CFI = .961, TLI = .957, RMSEA = .064 (CI = .059 - .070).

Moderation Analyses

Moderation analyses were examined using latent variable interactions. For the interaction analysis between anger and dysphoria predicting somatic depression, the direct effect of anger on somatic depression was significant, $B = .447, SE = .178, p = .012$. The direct effect of dysphoria on somatic depression was also significant, $B = 1.009, SE = .200, p < .001$. The interaction between anger and dysphoria predicting somatic depression was non-significant, $B = -.126, SE = .080, p = .113$.

For the interaction between anger and dysphoria predicting non-somatic depression, the direct effect of anger on non-somatic depression was not significant using alpha of .05, $B = .333, SE = .176, p = .059$. The direct effect of dysphoria on non-somatic depression was significant, $B = 1.273, SE = .236, p < .001$. The interaction between anger and dysphoria predicting non-somatic depression was non-significant, $B = .064, SE = .111, p = .562$.

Finally, for the interaction between anger and hyperarousal predicting somatic depression, the direct effect of anger on somatic depression was significant $B = .724, SE = .173, p < .001$. The direct effect of hyperarousal on somatic depression was also significant, $B = .554, SE = .175, p = .002$. The interaction between anger and

hyperarousal predicting somatic depression was not significant at the .05 level for alpha,

$B = -.210$, $SE = .117$, $p = .073$.

Chapter IV

Discussion

Summary of Results

The results from CFAs indicate that the *DSM-5* emotional numbing model has superior fit to the dysphoria model; this is consistent with two early studies thus far using *DSM-5* PTSD measures (Contractor et al., 2014; Elhai, Miller, et al., 2012); a third study found more support for the dysphoria model (Miller et al., 2013). Results from moderation analyses indicate that anger is not a significant moderator of the relationship between PTSD's dysphoria factor and either somatic or non-somatic depression, or between PTSD's arousal factor and somatic depression. However, the majority of the direct effects were significant, implying that a relationship between anger and depression and anger and PTSD exists, independently. Despite non-significant moderation results, this study has several important clinical and research implications, discussed below.

Implications

In comparing the dysphoria model against the *DSM-5* emotional numbing model, the numbing model demonstrated superior fit, consistent with the hypotheses and previous research. These two models share all the same individual symptoms. However, the placement of irritability, sleep difficulty, concentration difficulty and recklessness symptoms in either the dysphoria factor or arousal factor is what distinguishes them. Given the criticism of PTSD in *DSM-IV-TR*, and the superior fit of the *DSM-5* model, these early results with *DSM-5* data results suggest that the current conceptualization of PTSD in *DSM-5* is precise. Hopefully with a more precise understanding of PTSD's

factor structure, there will be more clarity regarding the psychopathology and nosology of PTSD.

Within the *DSM-IV* conceptualization of PTSD, prior results from the literature were mixed in regard to the superiority of the dysphoria versus emotional numbing model, although the meta-analysis conducted by Yufik and Simms (2010) demonstrated that the dysphoria model had superior fit. The dysphoria factor seems to contribute significantly to the heterogeneity of PTSD. For example, it is the dysphoria factor that is often strongly related to other mood and anxiety disorders (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013; Elklit, Armour, & Shevlin, 2010). The model itself is based on the notion of a distress and dysphoria component that underlies mood and anxiety disorder. Although this model was not utilized for PTSD in *DSM-5*, including PTSD's dysphoria symptoms goes against the original intention of PTSD in DSM-III being a "pure" diagnosis (Spitzer et al., 2007). Additionally, PTSD was moved from the mood and anxiety categorization into its own category of trauma and stressor-related disorders. While the removal of PTSD from the mood and anxiety disorders and the utilization of the emotional numbing model may appear to facilitate a more accurate representation of PTSD, including dysphoria symptoms may cloud PTSD's conceptualization.

Moderation Analyses: Implications

Although the moderation results were non-significant, the results are nonetheless informative. Empirical research demonstrates that there is a relationship between PTSD, depression and anger. In accord with the present results, perhaps this relationship is not best explained via moderation. For example, the direct effects indicate that anger and

dysphoria are related to somatic depression, which is consistent with similar prior research findings (Hellmuth et al., 2012; Raab et al., 2013).

Furthermore, similar to prior empiricism (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013; Contractor et al., 2014; Elhai, Contractor, et al., 2011) dysphoria was directly related to somatic depression and non-somatic depression. Hyperarousal was also directly related to somatic depression, which is consistent with prior research (Biehn, Contractor, Elhai, Tamburrino, Fine, Prescott, Shirley, Chan, Slembarski, Liberzon, et al., 2013). Most of the aforementioned studies examined these relationships using Wald tests to compare correlations between factors. What the results of this study and others may suggest is that although there are direct relationships between the factors of PTSD with depression and anger independently, an interconnected relationship may not exist between the three variables.

Although anger did not significantly moderate the relationship between the specified factors of PTSD and depression, the results are informative regarding anger as a construct. For example, because anger did not significantly moderate the relationship between PTSD's hyperarousal factor (for which anger is a symptom) and depression's somatic factor (which consists of emotional/affective symptoms), this could imply that anger truly is a unique additional side effect of trauma exposure that is not captured perfectly within a PTSD or major depression diagnosis. The direct effect of anger on somatic depression (which represents physical manifestations of depression) may suggest that anger, as measured by the DAR-5, represents anger directed outward as an externalizing symptom.

Limitations

The present study is not without limitations. More exhaustive investigations of PTSD are presently underway. Recently there have been five (Elhai, Biehn, et al., 2011) and six factor models of PTSD (Liu et al., 2014) proposed and the present study only compared two four factor models. A more thorough investigation of the aforementioned models may be more informative. These models are in the very early stages of development and thus were not used presently. This was not statistically possible in the present study given the current sample size. Additionally, replicating these results in clinical samples would be beneficial considering the factor structure of PTSD is used for clinical and diagnostic purposes as well as research and statistical purposes. Knowing that these results hold true in clinical populations is imperative.

In regard to the moderation analyses, the present study utilized latent variables to investigate these hypotheses. Although this is a more precise measurement of these variables, the analyses were conducted treating the variables continuously instead of categorically. This statistical drawback could have affected the results being non-significant. Prior research that investigated the relationship between PTSD, depression and anger did so via mediation analyses, albeit cross-sectionally. A replication of the present analyses using longitudinal data would be most informative.

Future Directions

Additional research on the factor structure of PTSD that could add to the existing literature would also be beneficial. Empirical investigations of the factor structure of such a heterogeneous disorder hopefully help to inform the *DSM* committee to ensure that the best representation of PTSD is being applied in subsequent revisions of the *DSM*. Future

research should continue to investigate the interrelations of PTSD, depression and anger, given the severity and high comorbidity of these constructs. The present study could be improved upon by conducting mediation analyses with longitudinal data. Utilizing a clinical population would be advantageous over a college sample. Exploring these relations using observed variables versus latent variables might produce different results as well. Additionally, one study (Vrana et al., 2009) manipulated anger in a lab experiment and demonstrated that women with PTSD (versus women without PTSD) demonstrated stronger anger and anxiety symptoms in reaction to a relived anger. Conducting a similar study, potentially utilizing PTSD factors and other mood outcome measures (i.e. depressive symptoms) may also be informative and relevant to the present study.

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Appendix A

Demographics

Please try to answer all questions honestly and to the best of your ability.

1. What is your gender?

    ☐ Female
    ☐ Male

2. What is your current age? _____

3. How many years of schooling have you completed, starting the with first grade?

    _____

4. What is your current employment status?

    ☐ Part time
    ☐ Full time
    ☐ Retired
    ☐ Unemployed
    ☐ Unemployed student

5. What is your current relationship status?

    ☐ Single
    ☐ Living with significant other
    ☐ Married
    ☐ Divorced, separated or widowed

6. What is your ethnic background?

    ☐ Hispanic or Latino
    ☐ Not Hispanic or Latino
    ☐ Unknown

7. What is your racial background?

    ☐ Caucasian or White
    ☐ African American or Black
    ☐ Asian
    ☐ American Indian or Alaskan Native
    ☐ Native Hawaiian/other Pacific Islander
    ☐ Unknown

8. What is your current annual household income?

   ☐ Less than $15,000
   ☐ $15,000 to $29,999
   ☐ $30,000 to $44,999
   ☐ $45,000 to $59,999
   ☐ $60,000 to $74,999
   ☐ $75,000 to $89,999
   ☐ $90,000 or higher

Appendix B

Stressful Life Events Screening Questionnaire

This questionnaire asks about many different types of stressful life events. These kinds of events can be frightening or distressing to almost everyone. During your life, have any of the following events ever happened to you? (For each question, please check the answer choice that applies to you).

1. Have you ever had a life threatening illness?
   ☐ Yes
   ☐ No

2. Were you ever in a life-threatening accident?
   ☐ Yes
   ☐ No

3. Was physical force ever used against you in a robbery or mugging?
   ☐ Yes
   ☐ No

4. Has an immediate family member, romantic partner or VERY CLOSE friend died as a result of accident, homicide, or suicide?
   ☐ Yes
   ☐ No

5. When you were a child or more recently, did anyone (parent, other family member, romantic partner, stranger or someone else) ever succeed in PHYSICALLY FORCING you to have intercourse, or oral or anal sex against your wishes OR when you were in some way helpless?
   ☐ Yes
   ☐ No

6. Other than experiences described in the previous item, has anyone ever used physical force or threat to TRY to make you have intercourse, oral or anal sex, against your wishes OR when you were in some way helpless?
   ☐ Yes
   ☐ No

7. Other than experiences mentioned in the previous two items, has anyone ever ACTUALLY TOUCHED private parts of your body or made you touch theirs against your wishes, OR when you were in some way helpless?
   ☐ Yes
   ☐ No

8. When you were a child, did a parent, caregiver or other person ever slap you repeatedly, beat or otherwise attack or harm you?
   - ☐ Yes
   - ☐ No

9. Other than the experiences mentioned in the previous item, have you ever been kicked, beaten, slapped around or otherwise physically harmed by a romantic partner, date, sibling, family member, stranger or someone else?
   - ☐ Yes
   - ☐ No

10. Other than the experiences already covered, has anyone ever THREATENED you with a weapon, like a knife or gun?
    - ☐ Yes
    - ☐ No

11. Have you ever been present when another person was killed, seriously injured, or sexually or physically assaulted?
    - ☐ Yes
    - ☐ No

    If so, was it only on TV, a movie, a picture or the internet?
    - ☐ Yes
    - ☐ No

12. Have you experienced repeated or extreme exposure to gruesome or horrifying details of another person's death, serious injury, or sexual violation (for example, repeatedly witnessing body parts after a serious accident, disaster, or violent conflict; or repeatedly being exposed to the details of child abuse)?
    - ☐ Yes
    - ☐ No

    If so, was it only on TV, a movie, a picture or the internet?
    - ☐ Yes
    - ☐ No

    Was it related to your work or occupation?
    - ☐ Yes
    - ☐ No

13. Have you ever been in any other situation where you were seriously injured or your life was in danger (e.g., involved in military combat or living in a war zone)?
    - ☐ Yes
    - ☐ No

    Please describe. _____

_____

_____

14. The events listed below correspond to the stressful event items queried above. If any of these events happened to you, CHECK the *ONE* event (only 1) that HAS CAUSED YOU THE MOST DISTRESS IN THE PAST MONTH. We realize that if you experienced one (or more) of these events, they may not cause you distress now. But please select the one event that is worse than the other (even if it doesn't cause you a lot of distress). If none of these events happened to you, check "None" at the bottom of this list.

☐ Life-threatening illness

☐ Life-threatening accident

☐ Physical force/weapon used
☐ Family member/close friend died
☐ Physical force used to have sex

☐ Physical force/threat to try to have sex
☐ Childhood: Touched your body private parts

☐ Parent/caregiver physically harmed you
☐ Partner/date, etc. physically harmed you
☐ Threatened with a weapon
☐ Present when someone was killed, injured, or assaulted
☐ Repeated exposure to vivid trauma details
☐ Other situation: seriously injured/life in danger
☐ None of these events happened to me

(a) When did this event occur? (your age): _____

(b) When did this event last occur? (your age): _____

(c) Did you experience intense fear, helplessness or horror when it happened?
    ☐ Yes
    ☐ No

(d) **How much distress** (anxiety, worry, sadness, frustration, grief, anger, guilt or shame) have you felt about this event in the past month**?** (*Check the best answer*)

None happened to me	No Distress	Slight Distress	Moderate Distress	Considerable Distress	Extreme Distress

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Appendix C

Posttraumatic Stress Disorder Checklist

Instructions: Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month. Make sure to base your answers on problems that started or got worse after the event. **Please base your answers on your most distressing event you reported on the previous screen.**

The event you experienced was _____ on _____.
                                    (event)   (date)

In the past month, how much were you bothered by:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2. Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	0	1	2	3	4
4. Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	0	1	2	3	4
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	0	1	2	3	4
8. Trouble remembering important parts of the stressful experience?	0	1	2	3	4

9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	0	1	2	3	4
10. Blaming yourself or someone else strongly for the stressful experience or what happened after it?	0	1	2	3	4
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	0	1	2	3	4
12. Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13. Feeling distant or cut off from other people?	0	1	2	3	4
14. Having trouble experiencing positive feelings (for example, being unable to have loving feelings for people close to you, or feeling emotionally numb)?	0	1	2	3	4
15. Feeling irritable or angry or acting aggressively?	0	1	2	3	4
16. Taking too many risks or doing things that cause you harm?	0	1	2	3	4
17. Being "superalert" or watchful or on guard?	0	1	2	3	4
18. Feeling jumpy or easily startled?	0	1	2	3	4
19. Having difficulty concentrating?	0	1	2	3	4
20. Trouble falling or staying asleep?	0	1	2	3	4

Appendix D

The Patient Health Questionnaire

How often have you been bothered by any of the following problems in the past month?

	Not at all	Several Days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	1	2	3	4
2. Feeling down, depressed, or hopeless	1	2	3	4
3. Trouble falling or staying asleep, or sleeping too much	1	2	3	4
4. Feeling tired or having little energy	1	2	3	4
5. Poor appetite or overeating	1	2	3	4
6. Feeling bad about yourself or that you are a failure or have let yourself or your family down	1	2	3	4
7. Trouble concentrating on things, such as reading the newspaper or watching television	1	2	3	4
8. Moving or speaking so slowly that other people could have noticed. Or the opposite being so fidgety or restless that you have been moving around a lot more than usual	1	2	3	4
9. Thoughts that you would be better off dead, or of hurting yourself	1	2	3	4

Appendix E

Dimensions of Anger Reactions

Please tick the box that best describes how you feel. There are no right or wrong answers.

1. I often find myself getting angry at people or situations

☐   ☐   ☐   ☐   ☐
Not at all   A little   Moderately   A lot   Very much

2. When I got angry, I got really mad

☐   ☐   ☐   ☐   ☐
Not at all   A little   Moderately   A lot   Very much

3. When I got angry, I stayed angry

☐   ☐   ☐   ☐   ☐
Not at all   A little   Moderately   A lot   Very much

4. When I got angry at some, I wanted to hit them

☐   ☐   ☐   ☐   ☐
Not at all   A little   Moderately   A lot   Very much

5. My anger prevents me from getting along with people as well as I'd have liked to

☐   ☐   ☐   ☐   ☐
Not at all   A little   Moderately   A lot   Very much