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AN EXAMINATION OF MINDFULNESS AND COGNITIVE INTERFERENCE IN  
AMERICAN VETERANS OF THE GLOBAL WAR ON TERRORISM

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A Thesis  
Presented To  
Eastern Washington University  
Cheney, Washington

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In Partial Fulfillment of the Requirements  
for the Degree  
Master of Science in Psychology

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By  
Andrew C. Rowley  
Spring 2017

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## Abstract

AN EXAMINATION OF MINDFULNESS AND COGNITIVE INTERFERENCE IN  
AMERICAN VETERANS OF THE GLOBAL WAR ON TERRORISM

by

Andrew C. Rowley

Spring 2017

Utilizing an internet-based research protocol, PTSD symptoms, mindfulness skills, and cognitive interference were assessed. Participants completed self-report measures of PTSD symptoms and mindfulness skills, and then completed an emotional Stroop task that contained words selected to induce cognitive interference based on their combat-related nature. Consistent with past research, this study hypothesized that participants with combat-related PTSD would have longer response latencies on the task relative to participants with lower scores on a combat-related PTSD measure. This study also hypothesized that veterans in general would exhibit longer response latencies than non-veterans. This study was also hypothesized that mindfulness skills would moderate this prolonged response latency. Specifically, I expected participants with higher scores on a self-report measure of mindfulness to exhibit decreased response latency relative to those participants with similar PTSD scores and lower mindfulness scores. These three hypotheses were not supported in the present study. Limitations of the study and implications for future research are also discussed.

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## An Examination of Mindfulness and Cognitive Interference in American Veterans of the Global War on Terrorism

When veterans of the United States Armed Forces return home from service in a war zone, sometimes, they have adverse reactions to the stressors of war. When those veterans seek help for their symptoms related to military service, they get physical, psychological, and financial help from the US government in the form of service-connected disability compensation. In the eleven year period from 1999-2010, the number of veterans receiving financial compensation from the US Department of Veterans Affairs (VA) for Posttraumatic Stress Disorder (PTSD) as a result of their service increased by 222% (Marx & Holowka, 2011). In a study of 138 professionals who work for the VA, Jackson et al. (2011) found that 25% of those professionals believed that many veterans who were seeking monetary disability compensation for their PTSD symptoms were exaggerating those symptoms. Another 25% in the same study believed that many of those veterans who were seeking compensation were underreporting their symptoms. In that same study, 59% of those mental health professionals reported that they rarely or never used any tests to diagnose PTSD and only 41% believed that testing was necessary in order to diagnose PTSD (Jackson et al., 2011). With so many professionals who do not believe that their current methods are valid and so many veterans reportedly feigning PTSD or consciously avoiding a diagnosis of PTSD and missing out on much needed help due to the face-valid nature of many of the current diagnostic tests for PTSD, it is apparent that more standardized procedures and less face-valid measures of PTSD symptomatology are needed. With the above in mind, it may be useful to examine the possibility of a more objective, less face-valid measure of PTSD symptoms to add to the repertoire of professionals who regularly diagnose and treat PTSD in combat veterans as well as other people who have survived a

potentially traumatic event. There is a growing body of research into cognitive interference that could prove useful in helping these professionals diagnose cases of PTSD that may otherwise go undiagnosed and to determine if individuals may be exaggerating their symptoms in order to benefit from secondary gains. The Emotional Stroop Effect has been studied with rape survivors (Foa et al., 1991), individual diagnosed with ADHD (dos santos Assef, Capovilla, and Capovilla, 2007), generalized social anxiety disorder (Dalrymple and Herbert, 2007), eating disorders (Jones-Chesters, Monsell, and Cooper, 1998), and veterans of the Vietnam War with PTSD (Mcnally, English, and Lipke, 1993). The purpose of this study was to expand on this growing body of research by examining the relationship between cognitive interference and combat-related PTSD in American veterans of the wars in Iraq and Afghanistan. This study also hoped to expand on the hypothesis that mindfulness, an important component of some trauma therapies, might help moderate cognitive interference in veterans with combat-related PTSD, which might show that those therapies may help increase attentional control and decrease some of the symptoms of PTSD.

### **Post-Traumatic Stress Disorder (PTSD)**

*The Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition) [DSM-5]*, American Psychiatric Association [APA], 2013) classifies Posttraumatic Stress Disorder (PTSD) as a Trauma- and Stressor-Related Disorder. This classification means that PTSD is a result of a dysfunctional response to a traumatic event or a series of traumatic events. There are eight different criteria that contribute to the diagnosis of PTSD and are applicable to anyone six years old or older.

The first of these diagnostic criteria is that (A) a person be exposed death, real or a perceived threat of death, serious injury, or violence of a sexual nature in at least one of the



following ways: (1) experiencing the event(s) for themselves, (2) watching the event(s) first-hand as it occurred to other people, (3) discovering that a friend or close family member has been killed, or almost killed, as long as their death, or near death, was violent and/or accidental in nature, and (4) having to endure repeated and/or extreme exposure to the aversive details of that traumatic event(s), as long as these exposures occur in the carrying out of one's job (e.g., a doctor repeatedly watching patients expire in the emergency department of a hospital).

The second criterion in the diagnosis of PTSD is (B) The presence of at least one of five intrusion symptoms that are relevant to and did not begin until after the traumatic event(s). These symptoms include the following: (1) Distressing memories of the traumatic event(s) that are involuntary, recurrent, and intrusive, (2) Dreams with content relevant to the event(s) that are both distressing and recurrent, (3) Dissociative reactions during which individuals may be unable to maintain awareness of their surroundings due to "flashbacks" of the traumatic event(s) during which they feel as though they are actually re-experiencing the event(s), (4) when exposed to internal or external cues that remind them of their traumatic events, individuals experience prolonged or intense psychological distress, and (5) obvious physiological reactions to some of the same internal or external cues described above.

The third criterion (C) involves persistent avoidance of stimuli that may remind an individual of their traumatic event(s). This avoidance may happen in the form of (1) cognitive avoidance, or avoiding internal cues such as thoughts, memories, and/or emotions regarding the traumatic event(s). The other manner of avoidance is (2) avoiding the external cues such as people, places, or things that may evoke disturbing and intrusive thoughts, memories, and/or feelings regarding the traumatic event(s).

The fourth criterion for diagnosis of PTSD is (D) a negative change in mood or thought patterns relating to the traumatic event(s) which begin or get worse after the trauma. In order to meet this criterion, these negative changes in thoughts and/or mood need to occur in at least two of the following seven ways: (1) a decreased ability to remember important aspects of their specific trauma that is not due to a head injury, alcohol use, or drug use but rather, is usually due to a dissociative amnesia; (2) persistent and exaggerated negative beliefs about themselves, those people around them, and the world in general; (3) Lasting thoughts about the cause of the traumatic event(s) leading to the sufferer believing that they are the cause of the event(s); (4) Persistent feelings of negative mood (e.g., depression, anger, guilt, fear, or shame); (5) significantly less interest in activities that they used to enjoy; (6) feeling detached or estranged from family, friends, or acquaintances; (7) lasting inability to experience emotions usually considered to be positive (e.g., unable to feel love, happiness, or pride).

The fifth criterion (E) involves increased reactivity and arousal that begins or gets worse after the traumatic event(s) and a diagnosis also requires the individual experiencing at least two of the following symptoms: (1) Irritability and anger outbursts with no or almost no provocation that are usually expressed as physical or verbal aggression directed toward someone or something, (2) reckless or self-destructive behavior, (3) hypervigilance, (4) an exaggerated startle response, (5) difficulty concentrating (6) a sleep disturbance experienced as having difficulty falling or staying asleep and/or not getting restful sleep.

The sixth criterion (F) relates to the duration of the individual experiencing criteria B, C, D, and E for at least one month as part of the requirement for a diagnosis of PTSD.

The seventh criterion (G) requires that the disturbance of criteria B, C, D, and E causes clinically significant distress or difficulties functioning in social, work, and/or other areas of an individual's life.

The eighth criterion (H) states that any of the above criteria cannot be attributable to substance abuse or any other medical condition. This ensures that the distress that leads to a diagnosis of PTSD is actually caused by the traumatic experience and not illicit, or any other, substance use.

An interesting aspect of the DSM-5 (APA, 2013) diagnosis of PTSD is that an individual suffering from PTSD may also have dissociative symptoms as a part of their response to the traumatic events. These dissociative symptoms must be in response to the stressor or, traumatic event(s), and must also be recurrent or persistent. They can include either (1) depersonalization or (2) derealization. Depersonalization is the experience of feeling outside of or observing one's own body or thought processes from the outside. Derealization is a persistent or recurrent experience of the world around oneself feeling surreal, distorted, or like a dream. This specifier requires that the dissociative symptoms cannot be attributed to substance use or any other medical condition.

Another interesting specifier in the DSM-5 (APA, 2013) diagnosis of PTSD is the delayed expression specifier. This specifier is used if diagnostic criteria are not fully met until six months or longer after the traumatic event(s). Some of the individual's symptoms may occur immediately following the traumatic event while other symptoms may take six months or longer to affect the individual (APA, 2013). Some of the many traumatic events that may lead to the development of PTSD include, but are not limited to the following events: rape or other sexual assault; auto accidents; being the victim of armed robbery; being in an abusive relationship;

natural disasters such as hurricanes, earthquakes, or tornadoes; wars, or any other event that may be interpreted as being traumatic to the person experiencing it. These traumatic events are thought to result in more severe and enduring PTSD if they are of human design or perpetrated by another person or group of people (APA, 2013). The focus of the present study is criterion B (4); the intrusive recollections of the traumatic event. This criterion is the focus because the intrusive recollections are related to attentional control and cognitive interference.

### **Combat-related PTSD**

One population in which PTSD is becoming increasingly prevalent is in combat veterans. Veterans of wars have been suffering from PTSD since psychiatric disorders have been recognized and treated by health professionals. Some even believe that PTSD has been described in documents dating as far back in history as 4000 years ago. In an analysis of ancient cuneiform tablets dating to 2094 B.C., Ben-Ezra (2004) compares the description of the death of King Urnamma in 2094 B.C. and the destruction of the city of Ur in 2003 B.C. and the subsequent reactions to these traumatic events to the diagnostic criteria for Acute Stress Disorder (ASD) in the *Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition)* [DSM-IV], American Psychiatric Association [APA], 1994). For the purposes of this paper, only wars dating back to the civil war are discussed. Soldiers returning home from wars in the past have been described as having Soldier's Heart, Shell-Shock, Combat Fatigue, Operational Fatigue, etc. Though the name has changed throughout its history; the causes and symptoms of PTSD have changed relatively little—except among combat veterans. Combat veterans have been exposed to some of the worst atrocities perpetrated by humans throughout history. Technological advances and the changing nature of war have made the stress of military combat even greater as time goes by. In their review of PTSD, Javidi and Yadollahie (2012) discuss the rapid advancement of

technology and tactics that occurred during World War I (WWI) and how it added a surreal sense of impending doom for the soldiers fighting against machines that had never been seen before. This sort of impending doom is a key feature in the development of PTSD. After the Civil War, veterans returning home were thought to be suffering from Soldier's Heart. When soldiers returning home from WWI presented with similar symptoms, they were described as having Shell-Shock. Veterans of World War II (WWII) and survivors of the bombings of Hiroshima and Nagasaki who also had these symptoms were diagnosed with Combat Neurosis, Operational Fatigue, or Combat Fatigue (Javidi & Yadollahie, 2012). Although combat veterans have been suffering from similar symptoms since wars have been fought, the current diagnosis of PTSD did not become officially recognized until 1980, in the third rendition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III; APA, 1980)*. It was these same symptoms in veterans of the Vietnam War that prompted the formalizing of a diagnosis and researching more effective treatments to deal with the burgeoning increase in sufferers of PTSD. The increase in diagnoses during the 1980s in America prompted Congress to commission a study to examine the prevalence rates of PTSD among these veterans and in 1988 the results from this study were released [*The National Vietnam Veterans Readjustment Study (NVVRS); Kulka et al., 1990*]. Although the results of this study have been the subject of much controversy (e.g., see Dohrenwend et al., 2007 and Schlenger et al., 2007), it is still considered by many to be the defining study of PTSD in combat veterans to date. The prevalence rates reported by Kulka et al. (1990) indicate that as many as 30.9% of combat veterans of the Vietnam War suffer from PTSD. The rates of combat-related PTSD in veterans of the wars in Iraq [Operations Iraqi Freedom (OIF) and New Dawn (OND)] and Afghanistan [Operation Enduring Freedom (OEF)] may be closer to 40% (Afari et al., 2009). Another study by Helmer et al. (2007) found

prevalence rates of up to 48% and 35% of Reserve and Active Duty service members, respectively, returning from the wars in Iraq and Afghanistan. When compared to community samples that are closer to 8.7% with a lifetime risk of developing PTSD (as diagnosed using DSM-5 criteria). When comparing these prevalence rates, it becomes apparent that there is a need to investigate combat-related PTSD more in-depth. When faced with such drastically increasing rates of PTSD in veterans of OIF, OND, and OEF relative to veterans of the Vietnam War; the importance of this line of research becomes even more apparent—especially with regard to these recent war veterans.

### **Neuropsychological Effects of PTSD**

Among the many psychological and social effects that PTSD has on individuals who suffer from the disorder, PTSD has also been shown to influence the structure and functions in their neuroanatomy. Some of these structural changes have been found largely in the limbic system, such as decreased volume in the hippocampus (Bremner et al., 1995), decreased functioning in the anterior cingulate cortex (ACC; Woodward et al., 2006), increased activity in the amygdala (Rauch et al., 2000), and a decrease in activation in the frontal-executive region (Matsuo, et al., 2003). It is this hypofrontality discussed in the Matsuo et al. (2003) study that may affect attention in individuals with PTSD. The frontal lobe of the brain has long been thought to be involved in attentional control, and hypofrontality has been linked to decreased efficiency or effectiveness of individuals with PTSD to control or maintain their attention when presented with stimuli that are relevant to their PTSD. This ability to control or maintain attention is often affected by what cognitive psychologists refer to as cognitive interference, also termed, Stroop interference (McNally, Kaspi, Reimann, & Zeitlin, 1990).

### **Cognitive Interference Theory and PTSD**

Cognitive theories of the development and maintenance of PTSD posit that when a individuals experience a traumatic event and consequently develop PTSD, they become hypervigilant, or more sensitive to stimuli that evoke memories of the trauma (Williams, Mathews, & Macleod, 1996). Cognitive researchers have termed this sensitivity cognitive bias, the emotional Stroop effect, cognitive interference, and other names. For the purposes of this study, the term “cognitive interference” will be used to describe this phenomenon. This cognitive interference is thought to be the hallmark of PTSD symptomatology (McNally, Kaspi, Reimann, & Zeitlin, 1990). Cognitive interference refers to the intrusive thoughts that the DSM-5 (APA, 2013) describes in Criterion (B) of the diagnostic criteria for PTSD. In their review of research, Williams et al. (1996) discussed this cognitive interference as it had been studied in the past, offered some explanations of why cognitive interference occurs in psychopathology, and discussed some of the possible causes and mechanisms underlying this phenomenon. Williams et al. (1996) describe the parallel distributed processing model of cognition presented by Cohen et al. (1990) as one in which the instruction of a participant to name the color of a word may be overridden by the emotional salience of a word related to a person’s specific psychopathology. For example, if a person is instructed to name the color of ink that the word “spider” is written in, and the individual has a spider phobia, the emotional salience of the word “spider” will capture more attentional resources than the instruction to name the color of the word resulting in a longer response time to name the color than a person who did not have a spider phobia.

The cognitive task used in most studies of cognitive interference is a modified version of the original work of J. Ridley Stroop (1935). In his studies of serial verbal reactions and interference, Stroop (1935) found that when participants were asked to name the color that words were written in, they took longer that when asked to name the color of Xs. He also found that

when this task was complicated further by asking the participants to name the color that a color word was written in, this effect was compounded. An example of this is asking a participant to name the color of the word “BLUE” written in red ink. Stroop postulated that this is owing to the fact that the natural tendency is to read the word rather than to name the color of the ink (Stroop, 1935). The Stroop paradigm (or Stroop effect), as this phenomenon has been labeled by cognitive researchers, is the most researched method of measuring cognitive interference (MacLeod, 1992) and for this reason, the “Stroop effect” should be examined as a possible alternative to the self-report measures currently used to assess combat-related PTSD. These self-report measures are very face-valid and allow for individuals seeking compensation to exaggerate, feign, or even malingering their PTSD symptoms easily (McNally et al., 1993). This malingering burdens an already overwhelmed system and uses valuable resources that could help individuals who genuinely need the help.

According to Bryant and Harvey (1995), individuals who are diagnosed with PTSD have exaggerated response latencies when identifying the color of a word when that word is threatening or salient to the traumatic event that caused their PTSD. For example, a person with PTSD resulting from a car accident may be more likely to have a longer response time identifying the color of a word such as “CRASH” than a word such as “CLOUD”. This exaggerated response latency is thought to be caused by more difficulty controlling their attention to the primary task (color identification) due to the intrusive nature of the thoughts and/or memories that the word “CRASH” brought to their mind.

Past research investigating cognitive interference in individuals with PTSD resulting from exposure to traumatic events, such as the Vietnam War (McNally, et al., 1990; McNally, English, & Lipke, 1993) and rape (Foa, Feske, Murdock, Kozak, & McCarthy, 1991), has found



that people who suffer from PTSD have been found to demonstrate more cognitive interference than controls who do not suffer from PTSD when presented with emotionally salient stimuli. For example, Foa et al. (1991) examined response latencies on a Stroop test in a sample consisting of female rape survivors with PTSD, female rape survivors without PTSD, and female controls with no history of sexual assault. The Stroop test that Foa et al. used consisted of four word types: Specific threat (e.g. RAPE), general threat (e.g. COFFIN), neutral words (e.g. GRAPE), and non-words (e.g. SCROAM). The target words were each randomized to appear in three of the following colors: orange, green, red, blue, or white. The researchers restricted the presentation of the stimuli such that words were not allowed to immediately repeat. Foa et al. (1991) found that only rape survivors who met criteria for a diagnosis of PTSD exhibited exaggerated response latencies on the rape-related words relative to other word types and groups. One interesting result from this study was that the PTSD group also exhibited an exaggerated response latency for the “neutral” word GRAPE and that the response time for GRAPE was similar to the threat word RAPE, when they examined the response latencies on individual words for each group. This result was interesting due to the similarity between the two words. While they did not elaborate on this similarity, it could be that the closeness of spelling between the two words may have made GRAPE a less neutral word for rape survivors in this study. This study supported past research by showing exaggerated response latencies on an emotional Stroop test when the words were relevant to the participants’ specific trauma.

When looking at the prevalence rates of PTSD among combat veterans, veterans of OIF, OND, and OEF are seemingly suffering higher rates of PTSD than veterans of the Vietnam War (Afari et al., 2009; Helmer et al., 2007) and yet this population of combat veterans has previously gone understudied with regard to cognitive interference and PTSD. Only two recent studies

could be found that investigated cognitive interference in combat veterans from OIF and OEF. In an unpublished dissertation, Craig (2006) investigated the relationship between cognitive interference and PTSD in American veterans of the wars in Iraq and Afghanistan. That study did not find statistically significant differences in performance on a Stroop task (not emotional Stroop task). In the dissertation, Craig suggested that her results are likely due to the small sample size. Another possible explanation is that Craig (2006) did not utilize the emotional Stroop task, in which the participants also name the color of ink in which words that are related to their psychological dysfunction are written.

Previously mentioned studies have utilized the emotional Stroop task and found that the participants with PTSD and other anxiety disorders have prolonged response latencies when the task is color naming of threat-related words. Craig (2006) did not explain why she chose to use a standard Stroop task in her study as opposed to the emotional Stroop task despite the fact that she mentioned that previous studies examining combat-related PTSD and performance on the Stroop test (e.g., McNally, English, & Lipke, 1993) did utilize the emotional variation of the Stroop test. The present study hopes to expand on Craig's (2006) study by using the emotional Stroop Task to examine cognitive interference caused by PTSD symptomatology and an internet-based protocol to gather a larger sample size, expedite the time required for the tests, and to measure response latencies by timing each stimulus to the thousandth of a second.

The second study found to examine the relationship between combat-related PTSD and cognitive interference in OIF/OND/OEF veterans utilizing the Stroop task, was conducted by Constans, et al. (2014). In their study of the emotional Stroop effect, the researchers examined a sample of 124 veterans who recently served in operations OIF or OEF. The participants in that study were given a modified Stroop task consisting of three types of words: Neutral words

(microwave, dishwasher, chair, etc.), social threat words (pathetic, stupid, scorn, etc.), and words relevant to deployment in OIF/OEF (IED, firefight, desert, etc.). The participants' responses were given by voice and measured for accuracy and response latency individually. They found that those participants in their sample of combat veterans who demonstrated an over-reporting bias, as measured by the Miller Forensic Assessment of Symptoms ([M-FAST]; Miller, 2001), also demonstrated an augmented response latency when presented with "threat" words relevant to their report of combat-related PTSD (Constans, et al., 2014). This lack of a difference between response times in over-reporters and those with a more neutral reporting style is counter to the idea that modified or emotional Stroop task might help more difficult to feign due to the automatic and, therefore, more objective, nature of the responses and does not support past research.

McNally et al. (1990) examined the relationship between cognitive interference and combat-related PTSD in a sample of 15 Vietnam War veterans diagnosed with PTSD and 15 controls who were also Vietnam War veterans but not diagnosed with PTSD. They found that the veterans who had been diagnosed with PTSD had longer response latencies on a cognitive task when the task was to identify the color of a word relating to their combat-related PTSD but not when the task was to identify the color of words that were salient to someone diagnosed with Obsessive-Compulsive Disorder (OCD), when the words in the task were not salient to any disorder (neutral), or when the words were positive in nature (McNally et al., 1990). Only threat words evoked exaggerated response latencies in the PTSD patients in their study participants. They also discussed the use of a card Stroop (1935) task and how it may not have measured the interference caused by individual words and stated that a computerized version of this test would likely provide more useful data.

In a similar study, McNally et al. (1993) administered similar cognitive tasks to 24 Vietnam War veterans at an inpatient treatment facility in the Veterans Administration (VA) healthcare system. The researchers did not use a control group consisting of individuals without PTSD in this study. Instead, they used word type as the control condition. They compared response latencies on threat words, neutral words, positive words, and words salient to someone diagnosed with OCD. In their analysis, they found that the threat word condition caused the predicted statistically significant difference in response latencies and the other word types had no statistically significant differences between them. McNally et al. (1993) also discuss the use of the Stroop (1935) test as a diagnostic tool and that it may also be used to assess the effectiveness of treatment methods. They discuss that this study shows that there is significant test-retest reliability when using the Stroop (1935) test to measure intrusive cognitions, or cognitive interference, in PTSD.

### **Cognitive Interference**

When measured by response latencies on a color naming task, cognitive interference has been found in individuals who have been diagnosed with many different forms of psychological disorders. In two different studies investigating cognitive interference in a sample of individuals with eating disorders (Channon, Hemsley, & de Silva, 1988; Jones-Chesters, Monsell, & Cooper, 1998) both found that individuals with eating disorders demonstrated cognitive interference when presented with stimuli that invoked their anxiety regarding food and/or body image. The Jones-Chesters et al. (1998) study found this effect of cognitive interference in patients with both bulimia nervosa and anorexia nervosa but not in their control sample.

Another disorder that has been shown to interfere with a person's ability to complete a cognitive task is Attention-Deficit/Hyperactivity Disorder (ADHD). In a study examining the

possibility of using the Stroop (1935) test as a tool to aid in the diagnosis of ADHD, dos santos Assef, Capovilla, and Capovilla (2007) used a computer version of the Stroop test to identify differences in attention control between individuals with ADHD and individuals without ADHD. In this study, dos santos Assef, Capovilla, and Capovilla (2007) found statistically significant differences in the response latencies on the cognitive task. Specifically, children diagnosed with ADHD took longer to complete the cognitive task. They discussed the advantages of using a computerized version of the task. They also stated that using the computerized version, as opposed to the card, or sheet versions, allows for not only measuring more accurately (in thousandths of a second), but also adds greater standardization in administration and data collection as well as adding the ability to measure the response latency for each individual stimulus rather than the average time of all stimuli on a card or sheet.

The cognitive interference in the above studies indicates a lack of attentional control, or the ability to intentionally focus one's attention. One area of promising research into attentional control is mindfulness skills.

### **Mindfulness Skills**

According to Germer, Siegel, and Fulton (2005), mindfulness is an English translation from the language of Buddhism, Pali, from 2500 years ago. The Pali word, "sati", means, "awareness, attention, and remembering" (p. 5). For Western psychologists mindfulness is a difficult construct to define operationally. It is defined many different ways by many different practitioners and scholars. Ludwig and Kabat-Zinn (2008) opined that the inability to agree upon an operationalized definition hinders the ability of researchers to compare results across studies. To operationalize the term "mindfulness", it is important to understand that mindfulness is not just a form of meditation. Germer et al. (2005) state that mindfulness can be thought of as a

construct that we measure, or as the act of attempting to bring about mindfulness (as in meditation), or mindfulness can describe the act of being mindful, or actively being aware.

The term “awareness” is a common thread throughout the different operational definitions amongst the published works regarding mindfulness. Lau and McMain (2005) discuss the importance of developing awareness in the clients and teaching them to integrate this immediate or “moment-by-moment, non-judgmental” awareness of “physical sensations, thoughts, and feelings” into their everyday lives (p. 865).

Throughout the published works, there are three basic precepts that seem to narrow down the construct of mindfulness as it pertains to psychological health. These three basic concepts are best described as (1) non-judgmental awareness of (2) one's moment-to-moment, or present, experience and (3) acceptance of this experience as valid and important (Germer et al., 2005; Kabat-Zinn, 2005, 2002; Ludwig & Kabat-Zinn, 2008). These basic precepts seem to fit well with Western psychotherapy practices and have been used along with them and studied for some time now. While there is plenty of research showing encouraging results for mindfulness as an addition to cognitive behavioral approaches to therapy for other anxiety disorders such as Social Anxiety Disorder (SAD; Dalrymple & Herbert, 2007) and Generalized Anxiety Disorder (GAD; Roemer, Orsillo, & Salters-Pedneault, 2008) the research base regarding PTSD and mindfulness is somewhat limited. One study conducted by Niles, et al., (2011) found that even a brief introduction to mindfulness in conjunction with an eight-week course of telehealth temporarily reduced PTSD symptomatology in a sample of combat veterans.

When discussing mindfulness and cognitive interference, the awareness of one's present-moment experience is an important part of the discussion. One of the teachings in mindfulness-based cognitive therapies is to intentionally regulate one's attention to their present-moment

experience (Vujanovic, Niles, Pietrefesa, Schmertz, & Potter, 2011). It is this ability to purposefully focus one's attention that may help mediate levels of cognitive interference in the current study.

One study conducted by Anderson, Lau, Segal, and Bishop (2007) examined the role of attention in mindfulness and cognitive interference in healthy adults. They found significant differences in subjective well-being between individuals who underwent Mindfulness-based Stress Reduction (MBSR) training and those who did not. However, the researchers did not find a significant relationship between mindfulness and cognitive interference. That study did not examine response times to aversive or "threat" words on the Stroop task. Instead, the words were selected by the researchers choosing 15 words total from 60 words (five words in each of three categories) that the participants identified as positive, neutral, or negative with regard to how they view themselves. The present study examined a sample of combat veterans with varying levels of PTSD symptomatology and utilized an emotional Stroop task with words selected for their relevance and salience to combat-related trauma.

Another study examined the relationship between mindfulness and cognitive interference in a sample of 28 individuals with varying levels of meditation experience from one month to 29 years (Ortner, Kilner, & Zelazo, 2007). The researchers found a significantly lower amount of cognitive interference in participants who were more experienced in mindfulness meditation. The authors speculate that this lower level of interference lies in the ability of people with more mindfulness skills to attend more to the task at hand. Emotional distracters tend to reduce cognitive efficiency by drawing on precious attentional resources that would otherwise be used to accomplish a given task. In comparison, a more mindful approach would be to attend more to the task at hand and allow for more efficient cognitive functioning (Ortner et al., 2007).

According to this explanation, it is reasonable to expect that participants in the present study with higher scores on a measure of mindfulness will tend to have faster responses on a Stroop task.

### **Present Study**

The purposes of this study were to replicate past findings with regard to the emotional Stroop effect seen in other samples and to make the improvements discussed above in the hopes of further advancing the study of cognitive interference. Given the above research, it was hypothesized that higher scores on a measure of PTSD would correlate with longer response latency with emotionally salient words. It was also hypothesized that veterans would have longer response latencies on an emotional Stroop task when confronted with a word that induced some cognitive interference in them by its combat-related nature than non-veterans. Lastly, it was hypothesized that scores on a mindfulness measure would moderate the effects of response latencies between the groups.

## **Method**

### **Participants**

Twenty veterans of the US Armed Forces and 88 non-veteran civilians participated in the current study. Participants were recruited through a flyer posted at a Department of Veterans Affairs outpatient counseling clinic as well as from a regional university in the Pacific Northwest. The veterans in the current study ( $n = 20$ ) consisted of 15 males and 5 females. Eighteen of those veterans self-identified as being Caucasian (not Latino/a), one self-identified as Asian/Asian-American, and one self-identified as being of “other” ethnicity. Ages of the veteran sample ranged from 40 to 67 years old ( $M = 40.57$ ,  $SD = 15.43$ ). Of the veterans who participated in the study, 8 served in the Army, 1 in the Marine Corps, 7 in the Air Force, 4 served in the Navy, and 1 served in the Coast Guard. Fifteen of the veterans deployed to a



combat zone, and five did not. Of the 15 veterans who deployed to a combat zone, 12 were engaged in direct or indirect fire combat during their deployment, and three were not.

A control sample of non-veterans ( $n = 88$ ) were recruited from a population of university undergraduate students recruited through the same method and in the same psychology department of the same university used to recruit the sample of veterans. Twenty-two of the non-veteran civilians were males and 66 were females. Of those who were not veterans, 62 self-identified as being Caucasian, 3 self-identified as black, 10 self-identified as being Latino/a, 5 self-identified as Asian/Asian-American, 7 self-identified as being of other ethnic background, and 1 chose not to respond. The age range of the non-veteran sample was from 18 to 32 years old ( $M = 21.66$ ,  $SD = 2.96$ ). The undergraduate non-veteran sample were also assessed for PTSD symptoms and separated according to their varying levels of PTSD symptomatology as well. Undergraduate participants were compensated with extra credit in an undergraduate psychology course whether they were veterans or not. Veterans outside the department of Psychology were encouraged to participate by informing them that this study will help to increase researchers' knowledge into certain aspects of combat-related trauma but were not compensated for their participation. All participants were reassured that the results from this study would not be able to identify them personally and that all results would remain anonymous. Veterans recruited at the Veteran's Administration outpatient clinic were informed that their participation in the study was completely separate from any treatment that they may or may not be receiving at the clinic and would not be included in their treatment records, nor used in any compensation claims.

## Materials

### PCL

The PTSD Checklist (PCL) was developed by the National Center for PTSD and is frequently used by the US Department of Veterans Affairs to assess levels of PTSD symptomatology [PTSD Checklist-Military or Civilian (PCL-M or PCL-C); Weathers, Litz, Herman, Huska, & Keane, 1993]. Items on this checklist follow criteria of Posttraumatic Stress Disorder (PTSD) in the DSM IV-TR (APA, 2000). The PCL has been shown to be a reliable and valid measure of PTSD symptoms and to be useful as a screening tool for PTSD symptomatology, as noted by Wilkins, Lang, and Norman, (2011) in their meta-analysis of all three measures, including the PCL-M, the PCL-C, and the PCL Specific or, PCL-S. It is a 17-item Likert-type self-report questionnaire. The responses are rated from 1 (not at all) to 5 (extremely) and describe how the respondent has been bothered by the particular symptom described by the questions in the last month. Scores range from 17 to 85—17 being the least likely to have PTSD and 85 being very likely diagnosable with PTSD. Keeping in mind that a formal diagnosis requires more than a self-report questionnaire, Weathers and his colleagues (1993) found that the PCL had good diagnostic utility with a cutoff score of 50 indicating a likely diagnosis of PTSD. Internal consistency (Cronbach's alpha) has been found to range between .94 (Blanchard et al, 1996) to .97 (Weathers et al., 1993). Test-retest reliability has been found to be as high as .96 at 2-3 days and as high as .88 at 1 week (Blanchard et al., 1996; Ruggiero et al., 2003). The PCL correlates positively with the Mississippi PTSD Scale with convergent validity of between .85 and .93 (Weathers et al, 1993). Strong positive correlations have also been found with MMPI-2 Keane PTSD Scale (.77), Impact of Event Scale (IES) (.77-.90) and with the Clinician administered PTSD Scale [.92; (CAPS) Blanchard et. al., 1996].

While the PCL-5, which aligns more closely with the diagnostic criteria in *The Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013) (PCL-5; Weathers, et al., 2013), has been published, Dickstein, et al. (2015) recommend using the PCL for DSM-IV in research with service members and veterans who deployed to OIF/OEF/OND and have been diagnosed under the DSM-IV criteria. They also recommend using the PCL until further research is conducted using the PCL-5 and a greater body of research regarding the psychometric properties of the measure is available (Dickstein et al., 2015). It is also important to note that the present study is focusing on criterion B (1), or the intrusive thoughts and memories, and criterion B (4), or the intense psychological reaction to stimuli that remind the individuals of those traumatic memories. These criteria have not changed significantly from the *DSM-IV-TR* to the *DSM-5*. This further justifies the use of the PCL rather than the PCL-5.

### **KIMS**

The Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004) is a 39 item self-report measure of mindfulness skills. The responses are Likert-type and range from 1 (Never or very rarely true) to 5 (Very often or always true). The respondents are instructed to rate each of the statements based on what is generally true for them. The statements address the four facets of mindfulness measured by the KIMS: Observe; (“I notice changes in my body, such as whether my breathing slows down or speeds up.”); Describe; (“I’m good at finding the words to describe my feelings.”); Act With Awareness; (“When I do things, my mind wanders off and I’m easily distracted.”); and Accept Without Judgement; (“I criticize myself for having irrational or inappropriate emotions”). The KIMS is a reliable measure as reported by Baer, Smith, and Allen (2004) with test–retest reliability for each of the four subscales of Observe, Describe, Act

with Awareness, and Accept without Judgement having correlations as high as .65, .81, .86, and .83, respectively. The researchers state that, as mindfulness is a relatively new and difficult-to-define construct, it was difficult for them to correlate the KIMS with other measures of mindfulness because none were published in 2004, when they were developing the KIMS.

### **Modified Stroop Test**

The Stroop test that was used in this study was designed by the researchers to be used on Qualtrics.com. Participants were instructed to identify the color in which a word presented on screen is written. Responses were entered by clicking a radio button on the left-hand side of the screen indicating which color the respondents answered. The order of the respective radio buttons used to indicate color choice responses were randomized by the survey software in order to help control for learning effects. Once their selection was made, the screen advanced automatically to the next stimulus. The task began with a familiarization screen with an example of a stimulus and clear instructions. The next portion of the task was to name the color of words (e.g., the word “RED” presented in blue ink). The visual stimuli included neutral words (Sink, Table, Paper, and Flowerpot), color words (Blue, Red, Green, and Orange), and combat-related words (Rifle, Bomb, Blood, and Terrorist). The stimuli were each selected to match one stimulus from each of the other categories for number of letters in each word. Each stimulus was presented one time in each of the colors (red, blue, green, and orange) in a randomized order. The neutral words were chosen to match each of the threat condition words in number of letters. The stimuli were all randomly presented in Times New Roman 36-point font in the following colors: Red, Blue, Green, and Orange. Each word was presented in each color. The instructions, “Select the color that the word below is written in as fast as you can.” were at the top of each of the presentations in a Times New Roman 12-point font in a black color. The Stroop task was

selected due to its prevalence in the previous studies regarding cognitive interference. There are no psychometric data available due to the fact that previous studies have used their own version of the test and there is no “standard” version which has been normed.

### **Procedure**

Participants used a personal computer to access a website developed by the researchers on Qualtrics.com. Once on the Web site, participants acknowledged having read the description and submitted consent by clicking on a link next to a statement that they understood the purpose of and gave their consent to participate in the study. After which, they entered demographic data. Based on their responses to demographic data participants were directed to complete questionnaires, PCL (Weathers et al., 1993) and KIMS (Baer, Smith, & Allen, 2004). These self-report measures were used because they are currently used in the identification of PTSD and the fact that there is no financial gain from this study was thought to lower the risk of over-reporting in order to secure benefits. To allow for correlational analyses of the data, PTSD symptoms, as measured by the respective PCL, were used as a continuous variable rather than to split the sample into PTSD and non-PTSD. Scores on the KIMS and the PCL-M or PCL-C (depending on veteran status) were compared to response latencies on the Stroop task (in milliseconds). Pairwise comparisons between the combat control and the combat-exposed veterans were analyzed to examine whether or not PTSD symptomatology is positively related to response times on the Stroop task.

Once the self-report measures of mindfulness skills and PTSD symptoms were completed, participants completed the emotional Stroop test and then the study was terminated and participants were thanked for their time. Participation was anonymously recorded and

undergraduates were awarded extra credit for their participation, as per usual protocols established by the Psychology department.

## Results

### Hypothesis One

Correlations were used to assess the relationship between scores on the PTSD Checklist (PCL) and response speed on the Stroop task. Scores on the PCL-M were not correlated with any of the trials of Stroop task,  $r_s < .30$ . Similarly, scores on the PCL-C were not associated with response time on this task,  $r_s < .17$ . Counter to expectations, participants with higher scores on the PTSD measure did not exhibit longer response latencies relative to those with lower scores on the PTSD measure.

### Hypothesis Two & Three

A MANCOVA was used to compare speed of response on the Stroop variables (i.e., Color words, Neutral words, and Threat words) between groups (Veterans and Non-Veterans). No difference emerged between scores on the KIMS ( $F < 1$ ), so analysis was run again removing this covariate (Tabachnick & Fidell, 2007). Age was used as a covariate given that there was a significant difference between groups [ $t(106) = 10.14, p < .001$ ]. After controlling for age, no group differences emerged for speed of response on Color words ( $F < 1$ ), Neutral words ( $F < 1$ ), or Threat words ( $F < 1$ ). Counter to hypothesis, there were no group differences in response latencies between the trials of the emotional Stroop task. In addition, mindfulness skills, as measured by the KIMS, were not a significant moderating variable. The subscales that this study specifically thought may be relevant (Observe and Act with Awareness), were also found to not be significantly related to response times on any of the trials of the Stroop task.

## Discussion

### The Present Study

Based on past research, it was hypothesized that PTSD symptoms would correlate positively with Emotional Stroop interference, or that participants with higher scores on the PTSD measures would exhibit longer response latencies relative to those with lower PTSD scores of combat-related trauma symptoms (or specific trauma in the civilian sample). Of importance to this study is that the experiencing of PTSD symptoms, not the mere exposure to a traumatic event, would result in slowed response time on an emotional Stroop test, suggesting cognitive interference. It was also hypothesized that veterans would show a slowed response time to emotionally salient combat-related words compared to non-veterans. Finally, I hypothesized that mindfulness would be a significant moderating variable.

Counter to expectations, my first hypothesis did not produce any of the significant results that were predicted. However, the present study was consistent with Craig's (2006) study in which the same predicted correlations were not observed. We believed that the use of the Emotional Stroop task would have invoked the predicted attentional biases in our sample of OIF/OEF/OND veterans whereas Craig's (2006) study did not include emotionally salient stimuli.

Four possible explanations could be influencing the lack of statistically significant results in the previous two studies and the present study. The first possible explanation as to why Craig's (2006) study and the present study were unable to replicate results found in samples of veterans of the Vietnam War could be that there is some qualitative difference between the two populations.

The second possible reason for the lack of a statistically significant difference in response latencies could be that this study did not employ a civilian-specific version of the emotional Stroop task. Using a Stroop task that is more relevant to the non-veteran sample along with a control sample of non-veterans who have not been trauma exposed as well as a trauma exposed but no-PTSD control sample could show differences within and between samples. In this way, Craig's (2006) CC model could also work with a sample of non-veterans and further distinguish between- and within-groups differences. Future research could use such a Stroop task that is more salient to a non-veteran sample along with the combat-salient version with both veterans and non-veterans to look for these possible differences.

The third possibility is that, if this study was designed in a manner similar enough to previous studies to invoke emotional Stroop interference in those individuals suffering from PTSD, the participants in this study who endorsed higher levels of PTSD symptomatology could be over-reporting their symptoms. In a review of the variance in PTSD disability compensation by state, the VA Office of the Inspector General (OIG; Department of Veterans Affairs Office of Inspector General, 2005) found that once disability ratings were increased to 100%, 39% of the 92 cases reviewed decreased mental health care visits by, on average, 82%. Some of those veterans ceased treatment altogether after their increase in payments. This disengagement in mental health services might indicate that those veterans may be over-reporting, feigning, or even malingering their self-report of PTSD symptoms in an attempt to secure financial remuneration from the VA in the form of disability compensation payments. The VA disability compensation system, while well-intentioned, is prone to feigning and even malingering due to the extremely face-valid nature of the assessments used to diagnose PTSD. In one study, Frueh, Gold, and Arellano (1997) examined 125 combat veterans from the at a Department of Veterans



Affairs (VA) inpatient treatment program. Of these 125 veterans, they examined compensation seeking (CS) veterans and non-compensation seeking (NCS) veterans. The researchers evaluated the response styles of these two groups of veterans on numerous measures of psychopathology, PTSD symptomatology, and malingering measures. On almost every single measure of psychopathology and malingering, the CS group had severely elevated scores relative to the NCS group. Some researchers have termed this tendency to exaggerate symptoms over-reporting bias (Constans et al., 2014). This over-reporting bias in the face of possible financial incentive is harmful to combat veterans who actually need the resources and psychological counseling available to this population. In light of this research, it is possible that the sample of combat veterans who participated in the present study may have been over-reporting their symptoms on the PCL—even though they were prompted that the results would not have any influence on any treatment or disability claims status.

Buckley, Galovski, Blanchard, and Hickling (2003) examined whether or not respondents could feign symptoms of PTSD and exhibit similar response latencies as individuals who actually suffer from PTSD. They enrolled six actors who had been trained by a doctoral-level psychologist and an acting coach on feigning PTSD symptoms into a study intended to develop a treatment program for PTSD. The actors enrolled covertly so that even the researchers developing the treatment program were participants. The actors were able to score similarly to actual PTSD patients on self-report measures and even convince the researcher participants that they had PTSD. However, they were unable to exhibit similar response latencies to those of actual PTSD patients enrolling in the same study. This inability of the actors to show the expected response latencies on a Stroop test supports the idea that a less face-valid measure, such as the Emotional Stroop Task, could assist in diagnosing PTSD more accurately. If enough of the

participants in the present study were feigning their self-report of symptoms on the PCL-M, they would likely be unable to demonstrate exaggerated response latencies on the Stroop task in the present study and may have decreased the effect size of those respondents who may actually have PTSD.

The present study may have failed to replicate past results due to an over-reporting bias, as described by Constans, et al., (2014). If the participants in the present study were over-reporting as the participants in the Constans et al., (2014) study, then we may have observed the same phenomenon as their study. The present study did not use a measure of response styles in order to detect over-reporting. Future research may benefit by adding in a measure to assess over-reporting of symptoms, such as the Miller Forensic Assessment of Symptoms Test ([M-FAST] Miller, 2001) or a similar measure, to determine if participants are exhibiting an over-reporting response style and if that response style may result in less statistical significance with regard to the Emotional Stroop Task.

The fourth possible explanation for the lack of any statistically significant results in the present study is that it has been discussed in one study (Kimble, Frueh, and Marks, 2009) that there is some evidence that the emotional Stroop effect does not exist. In a novel approach, Kimble, Frueh, and Marks (2009) reviewed the abstracts of unpublished dissertations as well as published studies and found that only 8% of unpublished dissertations and only 44% of published studies managed to show any statistically significant delayed reaction times on an emotional Stroop test in individuals who suffer from PTSD Kimble, Frueh, and Marks (2009). It might be that the present study supports the theory that there is no emotional Stroop effect in individuals diagnosed with PTSD.

With the present study and two previous studies of OIF and OEF veterans failing to replicate past results found with veterans of the Vietnam War, it seems to be important to discover the source of the differences between these two groups of veterans. More research into this area will be necessary in order to help identify and treat these veterans more appropriately.

As to the second hypothesis, that veterans, in general, would exhibit longer response times on the combat-related emotionally salient stimuli, our study failed to show any statistically significant differences between these two groups after controlling for age. The prediction that veterans would exhibit exaggerated response latencies on the Stroop task we used was based on the idea that veterans, in general, are taught through their training that their attentional resources should be focused on specific threats that relate to the words we used to invoke the attentional biases more than non-veterans, who do not have the same training. Though no studies could be found to support this hypothesis; it was thought that military training, by its very nature, would instill these attentional biases in order to reduce complacency and increase the likelihood of survival in military trainees. In this sense, the attentional bias to the military-specific threat cues may be adaptive while in the military and not-so much when veterans leave the military.

The third research hypothesis was that mindfulness would moderate the relationship between PTSD symptomatology and response times. Specifically, it was expected that higher scores on mindfulness would correlate with shorter response times relative to lower mindfulness scores at similar levels of PTSD symptoms. However, the analysis revealed no significant relationship between mindfulness and response latency. One difference between the present study and the Ortner et al. (2007) study is that this study employed the KIMS to measure mindfulness while their study utilized the Toronto Mindfulness Scale (TMS; Lau et al., 2006). The reason for our study employing the KIMS is that the TMSs two-factor model of curiosity

and decentering did not seem to fit our research questions as well as the KIMSs four factors of observe, describe, act with awareness, and accept without judgement. Of particular interest in the current study, were the Observe and the Act with Awareness scales of the KIMS due to the research question regarding attentional control. The results of the present study failed to find statistical significance with regard to either of these two subscales. The KIMS model also seems to fit better with the current operationalization of mindfulness described above. Another possible explanation of the difference in our results and the Ortner et al. (2007) study is that we used a different task to measure cognitive interference. That study used the Emotional Interference Task (EIT; Buodo, Sarlo, & Palomba, 2002) whereas we used the Emotional Stroop Task. The primary difference between the two tasks is that the EIT is a mixed auditory and visual task while the Stroop is a visual task. The present study utilized a visual task because it was an internet-based protocol and reduced the need for the end-user to have speakers, etc. The Stroop task has also been called “the gold standard” of attentional control measures (MacLeod, 1992) and is the most widely used measure of attentional control in the current body of research.

### **Limitations of the Present Study Implications for Future Research**

The present study had at least eight identifiable methodological shortcomings. The first and most apparent of which is a relatively small sample size. This study utilized an internet-based protocol in order to reach a larger sample size than previous studies and measure the response latencies more accurately but, did not use the capabilities of the internet to recruit from a larger sample of the population. The combat veteran sample consisted of veterans seeking assistance at a Vet Center and had a low participation rate. This low participation rate could be owing to the very passive nature of recruitment used for this study. The veterans in this study were not actively approached but, rather, were recruited with a flyer posted at the clinic. If the

recruitment were more active in nature, perhaps a larger sample with more statistical power could be garnered. The veterans in this study did have a longer mean response time but, the difference in the sizes of the non-veteran and veteran samples may have been too large to see the statistically significant differences that were expected (see figure i.). Other recruitment methods that could be used in a more active recruiting campaign include social media, getting other Vet Centers involved, and getting other centers where veterans tend to congregate (i.e., campus veteran centers, etc.). These methods could also help to reach veterans who are not treatment seeking but, who may reach a diagnostic level of PTSD symptomatology. The veterans who were recruited from the outpatient clinic were mostly treatment-seeking veterans. Some of those seeking treatment were likely also seeking compensation claims for PTSD. The fact that the results from this study would not be used to support their claims or a possible distrust of the study and the perceived possibility of the results being included in such claims may have dissuaded them from participating in the study. Future studies will have a difficult time overcoming this apprehension on the part of possible participants. Perhaps a more active method of recruiting, as discussed above, might help to overcome this apprehension if the study is discussed more in-depth with possible participants without revealing the nature and intent of the less face-valid Stroop test.

The second limitation of the present study is the fact that we did not screen for any other psychopathology in order to eliminate any participants who may not fit the research question appropriately. This was an artifact of the internet-based protocol that could be addressed in future research by simply asking a question in the demographic data that might help to eliminate any possible confounds from comorbid psychological disorders.

The third possible shortcoming is that this on-line study sacrificed the control and consistency of a laboratory environment. When completing the questionnaires wherever and whenever the participants could, they may have approached the study with less urgency or seriousness than they might have in a laboratory environment. If the study were replicated in a research laboratory set up specifically for this study, perhaps the consistency may affect some change in results. There may simply have been too many confounds involved to maintain enough consistency within the participants' experiences of the study. Future research could address this question by replicating this study in a laboratory rather than wherever and whenever participants can take the study.

The fact that the KIMS was not found to moderate the relationship between response latencies and PCL scores is the fourth area that future research could focus in order to re-test the hypothesis that more mindful people might exhibit more attentional control when faced with emotionally salient stimuli. One possible way to re-examine this question might be to use a different measure of mindfulness skills. It may be that the current study was looking at the wrong aspects of mindfulness that perhaps another measure (e.g. the TMS, Lau et al., 2006) might better capture as it did in the Ortner et al. (2007) study. Future research could also utilize more than one measure of mindfulness in order to see which of those measures may better relate to the concept of mindfulness as it relates to trauma and PTSD.

The fifth possible shortcoming that future research could address is the lack of a non-veteran Stroop test. The Stroop test can be modified to be more specific to different types of non-combat related trauma (i.e. MVA, rape, child abuse/neglect) by using threat words that are relevant to those participants who endorse surviving those specific traumatic events. If participants self-identified as being a rape survivor, they would take a Stroop test designed

specifically with rape threat words, a motor vehicle accident survivor would take a Stroop test designed using threat words relevant to auto accidents, etc. As participants endorse a specific trauma, they would then be diverted to the Stroop test most closely relevant to their specific trauma and only their trauma. This addition of more Stroop tests might help to expand the research base into the nature of attentional control difficulties in PTSD that is not combat-related.

The sixth area that future research could address is also examining the possible effects of different word types used in the modified Stroop paradigm. Foa et al. (1991) used non-words such as “narvos”, “rupe”, and “scroam” as a condition. The non-words used in the Foa et al. (1991) study closely resembled the specific threat condition. It may be useful to avoid those types of similarities and use nonsensical words instead. They also used general threat words such as “tumor”, “stress”, and “funeral” in a separate condition Foa et al. (1991). It might also be interesting to examine any possible effects that positive words such as “love”, “pretty”, or “peaceful” might induce with regard to response latencies.

The seventh possible shortcoming of this study was the lack of a measure of reporting style, or whether or not a respondent was answering truthfully, or in a socially desirable manner. Given some of the current research in this area, it seems as though the veterans in this sample who met diagnostic criteria on our measure may have been over-reporting their symptoms—if not feigning or even outright malingering. In order to address this question more in depth, a measure of malingering could be added to the materials in this study to test whether or not those veterans with extreme levels of PTSD might be demonstrating an over-reporting bias. To further examine this idea, it may be useful to add a measure of socially desirable response styles, or a Social Desirability Scale (SDS). Using such a measure may help determine if respondents are

answering questionnaires in a manner that fits with their idea of what will present them in the best light, or, in the case of compensation-seeking respondents, what will help them to receive the compensation they are seeking; i.e. veterans disability compensation. One such measure is the Marlowe-Crown Social Desirability Scale [(M-C SDS) Crowne & Marlowe, (1960)]. If respondents SDS scores were used to control for over-reporting styles, more useful information may come from their scores on measures of PTSD symptoms.

The eighth possible explanation for the lack of any reportable results in the present study is that perhaps the stimuli used in this study were not emotionally salient enough to induce cognitive interference in this sample of veterans. The stimuli were chosen due to their perceived relevance to the more recent wars by the researcher. There was no pilot testing of the stimuli words to see if they were emotionally salient enough to a sample of recent war veterans. Future research could address this by selecting words that seem relevant to the researchers and then testing those stimuli in a pilot test with a sample of veterans.

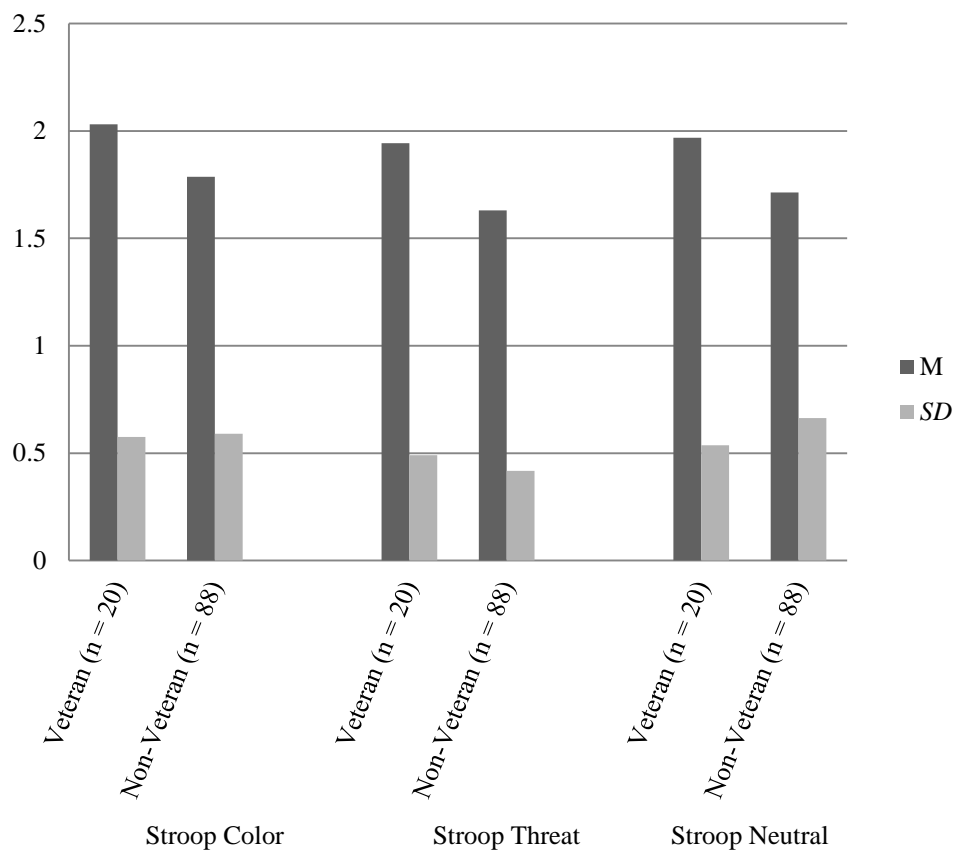
## **Conclusion**

While the present study may have failed to replicate past findings regarding PTSD and an emotional Stroop effect, or exaggerated response latencies correlating positively with increasing ratings of PTSD symptomatology, four interesting questions did come from this study. The first question is: Are face-valid measures of PTSD stretching the capabilities of the VA to help those veterans who really need their help? The second question is: Can this theory be tested without neglecting patients who may actually need this help? The third question is why are the recent war veterans not exhibiting the same cognitive interference as veterans of previous wars? It may even be that the lack of statistically significant results in this study was a result in itself. If those veterans who reported more PTSD symptoms than they actually suffer from; this could have



confounded this studies results. The fourth question is: “Does mindfulness have any relationship with cognitive interference, or should future research look into other possible moderating variables?” Only further research into these questions can help to discover a better way to diagnose and treat PTSD.

Figure i. Response Times (in seconds) by condition



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