
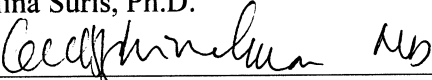
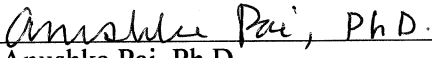



THE EFFECTS OF DEPRESSION ON HYPERTENSION IN FEMALES WITH  
MILITARY SEXUAL TRAUMA (MST)-RELATED PTSD

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## DEDICATION

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by

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### Abstract

**BACKGROUND:** Posttraumatic stress disorder (PTSD) and depression have been linked with cardiovascular disease, specifically hypertension. Additionally, PTSD and major depression independently increase the likelihood of hypertension. Military sexual trauma (MST) is also associated with greater psychiatric and cardiovascular symptom severity. Comorbid depression and PTSD have an established relationship with hypertension; however, this association has yet to be studied in female veterans with MST-related PTSD.

**SUBJECTS:** Data were used from baseline assessments of a recently published randomized clinical trial (RTC), with information from 113 female veterans with MST-related PTSD used for the present study. Only female veterans were included in the present study

**METHOD:** A retrospective electronic chart review was conducted to determine the presence or absence of hypertension. Baseline diagnosis of comorbid major depressive disorder (Structured Clinical Interview for DSM-IV), and depression symptom severity (Beck Depression Inventory-II) were used in statistical analyses to examine the relationship between depression and hypertension in the sample.

**RESULTS:** Neither comorbid major depressive disorder nor depression symptom severity were significant risk factors for hypertension in the sample. Subsequent exploratory analyses produced an expected finding that African American/Black race was associated with hypertension in our sample.

**DISCUSSION:** Providers should be aware of the risk for hypertension in female veterans with MST-related PTSD who identify as African American regardless of the presence of comorbid depression or greater depressive symptom severity. Future researchers should expand upon our

findings by examining the effect of age as well as comorbid physical health disorders (e.g., diabetes, hyperlipidemia) on hypertension in women with MST-related PTSD.

*Keywords:* PTSD, MST, hypertension, depression, female veterans

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LIST OF ABBREVIATIONS

BDI-II – The Beck Depression Inventory -II

CAPS – The Clinician Administered PTSD Scale

CPT– Cognitive Processing Therapy

DSM-IV – Diagnostic and Statistical Manual – Fourth Edition

DSM- 5– Diagnostic and Statistical Manual – Fifth Edition

MST – Military Sexual Trauma

PCT – Present-Centered Therapy

PTSD – Posttraumatic Stress Disorder

RCT – Randomized Clinical Trial

SCID – Structured Clinical Interview for DSM-IV

## **CHAPTER ONE**

### **Introduction**

Posttraumatic stress disorder (PTSD) is a psychiatric illness that can develop after a traumatic event. Relevant literature has shown a relationship between PTSD and cardiovascular disease, specifically hypertension. PTSD is associated with an increased likelihood of hypertension (Pietrzak, Goldstein, Southwick, & Grant, 2012). PTSD is also highly comorbid with major depressive disorder (Campbell et al., 2007). Additionally, PTSD has also been linked to hypertension. However, this relationship has not been researched in individuals diagnosed with PTSD.

Among individuals diagnosed with PTSD, certain clinical populations experience greater symptom severity. In particular, veterans with military sexual trauma (MST)-related PTSD report greater PTSD and depression symptom severity (Suris et al., 2013). Moreover, veterans with MST-related PTSD frequently have comorbid physical health problems including cardiovascular disease (Boscarino, 2004). It stands to reason that the additional psychological burden from comorbid major depressive disorder may increase likelihood of hypertension. However, the relationship between comorbid depression and hypertension has not been assessed in those with MST-related PTSD.

The present study only enrolled female veterans. The choice to only include data from female veterans was because gender can affect presentation of depression, PTSD, and hypertension. Because of this, we wanted to present initial data pertaining to female veterans without the confound of gender.

This paper will serve as a review of the literature regarding PTSD, MST, cardiovascular disease, hypertension, and depression. Following this, research methodology is presented to

determine the role of comorbid depression as a risk factor for hypertension in female veterans with MST-related PTSD. Appropriate analyses are subsequently conducted and implications are discussed based on these findings.

## CHAPTER TWO

### Review of the Literature

#### Posttraumatic Stress Disorder

Posttraumatic stress disorder (PTSD) is a psychiatric illness that may develop following exposure to a traumatic event. The symptoms of PTSD include persistent re-experiencing of the traumatic event, avoidance of stimuli associated with the event, and hyperarousal (American Psychiatric Association [APA], 2000).

Historically, PTSD was first introduced in the Diagnostic and Statistical Manual of Mental Disorders-III (APA, 1980). PTSD was described as a consequence of exposure to a stressor that was very severe and able to produce clinically significant symptoms. The stressor could be described as physical or psychological (Andreasan, 2010). The criteria for PTSD have evolved over time, including the definition of the stressor and what qualifies as an exposure. For example, the DSM-5 describes exposure to a stressor as: 1) directly experiencing it, 2) witnessing in person, the event occur to others, 3) learning that the traumatic event occurred to a close family member or friend, or 4) experiencing repeated or extreme exposure to aversive details of traumatic events (APA, 2013). PTSD is also no longer classified as an anxiety disorder, but it is a trauma and stress-related disorder. The diagnosis has been moved to a new chapter called “Trauma and Stress-Related Disorders.”

For the proposed study, the participants have been diagnosed using the Diagnostic and Statistical Manual of Mental Disorders-IV-Text Revision (DSM-IV-TR) (APA, 2000). To receive a PTSD diagnosis, a person must meet the following criteria:

A. The person has been exposed to a traumatic event in which both of the following were present:

(1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others.

(2) the person's response involved intense fear, helplessness, or horror.

B. The traumatic event is persistently re-experienced in one (or more) of the following ways:

(1) recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions.

(2) recurrent distressing dreams of the event.

(3) acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated).

(4) intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.

(5) physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.

C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:

(1) efforts to avoid thoughts, feelings, or conversations associated with the trauma.

(2) efforts to avoid activities, places, or people that arouse recollections of the trauma.

(3) inability to recall an important aspect of the trauma.

(4) markedly diminished interest or participation in significant activities.

(5) feeling of detachment or estrangement from others.

(6) restricted range of affect (e.g., unable to have loving feelings).

(7) sense of foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span).

D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:

(1) difficulty falling or staying asleep.

(2) irritability or outbursts of anger.

(3) difficulty concentrating.

(4) hypervigilance.

(5) exaggerated startle response.

E. Duration of the disturbance (symptoms in B, C, and D) is more than 1 month

F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning (APA, 2000, pp. 467-468).

PTSD differs from other psychiatric disorders because of the requirement of being preceded by a traumatic event. Specifically, the symptoms of PTSD have to be temporality and contextually tied to a qualifying exposure (North, Suris, Davis, & Smith, 2009).

### **Prevalence of PTSD**

Prevalence rates of PTSD vary depending on the population being studied. According to the DSM-IV-TR, there is lifetime prevalence for PTSD of approximately 8% of the adult population in the United States, (APA, 2000).

A replication of the National Comorbidity Survey results found lifetime prevalence of PTSD among adults in the United States was 6.8%. In terms of gender, lifetime prevalence for PTSD among women was 10.4% and among men was 5.0%, with women being twice as likely as men to receive a diagnosis of PTSD (Kessler, Chiu, Demler, & Walters, 2005).

Women may be more likely to be diagnosed with PTSD because of the higher instances of rape in women, as rape often results in greater perceived trauma severity, significantly increasing the likelihood of subsequently developing PTSD (Brewin, Andrews, & Valentine, 2000). As reviewed by Breslau (2002), women are approximately twice as likely as men to receive a diagnosis of PTSD following a traumatic event. She also found that symptoms of PTSD sustain for a longer period of time in women.

Within certain clinical populations, PTSD prevalence is greater. For instance, Dursa et al. (2014) examined data from the National Health Study for a New Generation of U.S. Veterans. The results showed that the prevalence of PTSD in study was 13.5% to 15.8% for OEF/OIF (Operation Enduring Freedom/Operation Iraqi Freedom) veterans and 10.9% for veterans who were not deployed. Within the population of OEF/OIF veterans, there was a higher likelihood for PTSD among Veteran Affairs health care users, African Americans, veterans who served in the Army, and those on active duty (Dursa, Reinhard, Barth, & Schneiderman, 2014). As reviewed by Gates and her colleagues, in 2012, the prevalence of PTSD in the United States military personnel, of those who have been deployed, is estimated to be about 14% to 16% (Gates et al., 2012).

PTSD is particularly prevalent among those who have served in the United States military (Gates, et al., 2012). Seal et al. (2009) examined trends and risk factors for Iraq and Afghanistan war veterans who are accessing health care of the Department of Veterans Affairs hospitals. About 36.9 % of veterans were diagnosed with a psychiatric disorder and 21. 8% were diagnosed with PTSD. They also found that PTSD prevalence rates increased four to seven times after the Iraq invasion began (Seal et al, 2009).

In 2013, Kilpatrick et al. (2013) studied the prevalence rates of PTSD and traumatic



exposure using DSM-IV-TR and DSM-5 criteria. They used a large national sample and found that DSM-5 prevalence was generally lower than DSM-IV-TR prevalence. According to Kilpatrick and his colleagues, DSM-IV-TR criteria was met, but not DSM-5 criteria because of the removal of nonviolent deaths from DSM-5 criteria, and the addition of at least one symptom of avoidance (Kilpatrick et al., 2013).

### **Negative Outcomes**

PTSD has been associated with several negative health outcomes, both psychiatric and physical. These negative health outcomes have implications for quality of life and psychosocial functioning.

***Psychiatric Consequences of PTSD.*** Many individuals diagnosed with PTSD have also been diagnosed with other psychiatric disorders. This is referred to as a psychiatric comorbidity. Common comorbidities in those who have been diagnosed with PTSD include: major depressive disorder, substance-related disorders, panic disorder, agoraphobia, obsessive- compulsive disorder, generalized anxiety disorder, and bipolar disorder (APA, 2000).

Marshall et al. (2001) studied comorbidity, impairment, and suicidality in individuals who displayed symptoms of PTSD as well as those who met full diagnostic criteria. This civilian sample was drawn from the National Anxiety Disorders Screening Day surveys conducted by health care professionals across the United States. The comorbidity rates of depressive disorder were 90.7% higher in individuals with at least four symptoms of PTSD. The comorbidity rates of anxiety disorders were 68.5% higher in these same individuals, including: obsessive- compulsive disorder, generalized anxiety disorder, social phobia, and panic disorder. The impairment rates were also 31.5% higher among individuals with at least four PTSD symptoms than no PTSD symptoms. Also, after controlling for depressive disorder, individuals with PTSD were at a

higher risk for suicidal ideation, with approximately three times the number of individuals diagnosed with PTSD reporting suicidal ideation when compared to those who reported no PTSD symptoms (Marshall et al., 2001). The results of this study suggest that comorbidity among those with PTSD and those who display PTSD symptoms common and important to understanding these individuals.

In 1995, Kessler and colleagues collected data for the National Comorbidity Survey. This study found that PTSD is strongly comorbid with other psychiatric disorders including: generalized anxiety disorder, panic disorder, phobia, major depressive disorder, dysthymia, bipolar disorder, antisocial personality disorder, and substance use disorders. Kessler, et al. (1995) also found that at least one other psychiatric disorder was present in 79.0 % of women with PTSD and 88.3 % of men with PTSD (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995).

In terms of quality of life, Pagotto et al. (2015) assessed the relationship between intensity of PTSD symptoms, presence of comorbid psychiatric conditions, and health-related quality of life. Pagotto et al. (2015) found that after controlling for psychiatric comorbidities, PTSD symptom severity negatively predicted quality of life (Pagotto et al., 2015).

***Physical Health Consequences of PTSD.*** Previous studies have demonstrated that individuals with PTSD suffer from more negative physical health consequences. For example, Sledjeski and her colleagues (2008) examined the relationship between lifetime traumas, PTSD, and chronic medical conditions. They found that participants with PTSD had the highest likelihood of chronic medical conditions, while those who did not report a trauma had the lowest risk. Also, the number of lifetime traumas was predictive of PTSD and chronic medical conditions. Regarding specific medical conditions, they found that individuals with PTSD had

the highest rates of arthritis/rheumatism, back/neck pain, headaches, chronic pain, heart disease, and ulcers, while individuals without trauma had had the lowest rates of these conditions (Sledjeski, Speisman, & Dierker, 2008). However, individuals who experienced trauma, but did not have the diagnosis of PTSD, did not have as many chronic medical illnesses, but did have medical consequences. This suggests that experiencing PTSD, rather than only an exposure to a trauma, is more predictive of negative physical health consequences (Sledjeski et al., 2008).

Vedantham et al. (2001) conducted a research study examining current health status, trauma exposure, and PTSD status of Canadian bus drivers. The group with PTSD reported more health complaints, increased use of treatments, and more unsatisfactory health ratings in comparison with the trauma exposed without PTSD group and the no trauma exposure group. The health measures did not differ between the trauma exposed without PTSD group and the not exposed group. The results of this study suggest that the diagnosis of PTSD increases the likelihood of encountering health issues and overall dissatisfaction with health (Vedantham et al., 2001).

Health perception is also affected by the severity of PTSD symptoms. Zoellner and her colleagues analyzed the relationship between PTSD severity and health perceptions in female sexual assault survivors. According to Zoellner et al. (2000), PTSD severity predicted negative physical health perception more than negative life events, anger, and depression. The results of this study also showed that symptoms related to re-experiencing the traumatic event were often associated with negative physical health perception (Zoellner, Godwin, Foa & 2000).

Another study conducted by Sareen and his colleagues in 2005 examined the relationship between physical disorders and anxiety disorders. They found that PTSD, agoraphobia, and panic attacks were all associated with physical disorders. The authors concluded that having

both an anxiety disorder and a physical disorder will likely cause increased disability (Sareen, Cox, Clara, & Gordon, 2005).

Finally, Perez et al. (2012) conducted a study to examine the role of depressive and hyperarousal symptomatology in trauma exposure and health. As hypothesized, individuals in the study who reported at least once traumatic event experienced significantly more physical health symptoms than those who did not experience traumatic events. Also, according to Perez and her colleagues, the relationship between physical health symptoms and trauma exposure was brought about by hyperarousal and depressive symptomatology (Perez, Abrams, Lopez-Martinez, & Asmundson, 2012).

### **Military Sexual Trauma**

Military sexual trauma (MST) is defined by the Veterans Health Care Act of 1992 (Public Law 102-585) as, “psychological trauma, which in the judgment of a mental health professional resulted from a physical assault of a sexual nature, battery of a sexual nature, or sexual harassment, which occurred while the veteran was serving on active duty.”

There is a large variance in the prevalence rates for MST, due to the several ways data are collected, different populations, and different definitions used for MST (Suris & Lind, 2008). Most often, MST prevalence rates will fall in between 20% and 43% (Suris & Lind, 2008). According to the National Screening for MST, conducted from 2002 through 2009, the prevalence rate for veterans who attended VA medical centers was 2.3%. The prevalence rate for female veterans was 21.9% and the rate for male veterans was 1.1%. It appears that MST prevalence rates for male veterans are lower than female veterans' rates. However, the number of men that are in the military is significantly higher than women, making the number of men and women reporting MST about the same (Suris & Smith, 2011).

### **Psychological Consequences of MST**

MST is associated with multiple psychological consequences including PTSD. For example, in 2006, Himmelfarb and her colleagues studied the associations between MST, civilian sexual trauma, and PTSD. Patients were found to experience MST with greater prevalence than either civilian sexual trauma pre- or post-service. Furthermore, they found that MST was more strongly related to PTSD than sexual trauma experienced before and after military experience. The authors concluded that those who have who experienced MST have a higher likelihood of receiving a PTSD diagnosis (Himmelfarb, Yaeger & Mintz, 2006).

In 1998, Butterfield and her colleagues studied the effect of physical and sexual assault on women in the military. The participants in this study were female veterans who filled out a questionnaire asking about trauma while attending appointments in primary care. They assessed lifetime trauma and found that approximately one-third of women reported being raped and 22% of the women reported being battered during their military service. Additionally, psychiatric comorbidity within the sample was reported as: 37% had depression, 54% had generalized anxiety disorder, 16% had panic disorder, 13% had alcohol abuse, and 49% had significant somatic complaints. They also found that women with at least one trauma during their military service had a greater likelihood of psychiatric symptoms than women whose trauma occurred outside of military service (Butterfield, McIntyre, Stechuchak, Nanda, & Bastian, 1998).

In 2009, Rowe and her colleagues studied treatment-seeking women veterans who had experienced military sexual trauma. The results of this study indicated that women who experienced MST reported more psychological symptoms than those who reported no MST. However, no significant differences were found in health behaviors between women who had experienced MST and women who did not, except for “starving.” No specific differences were

found in specific health behaviors between MST positive screens and negative screens, on bingeing, purging, starving, over-exercising, smoking, and alcohol. From the sample of those who screened positive for MST, 10.4 % reported starving behaviors versus 2.9% for those who screened negative for MST (Rowe, Gradus, Pineles, Batten & Davison, 2009).

In 2006, Yeager and her colleagues compared the rates of PTSD in women veterans who had experienced MST with rates of PTSD in women veterans with other traumas. They found that 41% of the sample had experienced MST. Looking at those who had experienced trauma, 43% of the subjects with trauma had PTSD. The women veterans who had experienced MST had increased rates of PTSD when compared to the women veterans who experienced other traumas. Therefore, MST strongly predicted a diagnosis of PTSD in this sample. (Yeager, Himmelfarb, Cammack, & Mintz, 2006).

While researching the screening program for military sexual violence for the Veterans Health Administration, Kimerling and her colleagues found that PTSD had a strong association with MST. They also found that women who had experienced MST were three times more likely than men who experienced MST to receive a diagnosis of PTSD. However, there are limitations to this research because it is correlational in nature and causality cannot be inferred (Kimerling, Gima, Smith, Street, & Frayne, 2007).

### **Physical Health Consequences of MST**

In 2000, Sadler and her colleagues studied health-related quality of life among female veterans who were raped and/or physically assaulted. The Medical Outcomes Study Short Form-36 was used to examine health-related quality of life. Approximately half of the female veterans experienced violence during their time in the military; this included 35% experienced physical assault, 30% rape, and 16% both. They also found that female veterans, who were raped, were

more likely to report chronic health issues. Furthermore, those who reported rape or physical assault reported a significantly lower health-related quality of life (Sadler, Booth, Nielson, & Doebbeling, 2000).

In 1999, Frayne et al. conducted a study to examine differences in physical health and current medical conditions between female veteran with or without a history of sexual assault during their military service who access services through the Veterans Administration. They reported that 23% of female veterans experienced sexual assault during their time in the military. Additionally, they found a relationship between physical health symptoms and sexual assault. Female veterans who self-reported sexual assault(s) were also more likely to report a heart attack within the last year, even after adjusting for cardiovascular risk factors such as age, diabetes, smoking history, and hypertension (Frayne et al., 1999).

In 2008, Street and her colleagues researched sexual harassment and assault in members of the military service and negative health correlates. The results of this study indicated that for both men and women, negative physical health outcomes were strongly associated with the effects of sexual assault. Even after 10 years of service, veterans with a history of sexual harassment and assault reported significantly lower health status than other veterans (Street, Stafford, Mahan & Hendricks, 2008).

### **Cardiovascular Disease**

Although the American Heart Association found that rates of death that can be attributed to cardiovascular disease have declined, they still remain prevalent in the population. In 2009, approximately 236 to every 100,000 deaths were attributed to cardiovascular diseases. The rates were approximately 281 deaths per 100,000 white males and 190.4 per 100,000 white females. The rates for black males were 387 per 100,000 deaths and 267.9 per 100,000 deaths for black

females (AHA, 2013). An estimate for total cardiovascular disease (CVD) can be made including cases of hypertension, myocardial infarction, angina pectoris, heart failure, and stroke. CVD is defined as including all diseases of the circulatory system. Prevalence of CVD reports rates of individuals with hypertension, heart disease, stroke, peripheral heart disease and diseases of the veins (*International Classification of Diseases, 10<sup>th</sup> Revision*).

According to the American Heart Association, hypertension (*also known as* high blood pressure) is defined as a systolic blood pressure of 140 or higher and diastolic blood pressure of 90 or higher. Hypertension can also be defined as someone who is taking antihypertensive medicine or being told by a qualified healthcare professional at least twice that they have hypertension. Hypertension prevalence is based on blood pressure measurements and interviews. (American Heart Association, 2013). According to the National Heart, Lung, and Blood Institute approximately one in three adults in the United States suffers from hypertension (American Heart Association, 2013). According to the National Health and Nutrition Examination Survey, there are more men than women who have hypertension until the age 45. However, from after the age of 45 until the age of 64, rates of hypertension appear to be similar. After the age of 65, women are at a higher percentage of having hypertension (American Heart Association, 2013). Among adults with hypertension, approximately 82% are aware that they have hypertension and approximately 75% are using antihypertensive medication for treatment. However, only approximately 53% of adults with hypertension have their blood pressure controlled to their target levels (American Heart Association, 2013).

In 2009, Cohen and her colleagues studied the association of mental health disorders and cardiovascular risk factors in Iraq and Afghanistan War Veterans utilizing the Veteran Affairs



health care system. The most common mental disorder found was 24% of the sample had a diagnosis of PTSD (Cohen, Marmar, Bertenthal, & Seal, 2009).

In 2009, Spitzer and his colleagues studied the association between physical health and trauma/PTSD. They found that research participants who had a history of trauma had a high likelihood for angina pectoris, heart failure, and stroke compared to participants who had no history of trauma (Spitzer et. al, 2009).

In 2008, Boscarino researched the relationship between early age heart disease and PTSD in Vietnam veterans. They found that PTSD and early age heart disease have an association and the early age heart disease could be a possible outcome of the PTSD symptoms. The results they found also suggest that mortality due to heart disease was associated with PTSD from the military service among those veterans who did not have heart disease at baseline (Boscarino, 2008).

In 2006, Chung and his colleagues found that older patients, who had experienced myocardial infarction, were more likely to be diagnosed with PTSD and other general health issues (Chung, Berger, Jones, & Rudd, 2006). Bruggimann and his colleagues found that patients who had experienced a non-severe stroke were more likely to experience symptoms of PTSD along with depressive and anxious symptoms (Bruggimann et al., 2006).

### **Hypertension and PTSD**

Hypertension is defined as a systolic blood pressure of 140 millimeters of mercury (mm Hg) or more, or a diastolic blood pressure of 90 mm Hg or more, or taking antihypertensive medication (Roger, Go, & Lloyd-Jones; 2012). A specific cardiovascular condition, hypertension, has been linked with PTSD on several instances. Pietrzak and his colleagues presented findings on medical conditions that were associated with PTSD and trauma exposure.

They found that participants with a lifetime diagnosis of PTSD were more likely to report being diagnosed with hypertension, angina pectoris, tachycardia and other heart diseases than those participants who reported at least one trauma but did not meet the full diagnostic criteria for PTSD (Pietrzak, Goldstein, Southwick, & Grant, 2012). Approximately 30 % of all women in the normal population have hypertension (American Heart Association, 2013).

As reviewed by Lutwak and Dill (2013), there is evidence that depression and PTSD are important risk factors for cardiovascular disease. Furthermore, depression and PTSD may increase the likelihood of engaging in behaviors that increase other cardiovascular risk factors (e.g., smoking, lifestyle). Therefore, PTSD as a result of MST or depression may theoretically increase the likelihood of cardiovascular disease (Lutwak and Dill, 2013). Kibler et. al (2008) used data from the United States National Comorbidity Survey to study hypertension in relation to PTSD and depression as well as comorbid PTSD-depression. They found that the prevalence of hypertension was higher in those who reported PTSD and no depression compared to participants with only depression or no psychiatric diagnosis. Moreover, participants who had comorbid PTSD and depression had relatively similar rates of hypertension to those who had PTSD and no depression. Despite PTSD being a significant risk factor for hypertension, previous findings are mixed regarding contribution of depression in predicting hypertension (Kibler, Joshi, & Ma, 2008).

Vimalananda et al. (2013) studied the prevalence of cardiovascular risk factors present among female veterans who utilize Veteran Affairs medical facilities. They found that hypertension, hyperlipidemia, and diabetes were common risk factors in this population. Approximately 13% of women between the ages of 35 and 44, 28% of women between the ages of 45 and 54, and 42% of women between the ages of 55 and 64 had hypertension. They also

found that the likelihood of females having two or more cardiovascular risk factors in comparison to males increased with age (Vimalanadna et al., 2013).

In 2006, Kang et al. studied risk of selected cardiovascular diseases and PTSD in World War II veterans. They found that those veterans with PTSD had an increased risk for hypertension, chronic ischemic heart disease, and circulatory diseases (Kang, Bullman, & Taylor, 2006).

### **Hypertension and African Americans**

According to the American Heart Association, African Americans are more likely to have hypertension. As of 2014, more than 40% of African Americans had been diagnosed with hypertension. About 47% of African American women in the United States have been diagnosed with hypertension. Researchers suggest that an increased likelihood of obesity and diabetes could be affecting African Americans. Furthermore, a new gene is being studied that could be making African Americans more sensitive to salt (*American Heart Association*, 2014).

### **Hypertension and Depression**

**General.** Although not addressed widely throughout the literature, researchers have found links between hypertension and depression. In order to determine if anxiety and depression were risk factors for hypertension, Jonas and colleagues (1997) conducted a longitudinal study tracking individuals before they were diagnosed with hypertension. They found that there was a significant risk associated with anxiety and hypertension as well as depression and hypertension for both men and women. There was no significant difference found in the results for men and women (Jonas, Franks, & Ingram 1997).

In 2000, Davidson and her colleagues conducted a study to determine if depressive symptoms increase the likelihood of hypertension in young adults. The young adults were aged

25 to 35 and were followed over the course of 5 years. Participants with high or intermediate depressive scores on the Center for Epidemiological Studies Depression Scale were at a significant risk for hypertension. The risk for hypertension was not considered significant in young white adults as opposed to young black adults. Young black adults had a 6% incidence of hypertension for the sample of 1,537 and young white adults had a 2% incidence of hypertension for the sample of 1,806 (Davidson, Jonas, Dixon, & Markovitz, 2000).

***Veterans.*** In 2010, Shen et al. examined the prevalence of depression among female veterans with diabetes, heart disease, and hypertension. They studied a cross-sectional, national sample of 13,000 women accessing health care at the Veteran Health Administration. They found that of those who were diagnosed with diabetes, heart disease, or hypertension, 27% also had a diagnosis of depression. Of the 27% of participants diagnosed with depression, 40% had been diagnosed with major depressive disorder (MDD) and 60% had minor depression. Minor depression can be defined as a mood disorder that does not meet full criteria for major depressive disorder but in which at least two symptoms are present for at least two weeks. It is sometimes referred to as Depressive Disorder Not Otherwise Specified (Shen, Findley, Banerjea, & Sambamoorthi, 2010; APA, 2000).

### **Summary and Hypotheses**

PTSD is a psychiatric illness that may develop following a traumatic event. Prevalence rates of PTSD in the general population are at 8% (APA, 2000). However, PTSD is found in greater prevalence and severity in certain subsets of the population such as women, armed forced veterans and personnel and veterans with military sexual trauma (Kessler et al., 2005; Breslau, 2002). PTSD has been linked to a number of psychiatric consequences, depression being most apparent (Marshall et al, 2001). PTSD has also been linked to general negative health

consequences as well as reports of poorer overall health. Specifically, PTSD has been linked to cardiovascular disease, diabetes and pain (Sledjeski et al, 2008).

MST-related PTSD affects veterans both physically and mentally (Himmelfarb et al, 2006; Butterfield et al, 1998). Research has supported the fact those veterans who have experienced MST experience an increased likelihood of medical conditions, including cardiovascular disease (Sadler et al., 2000; Frayne et al., 1999).

PTSD and depression have also been shown to be a related psychiatric disorder to cardiovascular disease (Cohen et al, 2009); specifically, they are both significant risk factors for hypertension (Shen et al, 2010). The previous study sample includes women veterans with MST, thus providing an opportunity to study this important research question.

This research study can potentially influence better care of female veterans. The results of this study can inform clinicians on the importance of looking at both physical and mental health issues in female veterans. Awareness of the relationships between PTSD, MST, depression and hypertension is very important because it allows further understanding of general medical issues this population may be living with.

Hypotheses of the proposed study are as follows: 1) Women who have comorbid depression and MST related PTSD will be more likely to be diagnosed with hypertension than woman diagnosed with MST related PTSD without comorbid depression. 2) The greater the severity of symptoms of depression the participant reports, the higher the likelihood she will have hypertension.

## CHAPTER THREE

### Method

#### Participants

The present study used data from a previously conducted randomized-controlled trial (RCT) that examined the effectiveness of Cognitive Processing Therapy (CPT) for veterans with MST-related PTSD (Suris, Link-Malcolm, Chard, Ahn, & North, 2013). Both male and female veterans were recruited from the VA North Texas Healthcare System. Veterans were randomized into one of two conditions: CPT or a non-trauma focused comparison condition (Present-Centered Therapy [PCT]). Participants received a total of 12, one-hour sessions of either CPT or PCT from trained psychotherapists, followed by scheduled assessments. The primary outcome measure for the RCT was total Clinician-Administered PTSD Scale (CAPS) score, a measure of PTSD severity (Blake, Weathers, Nagy, Kaloupek, Gusman, Charne, & Keane, 1995). Secondary outcome measures included anger (as measure by the State-Trait Anger Expression Inventory), depression (as measured by the Beck Depression Inventory-II [BDI-II]), and healthcare utilization and its associated costs (as measured by the Health Care Utilization form) (Spielberger, 2010; Beck, Steer, & Brown, 1996).

The previous RCT enrolled 161 male and female veterans. Of this number, 128 ( $n = 113$  female;  $n = 15$  male) veterans were randomized into a treatment condition and received a baseline assessment. For the purpose of the present study, only data from female veterans who completed the baseline assessment were used. Only data from female veterans were used because the uneven sample of only 15 men and 113 women would not allow for meaningful comparisons.

The mean age of the sample was 45.59 years ( $SD = 9.24$ ) with a minimum age of 25 and a maximum age of 68. The median age was 47 years, meaning half of the sample is below 47 and

half of the sample is above 47. The sample consisted of 45.1% Black/African American, non-Hispanic participants; 34.5% White/Caucasian, non-Hispanic participants; 5.3 % White, Hispanic participants; 3.5% American Indian/Alaskan native participants; 1.8% Native Hawaiian/ Pacific Islander, and 9.7% participants who identified themselves as “Other.”

Inclusion and exclusion criteria for the larger study included:

*Inclusion Criteria.*

1. Be veterans or active duty personnel, from any era, with a diagnosis of PTSD due to MST
2. Experience MST no less than 3 months prior to entering the trial
3. Identify that MST is the trauma that is causing them the worst current distress (if they have other sexual traumas)
4. Have at least one clear memory of the trauma (sufficient to write impact statement)
5. Consent to be randomized into treatment
6. Agree not to receive other psychotherapy for PTSD during the 12 sessions of active treatment (psychotherapy for other problems, brief check-ins with an existing therapist, and attendance at self-help groups were allowed)
7. If on psychoactive medications, be on a stable medication regimen for a minimum of 2 months prior to entering the trial

*Exclusion Criteria.*

1. Prior CPT or PCT treatment (based on chart review by study coordinator)
2. Current substance dependence
3. Prior substance dependence that has not been in remission for at least 3 months
4. Any current psychotic symptoms
5. Current mania or unstable Bipolar Disorder
6. Prominent current suicidal or homicidal features
7. Any severe cognitive impairment or history of Organic Mental Disorder
8. Current involvement in a violent relationship

Research participants were primarily referred by clinicians, networking with other mental health professions, and talking with female veteran groups. Participants were pre-screened for

eligibility by research staff speaking with the referring clinician. If the veteran was interested, research staff contacted the veteran to begin official screening.

### **Measures**

**CAPS.** The CAPS, commonly considered to be a “gold standard” of PTSD diagnosis, was used to determine a diagnosis of PTSD as well as the frequency and intensity of PTSD symptoms in the last month. The CAPS is a 20-item structured clinical interview that corresponds to DSM-IV criteria for PTSD (Blake et al., 1995). The CAPS has strong psychometric properties. Inter-rater reliability for the CAPS is high, ranging from 0.92 to 1.00 ratings and 0.93 to 0.98 for the “Frequency” and “Intensity” scales, respectively (Hovens et.al., 1994). The CAPS also has strong convergent validity when compared to other psychodiagnostic tools of PTSD including the Structured Clinical Interview for DSM-IV (SCID) PTSD module (.83) (Foa & Tolin, 2000). Overall agreement between a clinician-rated diagnosis and CAPS diagnosis was 79% (Hovens et.al., 1994).

**SCID.** The SCID was used in the RCT to determine current and lifetime psychiatric diagnoses, GAF, psychosocial stressors, and number of previous suicide attempts. Skodol et al. (1988) found that the diagnostic validity of the SCID varies based on diagnosis (e.g., 0.45 for Narcissistic Personality Disorder to 0.95 for Antisocial Personality Disorder). Lobbesteal and colleagues research revealed moderate to excellent inter-rater agreement of the Axis I disorders (Lobbesteal, Leurgans, & Arnt, 2010). For the current study, the SCID was used to determine a current diagnosis of major depressive disorder.

**BDI-II.** The BDI-II was used to assess the severity of depressive symptoms. The BDI- II is a 21-item scale that is used to assess for symptoms of depression. Each item contains statements corresponding to different levels of severity. The items on the BDI- II correspond



with the DSM-IV criteria for major depressive disorder. The BDI-II has a test-retest reliability of .90 (Beck, Steer, Ball, & Ranieri, 1996).

**Hypertension.** Hypertension was determined by the presence of a hypertension diagnosis in the electronic medical records and/ or the use of antihypertensive medication. See Appendix A for a list of antihypertensive medications that were searched for in the medical records to indicate presence of hypertension.

### **Procedures**

A retrospective chart review was performed. The participant's medication list and problem list, dated from when participants were enrolled in the study, was conducted to determine the presence or absence of hypertension. Presence of hypertension was determined by at least one of the following: if the problem list stated a diagnosis of hypertension, if the problem list stated a diagnosis of high blood pressure, and/or prescribed anti-hypertensive medication on the participant's medication list.

Additionally, presence of major depressive disorder, as determined by the SCID, depression symptom severity (First, Spitzer, Gibbon, & Williams, 2002), and sociodemographic information (i.e., race/ethnicity, age) were compiled for statistical analyses.

## CHAPTER FOUR

### Results

#### Descriptive Statistics

All statistical analyses were performed using SPSS version 22.0. The total sample consisted of 113 female participants. Descriptive statistics (see Table 1) were performed for socio-demographic variables (i.e., ethnicity, age) and the study's independent and dependent variables (presence of major depressive disorder and hypertension). As measured by the SCID, 77.0% of participants met criteria for DSM-IV for current major depressive disorder. Based on study criteria (medication and problem list), 49.6 % of participants screened positive for hypertension. Depression symptom severity was determined by the BDI-II. Additionally, the mean score for the BDI-II for the sample was 27.59 (SD = 10.33) which falls within the moderate severity range.

#### Results of Hypothesis Testing

##### *Hypothesis I.*

The first hypothesis was that female veterans who had comorbid depression and MST-related PTSD would be more likely have hypertension than women who had MST-related PTSD without comorbid depression. The independent variable was a positive or negative screen for major depressive disorder. The dependent variable was presence of hypertension in the electronic medical records. This hypothesis was analyzed using a chi-square test as the variables are nominal scale data. Participants in this study did not significantly differ in their likelihood to have hypertension based on the presence or absence of a current diagnosis of major depressive disorder,  $\chi^2(1, N = 113) = .16, p = .692$ , as seen in Table 2. Specifically, a relatively similar ratio of female veterans with depression had (38.1%) and did not have (38.9%) hypertension.

Similarly, the ratio did not significantly differ for female veterans without depression in terms of those with (12.4%) and without (10.6%) hypertension.

***Hypothesis II.***

The second hypothesis was that the greater the severity of symptoms of depression the participant reports, the higher the likelihood she will have hypertension. The predictor variable was the depression severity score as measured by the BDI-II. The criterion variable was hypertension. This hypothesis was analyzed using a binary logistic regression. Based on the Wald statistic, depressive symptoms did not significantly predict the likelihood of hypertension in female veterans with MST-related PTSD,  $\chi^2(1, N = 113) = 1.026, p = .311$ .

**Exploratory Analysis**

Researchers have documented a positive relationship between African American race and hypertension (American Heart Association, 2014). To examine if this finding was present in this sample, a Chi-Square test was performed. Specifically, Pearson's Chi-Square coefficient was calculated between African American/Black race and hypertension. Results of the analyses were significant, with African American/Black veterans being more likely to have hypertension than non-African American/Black veterans,  $\chi^2(1, N = 113) = 5.817, p = .016$  (see Table 3).

## CHAPTER FIVE

### Discussion

This study is the first to examine the relationship of hypertension and depression in a sample of female veterans with MST-related PTSD. In contrast to our predictions, both hypotheses were rejected. Comorbid major depressive disorder was not a significant risk factor for hypertension in female veterans with MST-related PTSD. Additionally, increased depressive symptom severity did not increase the likelihood of the presence of hypertension. These findings are notable because they stand in contrast to numerous studies documenting the relationship between depression and hypertension (Jonas, Franks, & Ingram 1997; Davidson; Jonas, Dixon, & Markovitz, 2000; Kibler et al, 2008).

Our findings are paradoxical because it stands to reason that comorbid major depressive disorder would result in increased psychological burden resulting in greater likelihood of hypertension. However, because depression was not associated with hypertension within the sample, it is likely that other factors outside of comorbid depression- may predict hypertension in this population. For example, previous studies have associated PTSD to hypertension (Boscarino, 2004). However, because our entire sample had PTSD, it is impossible to parse out PTSD diagnosis as a predictor of hypertension in our sample. Because of this, future research should examine the independent contributions of PTSD and depression in survivors of MST.

Consistent with previous research, African American/Black race was found to be significantly related to hypertension. This is not an unexpected finding due to previous literature (American Heart Association, 2014); however, our results are the first to document this relationship in a female sample with MST-related PTSD. This finding further confirms that

African American females experience hypertension at higher rates than female veterans of other races.

Of note, rates of hypertension for the female veterans in this study and the general United States population differ greatly. Overall, 56% of the sample had hypertension compared to the 30% of the general population of women in the US (American Heart Association; American Heart Association, 2014). A similar pattern emerged when comparing rates of hypertension between African American women veterans in our sample and African American women in the general United States population, with 61% compared to 47% respectively, having hypertension. These findings demonstrate that the study sample appears to be in poorer health than the general population regarding this cardiovascular condition.

The non-significant results of this study are surprising because we had a high percentage of African American/Black females (45.1%) and a high percentage of major depressive disorder (77%) in our sample. Independently depression and PTSD are predictors of hypertension (Cohen et al., 2009; Shen et al., 2010). This could mean that providers are potentially missing identification of a health condition while diagnosing female veterans. Providers should have knowledge about comorbid conditions in order to properly identify illness that require treatment and provide referrals to qualified providers. Awareness of the negative health effects of psychological distress can assist providers in providing good thorough medical care. Psychological distress can affect the quality of life of individuals overall. It is important to note that pharmacological treatments are common with psychiatric illness such as PTSD and depression. Recognizing the interactions are imperative for providers of both medical and psychiatric care.

The method employed by this study to categorize a participant as having hypertension

may have created false positives by being overly inclusive. Specifically, participants who were taking antihypertensive medications, but did not have a hypertension diagnosis may have only been pre-hypertensive, but they were labeled as having hypertension for the purpose of this study.

Findings from this study have implications for providers. Providers should be aware that African American females with MST-related PTSD are more likely to have hypertension. Additionally, providers should be aware that comorbid major depressive disorder may not be a risk factor for hypertension in this population. Regardless of a current diagnosis of major depressive disorder, providers should keep in mind the effects of race when addressing hypertension in female patients with MST-related PTSD. Hypertension and other cardiovascular diseases can be affected by lifestyle choices such as eating habits, exercising and smoking. These could be contributing factors that could be looked at in relation to hypertension in future studies.

**Limitations**

There are several limitations in this study. One notable limitation is that of the wide array of cardiovascular risk factors, we only examined hypertension. Numerous other risk factors (e.g., angina pectoris, tachycardia, myocardial infarctions, and other heart diseases) that may have been indicative of cardiovascular disease were not examined. Future researchers should strive to measure all forms of cardiovascular risk factors to further understand if depression significantly predicts other cardiovascular risk factors, outside of hypertension, within female veterans with MST-related PTSD.

Another limitation is that our statistical analyses did not control for competing risk factors of hypertension. For example, age is a well-established risk factor for hypertension, with older adults being more likely to have hypertension (American Heart Association, 2013). This effect is even more pronounced in women, with older females being at a greater risk for

developing hypertension than older males (American Heart Association, 2013). Because our sample contained a wide range of ages (25 to 68 years old), it is possible that age could have affected our results. Additionally, there is an association between hypertension and hyperlipidemia and diabetes, with individuals who have hyperlipidemia or diabetes having an increased likelihood of hypertension (Vimalanadna et al., 2013). Because we did not assess for either of these variables, the presence of these conditions and their effect on our results is unknown. Because of this, future researchers should strive to assess and statistically control for competing risk factors such as age and other physical health comorbidities (e.g., hyperlipidemia, diabetes).

A final limitation is that our study only analyzed female veterans with MST-related PTSD. This limits the generalizability male veterans with MST-related PTSD. Because a relatively similar number of male and female veterans experience MST (Mullen, Holliday, Morris, Raja, & Surís, 2014), understanding the health needs of both male and females in this population is important. Therefore, future researchers should study both male and female veterans with MST-related PTSD.

## **Conclusion**

Understanding the role of PTSD and depression in risk for hypertension in women with MST-related PTSD is important because both PTSD and depression are risk factors for cardiovascular disease (American Heart Association, 2013; Boscarino, 2014). Even though PTSD and depression are established risk factors for hypertension, in this sample, comorbid depression did not result in significantly greater likelihood of hypertension. Exploratory findings did identify a significant risk factor in this population, with African American/Black participants having an increased likelihood of having hypertension. Our findings support that providers should be cognizant of the role of African American/Black race, when assessing for hypertension

in this population. Future researchers should replicate this study by including male veteran survivors of MST, while controlling for other risk factors such as PTSD diagnosis, age, diabetes, and hyperlipidemia.



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Table 1

*Sociodemographic and Clinical Information of Sample*

Variable	<i>n</i>	%
Race/Ethnicity		
White, non-Hispanic	39	34.5
African American, non-Hispanic	51	45.1
White, Hispanic	6	5.3
American Indian/Alaskan Native	4	3.5
Native Hawaiian/Pacific Islander	2	1.8
Other	11	9.7
Hypertension		
Current	56	49.6
Never	57	50.4
Major Depressive Disorder		
Current	87	77
Never or Lifetime	26	23

*Note.* BDI-II = Beck Depression Inventory-II.



Table 2

*Distribution of Hypertension and Depression*

		Hypertension		
		No	Yes	Total
Depression	No	14 (12.4)	12 (10.6)	26 (23.0)
	Yes	43 (38.1)	44 (38.9)	87 (77.0)
	Total	57 (50.4)	56 (49.6)	113 (100.0)

*Note.* Reported values are  $n(\%)$  of entire sample.

Table 3

*Distribution of Hypertension and African-American Race*

		Hypertension		
		No	Yes	Total
African-American	No	37 (32.7)	25 (22.1)	62 (54.9)
	Yes	20 (17.7)	31 (27.4)	51 (45.1)
	Total	57 (50.4)	56 (49.6)	113 (100.0)

*Note.* Reported values are  $n(\%)$  of entire sample.

## Appendix A

*Medication List*

This is a comprehensive list of possible antihypertensive medications adapted from the Micromedex database:

**Diuretics:** Chlorothiazide, Chlorthalidone, Hydrochlorothiazide, Polythiazade, Indapamide, Metolazone, Bumetanide, Furosemide, and Torsemide

**Potassium Sparing Diuretics:** Amiloride Hydrochloride, Triamterene, Eplerenone, and Spironolactone

**Ace Inhibitors:** Benazepril Hydrochloride, Captopril, Enalapril Maleate, Fosinopril Sodium, Lisinopril, Moexipril Hydrochloride, Perindopril Erbumine, Quinapril Hydrochloride, Ramipril, and Trandolapril

**Beta-Blockers:** Acebutolol Hydrochloride, Atenolol, Betaxolol Hydrochloride, Bisoprolol Fumarate, Metoprolol Tartrate, Nadolol, Penbutolol Sulfate, Pindolol, Propranolol Hydrochloride, and Labetalol Hydrochloride

**Calcium Antagonists:** Amlodipine Besylate, Isradipine, and Nicardipine Hydrochloride

**Angiotensin II:** Losartan Potassium and Valsartan

**Vasodilators:** Hydralazine Hydrochloride and Minoxidil

**Additional Medications:** Timolol, Diltiazem Hydrochloride, Verapamil Hydrochloride, Felodipine, Nifedipine, Doxazosin Mesylate, Prazosin Hydrochloride, Terazosin Hydrochloride, Carvedilol, Candestartan Cliexetil, Eprosartan Mesylate, Irbesartan, Olmesartan Medoxomil, Telmisartan, Clonidine, Methyldopa, Reserpine, Guanfacine Hydrochloride, and Aliskiren

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**EDUCATION/TRAINING**

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INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
The University of Texas at Arlington	B.A.	2012	Psychology
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2016-Present Consulting Analyst at Cerner Corporation

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**Professional Memberships**

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2011-2012 Sigma Alpha Lambda Honors Society: Member, Public Relations, Vice President

2009-2012 Psychology Society at University of Texas at Arlington