ASSOCIATION BETWEEN PTSD SYMPTOM CLUSTERS, SUBSTANCE USE, HYPERSEXUALITY, AND ERECTILE DYSFUNCTION IN SERVICE MEMBERS AND VETERANS

by

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A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Psychology

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ABSTRACT

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Service members and veterans of the current era, Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) are at a high risk for a variety of psychological disorders and physical health impairments. Common disorders among male service members and veterans include posttraumatic stress disorder (PTSD), substance use, and hypersexuality. Each of these disorders affect all aspects of an individual’s life and can deteriorate important interpersonal relationships or impair functioning in a variety of contexts. All these variables may affect sexual health and functioning in these service members. Sexual functioning is an important aspect of overall well-being, relationship satisfaction, and marriage satisfaction. Conversely, sexual dysfunction can create interpersonal distress in important relationships and decrease overall well-being. One of the most common forms of sexual dysfunction in males is erectile dysfunction, and rates of sexual dysfunction are higher among male service members than civilian males. These rates increase for combat veterans with a posttraumatic stress disorder (PTSD) diagnosis compared to those who do not have the
same diagnosis. To date, sexual dysfunction has been associated with PTSD, substance use, and hypersexuality. The current study examines how each of these disorders together are associated with erectile dysfunction in a sample of OEF/OIF/OND service members and veterans ($N = 213$). Exploratory analysis breaks down PTS symptoms into seven separate symptom clusters in an effort to determine what types of symptoms are most strongly associated with erectile dysfunction. The study recruited a non-clinical sample via Facebook and asked them to complete a survey battery that covered sexual health and assessed for PTSD, substance use, and hypersexuality. Results from multiple linear regressions indicated that PTS symptoms were significantly associated with erectile dysfunction, in particular anhedonia and dysphoric arousal symptoms accounted for the most variance in this sample. Limitations to this study include the use of cross-sectional data so no determination can be made about the stability of these relationships across time, restriction of the range in the majority of the measures due to this being a nonclinical sample, and the recruitment method may impact generalizability to those members of this population who do not have access to or use social media.
PUBLIC ABSTRACT

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Service members and veterans of the current era, Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) are at a high risk for a variety of psychological disorders and physical health impairments. Common disorders among male service members and veterans include posttraumatic stress disorder (PTSD), substance use, and hypersexuality. Each of these disorders affect all aspects of an individual’s life and can deteriorate important interpersonal relationships or impair functioning in a variety of contexts. All these variables can affect sexual health and functioning in these service members. Sexual functioning is an important aspect of overall well-being, relationship satisfaction, and marriage satisfaction. Conversely, sexual dysfunction can create interpersonal distress in important relationships and decrease overall well-being. One of the most common forms of sexual dysfunction in males is erectile dysfunction, and rates of sexual dysfunction are higher among male service members. These rates increase for combat veterans with a posttraumatic stress disorder (PTSD) diagnosis compared to those who do not have the same diagnosis. To date sexual dysfunction has been associated with PTSD, substance use, and hypersexuality. The current study examines how each of these disorders together are associated with erectile dysfunction in a sample of OEF/OIF/OND service members and veterans (N = 213). Exploratory analysis breaks down PTS symptoms into seven separate symptom clusters
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Jeremiah E. Fruge
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CHAPTER I

INTRODUCTION

The current generation of veterans and service members represent a population at-risk for a wide variety of physical and psychological impairments. Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) service members and veterans are at a heightened risk for Posttraumatic Stress Disorder (PTSD) and other comorbid disorders (e.g., substance use disorders, anxiety, depression), and it is estimated that nearly one-third of these veterans and service members will suffer from at least one mental disorder or brain injury (Larner & Blow, 2011; Strom et al., 2012). There is a large and growing body of evidence examining how these disorders are impacting other areas of health, including sexual functioning (Tran, Dunckel, & Teng, 2015; Wilcox et al., 2014).

Sexual dysfunctions are disturbances in a person’s ability to respond sexually, experience sexual pleasure, sexual desire, or psychophysiological changes (APA, 2013; Laumann, Paik & Rosen, 1999). For males, one of the most common forms of sexual dysfunction is erectile dysfunction with estimates for men over the age of 40 ranging between 13-21%, and 2% for men under the age of 40 (APA, 2013). Healthy sexual functioning has been found to be important in healthy relationship functioning and overall satisfaction with a person’s life (Flynn et al., 2016; Fugl-Meyer, Lodnert, Branholm, & Fugl-Meyer, 1997). Sexual dysfunction has a strong negative effect on mental wellbeing and marriage satisfaction in the veteran population (Goff, Crow, Reisbig, & Hamilton, 2007; Hayes et al., 2010; Nunnink, et al., 2012). Sexual dysfunction has long been associated with a variety of mental health disorders, some of
which are very common in the military and veteran population such as PTSD, substance abuse (Flynn et al., 2016; Hirsch, 2009; Nunnink, et al., 2012) and hypersexuality.

PTSD involves frequent intrusive and unwanted thoughts, avoidance of internal and external stimuli associated with a traumatic event or events, changes in mood (such as irritability or depression), and changes in cognition such as a distorted or negative world view (APA, 2013). PTSD is often associated with higher levels of functional impairment in important relationships, work, academics, and physical health. Veterans diagnosed with PTSD are at a heightened risk for comorbid disorders including substance use disorders, and there is an association with poorer relationships due to symptoms such as emotional numbing, avoidance, and hypervigilance (APA 2013; Kimerling, Prins, Westrup & Lee, 2014; Larner & Blow, 2011; Oster, Morello, Venning, Redpath, & Lawn, 2017). Substance use disorders are common among service members and veterans, and can include dependence or abuse of alcohol and drugs. The physiological effects of substances such as alcohol may create sexual impairments such as erectile dysfunction (APA, 2013; Farhner, 1987). Hypersexual Disorder (HD) involves excessive and impulsive engagement with sexual stimuli, attempts to decrease sexual fantasies without success, and repeatedly engaging in time consuming sexual activities (such as masturbation or viewing pornography) all of which lead to clinically significant distress and impairment (Kafka, 2010; Reid et al., 2012). These impairments have a long duration (at least 6 months), are associated with risky sexual behaviors and are exhibited by individuals above the age of 18 (Kafka, 2010; Reid et al., 2012). There is an association with degradation of important relationships, sexual dysfunction, and impulsive behaviors regardless of the negative consequences associated with the activity (Bancroft &
Vukadinovic, 2004; Reid, Harper, & Anderson, 2009). Common among each of these disorders is an attempt to regulate or avoid distressing internal or external stimuli, and each of these disorders has been associated with sexual dysfunction in male veterans and service members (APA, 2013; Arackal & Benegal, 2007; Hirsch, 2009; Kraus et al., 2017; Nelson & Oehlert, 2008; Smith et al., 2014).

Sexual functioning research with younger male veterans is indicating there are differences in risk factors for sexual dysfunction compared to older males (Lehrner et al., 2016; Wilcox et al., 2014). Current research of sexual dysfunction, including erectile dysfunction, indicate the prevalence rates of these disorders is much higher among male veterans under the age of 40 compared to their civilian peers, and even higher among combat veterans with a PTSD diagnosis versus those who do not have that diagnosis (Tran et al., 2015). The current study utilizes cross-sectional data collected from male service members and veterans to explore the association between PTSD, SUDs, HD, and erectile dysfunction. A model was generated using a multiple linear regression to understand the association between these factors and erectile dysfunction. Exploratory analyses of the relationship between PTS symptom clusters (based upon 7-factor Hybrid model; Armour et al., 2015) and erectile dysfunction were conducted. Understanding the relationships between disorders and specific symptom cluster may inform clinical assessment practice and potentially improve clinical interventions to help ameliorate the difficulties resulting from these disorders.
CHAPTER II

LITERATURE REVIEW

Current Veterans

There have been greater than 1.6 million service members who have served in Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND) with estimates since the start of these operations that there have been around 200,000 new veterans leaving the service every year (Larner & Blow, 2011; Oster, Morello, Venning, Redpath, & Lawn, 2017). Current studies suggest that nearly a third of these veterans suffer from a mental disorder or a brain injury, and information on how they cope and factors that predict further dysfunction are limited (Larner & Blow, 2011). OEF/OIF/OND veterans and service members are at a heightened risk of Posttraumatic Stress Disorder (PTSD), comorbid mental disorders (e.g. depression or anxiety disorders), and dysfunctional coping behaviors due to these experiences (Larner & Blow, 2011; Strom et al., 2012). Male veterans are more likely to receive a PTSD and alcohol use disorder compared to female veterans (Ramsey et al., 2017; Trivedi et al., 2015). While on active duty, there are lifestyle factors (e.g. alcohol binges, nicotine dependence) that may increase or influence dysfunctional coping behaviors in response to traumatic events (Kimerling et al., 2014; Larner & Blow 2011; Oster et al., 2017). The high numbers of veterans and service members exposed to potentially traumatic events leads to an increased need to accurately screen for and predict further disorders or dysfunction due to their military service.

Sexual health screening is one area of functioning that is often neglected in the general population and in the veteran population in males under the age of 40 years old
(Hirsch, 2009; Nunnink, Fink, & Baker, 2012), though more research is being conducted to fill this gap in the literature (e.g. Tran et al., 2015). Sexual functioning plays a key role in marriage satisfaction and is an important component of maintaining a strong intimate relationship for veterans and their spouses (Hayes et al., 2010; Laumann, Paik, & Rosen, 1999). OIF/OEF/OND veterans are particularly vulnerable to potential sexual dysfunction due to their high levels of mental disorders such as PTSD or substance use disorders (SUDs), because these disorders place a large strain on the veteran and their intimate partners and families (Nunnink, et al., 2012). Psychological distress in particular has been shown to be associated with poor physical and psychological well-being as measured by the SF-36 (Nunnink, et al., 2012) for individuals receiving services within the VA system, and this psychological distress is associated with potential sexual dysfunction in a younger population (Nunnink et al., 2012; Zhang, Xiao, Zang, & Deng, 2006). One potential association between sexual dysfunction in veteran relationships could potentially be the new roles spouses must take on such as a caretaker at a young age compared to the general population (Hayes et al., 2010). The vulnerability of this relatively young population to mental disorders and physical disabilities highlights the importance of both research and screening for sexual dysfunction (Hirsch, 2009; Nunnink, et al., 2012).

**Sexual Function/dysfunction**

Sexual dysfunctions are disturbances in a person’s ability to respond sexually, experience sexual pleasure, sexual desire, or psychophysiological changes (APA, 2013; Laumann, Paik & Rosen, 1999). The DSM-V contains 10 diagnoses for sexual dysfunctions, with the majority of the diagnoses being sex specific (e.g. erectile
dysfunction or female orgasmic disorder; APA, 2013). The risk for the majority of male sexual dysfunction disorders increase with age, especially after 50 years of age (APA, 2013). In general, sexual dysfunction is incredibly common in the United States for both men and women though it is more prevalent in women, with prevalence rates of sexual dysfunctions for men ranging from 10%-52% and 25%-63% for women (Laumann et al., 1999). Erectile dysfunction has been indicated as one of the most common sexual dysfunctions for men with prevalence rates of 13%-21% for men ages 40-80 years old and less than 2% of men younger than 40 years old (APA, 2013). There are indications that with younger males, sexual functioning problems are more associated with their emotional or psychological problems as compared to their physical problems, this further increases the need for sexual health screening in younger males to become a regular practice (Zhang, et al., 2006).

Multiple studies examining the prevalence rates sexual dysfunction and erectile dysfunction in OEF/OIF/OND veterans under the age of 40 indicates prevalence rates of erectile dysfunction to be between 3%-33.24%, and PTSD is been associated with erectile dysfunction (Badour, Gros, Szafranski, & Acierno, 2015; Helmer et al., 2013; Monawar et al., 2013; Tran et al., 2015; Wilcox, Redmond, & Hassan, 2014). A study examining neuroendocrine correlates of PTSD with sexual dysfunction in this generation of veterans indicated that veterans with a PTSD diagnosis had higher levels of androgen dihydrotestosterone (DHT) which was associated with decreased sexual desire and a decreased frequency of sexual intercourse (Lehrner et al., 2016). Some hypotheses about specific symptom clusters of PTSD that are associated with erectile dysfunction include emotional numbing (or anhedonia) or the intrusive symptom cluster (Tran et al., 2015).
For those endorsing erectile dysfunction, there are strong associations with poorer physical and psychosocial health, lower quality of life, and lower levels of happiness (Wilcox et al., 2014). Additionally these studies echo a difference of symptoms, psychological and physical, that differentiate the presence of sexual dysfunction for males under the age of 40 and those over the age of 40 which can include a PTSD diagnosis, hypertension, and/or changes in DHT levels (Lehrner et al., 2016; Wilcox et al., 2014). One study examining the documentation of sexual dysfunction diagnoses of veterans in the VA health care system found that mental health diagnoses such as PTSD and major depressive disorder (MDD) were associated with a sexual dysfunction diagnosis (Helmer et al., 2013). In addition, documentation issues within the VA may result in sexual dysfunction diagnoses being underreported for this population (Helmer et al., 2013). The high prevalence rates of erectile dysfunction in younger males in this population presents a need for increased routine screening of sexual health (Cosgrove et al., 2002; Tran et al., 2015; Yehuda, Lehrner, & Rosenbaum, 2015).

Sexual dysfunctions for men and women can negatively affect interpersonal relationships and quality of life (Laumann et al., 1999). In a national survey of adults in the US, sexual health was indicated as highly important by 62.2% of men and 42.8% of women. In fact, healthy sexual functioning has been found to be significantly associated with overall satisfaction with life (Flynn et al., 2016; Fugl-Meyer, Lodnert, Branholm, & Fugl-Meyer, 1997). Poorer physical health and mental illness such as anxiety or depression has been associated with poorer sexual health especially in younger men, whereas stronger health was associated with better sexual health in all adults (Flynn et al., 2016). PTSD is strongly associated with sexual dysfunction in men, with some estimates
showing that up to 80% of treatment seeking males experience sexual dysfunction (most commonly erectile dysfunction), which may be related to hypervigilance to internal cues and difficulty being vulnerable with a partner (Kimerling et al., 2014). The association between physical and mental health and sexual health represents an important aspect of functioning that needs to be assessed regularly in clinical settings, especially for at-risk populations such as veterans or abuse survivors (Flynn et al., 2016).

Sexual dysfunction has a strong negative association with mental wellbeing and marriage satisfaction in the veteran population as well (Goff, Crow, Reisbig, & Hamilton, 2007; Hayes et al., 2010; Nunnink, et al., 2012). The argument to increase the research focused on males under 40 years of age is echoed in the veteran population, and the OEF/OIF/OND veteran sample has been indicated as a uniquely vulnerable sample due to the high levels of mental illness, physical problems, and their relatively young age compared to previous generations of veterans (Hirsch, 2009; Nunnink, et al., 2012). Due to the relatively lower age of most OEF/OIF/OND veterans, they are less likely to report age-related complications for sexual dysfunction (e.g. prostate cancer or vascular problems) and are more likely to report psychological issues (e.g. PTSD or SUDs) which have been linked to sexual dysfunction (Nunnink, et al., 2012). Nearly 30% of participants in a sample of OEF/OIF/OND veterans screened positive for sexual functioning problems, many of these veterans also endorsed PTSD symptoms (Nunnink, Goldwaser, Afari, Nievergelt, & Baker, 2010). Within the military and veteran population sexual dysfunction (e.g. erectile dysfunction, reduced libido), has been associated with PTSD, substance abuse, depression, age (for older veteran generations), anxiety disorders, and hypertension (Hirsch, 2009; Letourneau, Schewe, & Frueh, 1997;
McIntyre-Smith, St. Cyr, & King, 2015; Nunnink, et al., 2012). Due to higher rates of psychological disorders among younger veterans and the association of psychological distress with sexual dysfunction routine screening for sexual health is necessary.

Sexual problems in this population, as with the general population, is associated with poorer relationship satisfaction for both service members and their spouses compared to either anxiety or depression indicating the large impact that sexual functioning can play (Goff, Crow, Reisbig, & Hamilton, 2007). Research examining sexual functioning in this population is growing, though relative to other aspects of this population it is understudied, better understanding of disorders or symptoms that impact sexual health is an important place to expand the current literature base. Current research indicates specific factors (e.g. PTSD, SUDs, etc.) that have been associated sexual dysfunction. More research examining the symptoms within these disorders may provide a better understanding of the associations between these disorders.

**Factors of Low Sexual Functioning in Veterans**

**PTSD.** The current version of the American Psychiatric Association’s (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013) notes that the 12-month prevalence of PTSD among adults in the United States is approximately 3.5%. Some of the key features of PTSD are: re-experiencing the trauma through dreams, memories, or flashbacks; avoidance of stimuli associated with traumatic events including thoughts, feelings, or memories; hyperarousal such as anger outburst, hypervigilance, or difficulties concentrating; impaired affect regulation, and increased difficulties with interpersonal relationships (Kimerling et al., 2014; APA, 2013). PTSD is associated with higher levels of functional impairment in a
variety of contexts including social, interpersonal, educational, occupational, physical health, etc. (APA, 2013; Kimerling et al., 2014). PTSD is associated with poorer social, family, and intimate relationships potentially due to emotional numbing, dissociation, hypervigilance to internal states, or other comorbid disorders (APA, 2013; Kimerling et al., 2014; Larner & Blow, 2011). According to the DSM-V, individuals with a PTSD diagnosis are 80% more likely than those without a PTSD diagnosis to have additional symptoms that meet criteria for a comorbid disorder such as depression, anxiety, or SUDs (APA, 2013).

The DSM-V breaks down PTSD into the following four symptom clusters (1) re-experiencing symptoms, (2) cognitive, behavioral, or emotional avoidance symptoms, (3) negative alterations in cognitions and mood (NACM), and lastly (4) increased arousal and/or reactivity symptoms. Symptoms from each cluster must be met for at least one month following exposure to a traumatic event (APA, 2013). Research examining the symptom clusters of PTSD have been mixed, and in most cases how shown that the four symptom clusters do not map on to the results from assessments done within populations exposed to trauma (e.g. Armour et al., 2015).

There are currently multiple models that are suggested, a separate DSM-5 Dysphoria Model (Miller et al., 2013) which has shown a better fit compared to the initial model, a 5-Factor Dysphoric Arousal Model (Elhai et al., 2011), two separate 6-factor models focused on anhedonia (Liu et al., 2014) or externalizing behaviors (Tsai et al., 2014) and most recently a 7-Factor Hybrid Model which combines the strengths of the two 6-factor models (Armour et al., 2015). The Hybrid Model breaks PTSD down into the following clusters: (1) intrusion symptoms, (2) cognitive, emotional, or behavioral
avoidance, and breaks the NACM cluster into (3) negative affect and (4) anhedonia which conforms to the Anhedonia model proposed by Liu et al. (2014), (5) externalizing behaviors conforming to the Externalizing Behaviors Model (Tsai et al., 2014), (6) anxious arousal, and (7) dysphoric arousal (Armour et al., 2015). In particular this model is strongly associated with anger and impulsivity (minus re-experiencing and avoidance clusters) which is important because research studies have found that there are different subtypes of veterans with a PTSD diagnosis (Armour et al., 2016; Miller, Greif, & Smith, 2003). This model may be able to better capture these subtypes due to the breakdown of the symptom clusters. In studies directly comparing the hybrid model to the other proposed models it has shown superior statistical fit (Armour et al., 2015; Armour et al., 2016). Additionally, these direct comparisons of models used a large sample of U.S. veterans with the majority being male veterans which is a fit for the sample of the current study. In multiple research studies, the 7-Factor Hybrid Model has shown superior fit compared to the other models and therefore this model is used in this study when examining PTSD symptom clusters (Armour et al., 2015; Armour et al., 2016).

Within the Hybrid Model there are multiple factors which may be relevant to erectile dysfunction. Barlow (1986) noted that negative affective responses in a sexual context may “predate the dysfunction and contribute to its etiology” (p. 145). The anhedonia symptom cluster follows closely with this research, because decreases in positive affect can lead to decreased enjoyment of activities (Armour et al., 2016) that were previously considered enjoyable such as sex. Negative affect and anhedonia have been noted as separate constructs and are treated as such within the Hybrid Model (Armour et al., 2016; Watson, 2005, 2009) Finally a factor which is common to all
models is avoidance. Barlow (1986) noted that negative affect can lead to “avoidance of erotic cues and thereby facilitate some sort of cognitive interference produced by focusing on non-erotic cues” (p. 145). In addition, experiential avoidance involves attempts to escape or avoid distressing internal experiences including memories, physical sensations, or thoughts (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Within PTSD symptoms there is an associated increase in arousal and intrusive thoughts which may be viewed as distressing and unwanted, and an individual may attempt to avoid these stimuli and at times misinterpret increased heart rate (due to a sexual response) with an increase in anxious arousal which is then to be avoided (Hayes et al., 1996).

Externalizing behaviors is the final factor within this model. Externalizing behaviors are commonly linked to anger, impulsivity, and risk-taking behaviors (Armour et al., 2016). Male veterans in particular are at a heightened risk for risk-taking behaviors (e.g. unprotected sex or thrill seeking) or impulsive actions such as illicit substance use or hypersexual disorder (HD) type behaviors (Howard 2007; Kimerling et al., 2014; Oster, 2017). Avoidance has also been connected with substance use and dependence, which, as covered later in the paper, may serve as a coping mechanism for these distressing experiences (Hayes et al., 1996; McDevitt-Murphy, Fields, Monahan, & Bracken, 2015). Each of these constructs are represented as symptom clusters within the Hybrid Model (Armour et al., 2015), and will be explored within this study.

Researchers have suggested that the prevalence sexual dysfunction in veterans with a PTSD diagnosis is higher than in the general population, and is higher among male combat veterans with a PTSD diagnosis compared to male combat veterans without a PTSD diagnosis (85% vs. 22% respectively; Cosgrove et al., 2002; Tran, Dunckel, &
Teng, 2015). Sexual health in this population is often overlooked in clinical settings (Helmer et al., 2013; Tran et al., 2015). High rates of comorbid mental and physical health disorders, medication, and/or symptoms of PTSD may be leading to this high prevalence rate (Tran et al., 2015). Avoidance and/or numbing symptoms of PTSD have been shown to be associated with sexual desire problems in OEF/OIF/OND male veterans (Badour et al., 2015). Multiple components of the biological, cognitive and affective symptoms of PTSD are associated with sexual dysfunction in this population though it is unclear what pieces are maintaining these issues or causing them (Yehuda et al., 2015). Exposure to traumatic events can disturb or possibly rupture many aspects of an individual’s life including support networks, safety, and general relationships with other individual (Yehuda et al., 2015). The high rates of exposure to trauma and the high rates of PTSD in this population place them at a unique risk for sexual dysfunction.

PTSD rates among service members and veterans are higher than the general population, and the highest rates among military members are those exposed to trauma such as combat or military sexual trauma (MST). In a recent study of US veterans, 12-month prevalence rates for PTSD are approximately 9.3% and 9.7% for male veterans specifically, which is nearly triple the prevalence rates in civilian populations (Haskell et al., 2011; Trivedi et al., 2015). Veterans with a PTSD diagnosis are at a heightened risk for developing additional comorbid disorder such as depression, anxiety, SUDs, and they are at a higher risk of physical health issues (Haskell et al., 2011; Trivedi et al., 2015; Oster et al., 2017). Accounting for lifestyle factors of the military, such as increased alcohol consumption or lower social desirability of expressing emotions, the risk for comorbid SUDs or dysfunctional coping strategies increases (Oster, 2017). Veterans with
a PTSD diagnosis are at risk for a variety of potentially maladaptive coping behaviors, which may include substance abuse, avoidance of internal states, or hypersexuality (Howard, 2007; Larner & Blow, 2011; Kimerling et al., 2014). Multiple studies have shown that veterans with PTSD, especially male veterans, are more likely to engage in multiple forms of risk-taking behaviors that include risky sexual behaviors (e.g. unprotected sex with strangers) and substance abuse (e.g. binge-drinking, illicit drug use). These risky behaviors increase the likelihood of physical health impairments such as sexually transmitted infections (STIs; Adler, Britt, Castro, McGurk, & Bliese, 2011; Killgore et al., 2008; Strom et al., 2012). It was found in a recent study that male veterans with PTSD may utilize some of these risk-taking behaviors (e.g. binge drinking) as a way to cope with stressful situations or negative internal states (Kimerling et al., 2014).

**Substance Use.** Alcohol Use Disorder (AUD) as defined by the DSM-V is a cluster of behavioral and physical symptoms that can include withdrawal, tolerance, and craving and this pattern of behaviors creates difficulties in functioning (APA, 2013). Twelve-month prevalence rates for AUD in the United States among adults aged 18 and older is approximately 8.5% with higher rates among men (12.4%) compared to women (4.9%; APA, 2013). Cultural attitudes toward alcohol, stress levels, and higher levels of impulsivity are highlighted as potential risk factors for AUD (APA, 2013). Alcohol dependence and heavy alcohol consumption have been associated with sexual dysfunction, including reduced libido and erectile dysfunction, and in one study the participants were found to have normal hormonal levels which seemed to indicate a psychological cause for the sexual dysfunction (Fahrner, 1987). Additionally, with the increased risk of sexual dysfunction created by increased consumption and binge
drinking, the sexual dysfunction itself increases difficulties in interpersonal functioning and intimate relationships (Arackal & Benegal, 2007; Fahrner, 1987).

Drug Use Disorders (DUDs) in the DSM-V include sedative/tranquilizer, cannabis, amphetamine, cocaine, opioid, hallucinogen, and other forms of illicit substances (APA, 2013; Grant et al., 2016). The 12-month prevalence rate for DUDs in a general population sample were 3.9% and the lifetime prevalence rate was 9.9%, with the rates generally higher for men than women (Grant et al., 2016). Comorbid AUD increases the risk for a DUD diagnosis when compared to those who are not abusing or dependent on alcohol, and a comorbid mental illness diagnosis increases the risk for developing a SUD diagnosis (APA, 2013; Kurti et al., 2016).

There is a high level of comorbidity between PTSD and SUDs, with some estimates for males with PTSD in the general population being approximately 52% for alcohol use and 35% for drug use (Kimerling et al., 2014). The DSM-V indicates that some substance classes are associated with sexual dysfunctions such as alcohol, opioids, stimulants, and sedatives particularly during either intoxication or withdrawal (APA, 2013). Service members and veterans who have reported Military Sexual Trauma (MST) and have a PTSD and/or SUDs diagnosis are at an increased risk for a sexual dysfunction diagnosis (Turchik, Pavao, Nazarian, Iqbal, McLean, & Kimerling, 2012). SUDs are associated with higher levels of impairment in important areas of functioning, increased suicide risk, diminished quality of life, physical health risks, and other negative outcomes (APA, 2013; Grant et al., 2016). Negative emotionality, affective blunting or dysregulation, and experiential avoidance are associated with substance abuse due to some substances having a potentially positive effect on mood and negative emotions.
Due to the common nature of sexual dysfunction in individuals with substance use disorders, assessing for sexual dysfunction is recommended (Arackal & Benegal, 2007; Fahrner, 1987). Substance Use Disorders (SUDs) comprising both AUDs and DUDs are among the most common health conditions among US veterans, and there is an increasing number of veterans being treated for substance use (Chiao-Wen et al., 2016). Substance use creates a new set of impairments for the veteran or military member who may already be struggling to cope with PTSD such as negatively reinforcing avoidant behavior in response to negative internal states. More severe PTSD symptoms have been associated with increased problem behaviors such as substance abuse among veterans and military personnel (Brown, Williams, Bray, & Hourani, 2012). A qualitative study examining the function of binge drinking in veterans found veterans with PTSD engaged in binge drinking as a way to cope with their PTSD symptoms and the memories associated with trauma (McDevitt-Murphy et al., 2015). Results from a survey given to active duty U.S. military members has shown a sharp increase in heavy alcohol use, which may indicate self-medicating due to mental issues such as PTSD (Bray et al., 2010). Illicit drug use in the military as of 2008 remained relatively low except for prescription drug misuse which has steadily been on the rise among active duty military members since 2005 (Bray et al., 2010). Veterans with PTSD and a comorbid alcohol use disorder (AUD) diagnosis have been shown to have increased health complaints, absences from work, poorer treatment prognosis, and worse relationship issues compared to veterans with only one or none of these diagnoses (Schumm, Monson, O’Farrell, Gustin, & Chard, 2015). Substance use disorders in the veteran population have been associated with a worse prognosis for
health care utilization and higher mortality rates, indicating that assessing for and treating substance use in this population is incredibly important (Trivedi et al., 2015).

**Hypersexuality.** Hypersexual Disorder (HD) was a proposed diagnosis for DSM-V that has its operational criteria definitions based upon two well-established DSM-IV-TR sexual disorders: Hypoactive Sexual Desire Disorder and the Paraphilias (Kafka, 2010). A field trial showed that the diagnostic criteria for HD have high levels of reliability and validity (Reid et al., 2012). The proposed diagnostic criteria for HD includes:

“A. Over a period of at least 6 months, recurrent and intense sexual fantasies, sexual urges, and sexual behavior in association with four or more of the following five criteria: 1. Excessive time is consumed by sexual fantasies and urges, and by planning for and engaging in sexual behavior. 2. Repetitively engaging in these sexual fantasies, urges or behavior in response to dysphoric mood states (e.g. anxiety, depression, boredom, irritability). 3. Repetitively engaging in sexual fantasies, urges or behaviors in response to stressful life events. 4. Repetitive but unsuccessful efforts to control or significantly reduce these sexual fantasies, urges and behavior. 5. Repetitively engaging in sexual behaviors while disregarding the risk for physical or emotional harm to self or others. B. There is clinically significant personal distress or impairment in social, occupational or other important areas of functioning associated with the frequency and intensity of these sexual fantasies, urges or behaviors. C. These sexual fantasies, urges or behaviors are not due to the direct physiological effect of an exogenous substance (e.g., a drug of abuse or medications), a co-occurring
general medical condition, or to manic episodes. D. The person is at least 18 years of age. Specify if: masturbation, pornography, sexual behavior with consenting adults, cybersex, telephone sex, and strip clubs” (Kafka, 2010, p. 379; Reid et al., 2012, p. 2869).

Hypersexual behavior can include compulsive masturbation, pornography dependence, protracted promiscuity, excessive online sexual pursuits, solicitation of commercial sex workers, unsafe sexual practices and the negative consequences associated with these behaviors such as STI (Bancroft & Vukadinovic, 2004; Reid, Harper, & Anderson, 2009;). The age requirement was put into place to exclude adolescents who are exploring their sexual identities or engaging in sexual experimentation (Kafka, 2013). This age exclusion criterion additionally highlights the importance of the personal distress, relationship issues, and other serious consequences associated with HD, even though adolescents may have some of the features of HD it is unlikely they will have the levels of distress and impairment associated with HD (Kafka, 2013). This age exclusion is analogous to alcohol use, it may begin in adolescence but the progression of alcohol use to alcohol dependence is more likely to occur in adulthood (Kafka, 2013). Hypersexuality has been used interchangeably with sexual addiction, sexual compulsivity, compulsive sexual behavior(s), or sexual impulsivity (Bancroft & Vukadinovic, 2004). Ultimately HD was not included in the DSM-5 due to objections that there was insufficient data that the proposed criteria represented a distinct clinical disorder, potential misuse of HD diagnosis in a forensic setting, pathologizing “normal” sexual behaviors, or providing “a medicalized excuse for immoral conduct” (Kafka, 2014). HD should be considered an impulsivity disorder, and not necessarily a sexual

Hypersexuality has been associated with sexual dysfunction, such as erectile dysfunction and reduce libido, even in males who are married or in a committed intimate relationship (Klein, Jurin, Briken, & Štulhofer, 2015). Potentially engaging in increased frequency of hypersexual behaviors, such as masturbation or pornography viewing, could lead to erectile dysfunction (Klein et al., 2015). Additional factors such as anxiety, sexual boredom, or relationship problems may influence the relationship between hypersexuality and sexual dysfunction (Klein et al., 2015). Hypersexuality has been associated with dangerous outcomes such as STIs. Additionally, there is some indication that hypersexuality may be associated with addictive behaviors such as gambling addiction and SUDs (Kraus et al., 2017; Nelson & Oehlert, 2008; Smith et al., 2014). Hypersexuality may potentially serve as a coping strategy in response to distressing internal states such as depression, anxiety, or trauma (Howard, 2007; Wetterneck, Burgess, Short, Smith, & Cervantes, 2012). Individuals who meet criteria for hypersexuality tend to be much more experientially avoidant and have higher levels of impulsivity, which may indicate poorer self-regulation and could be tied to poor decision making (Garofalo, Velotti, & Zavattini, 2016; Wetterneck et al., 2012). Hypersexuality may be a maladaptive strategy due to emotional dysregulation and lack of appropriate emotional regulation strategies (Garofalo, Velotti, & Zavattini, 2016; Reid, Harper, & Anderson, 2009). Negative affect and a lack of adaptive coping strategies may keep hypersexual individuals stuck in their maladaptive pattern of hypersexual behaviors (Reid, Harper, & Anderson, 2009).
In a study examining hypersexuality in a military sample, increasing severity of PTSD was associated with a higher probability of engaging in hypersexuality, while depression and anxiety disorders are not significantly associated with hypersexuality (Kraus et al., 2017; Nelson & Oehlert, 2008; Smith et al., 2014). This potentially indicates heightened levels of avoidance have manifested in increasingly maladaptive behaviors as a result of the need to avoid distressing stimuli. Additionally, the authors noted that “the prevalence of CSB [compulsive sexual behavior], although it dropped over the course of follow-up, appeared considerably higher than published population estimates for CSB, suggesting that male veterans may be at particularly high risk for CSB” (Smith et al., 2014, p. 217). Findings in similar studies examining hypersexuality in the military and veteran population have found increased levels of hypersexuality compared the levels in the civilian population (Kraus et al., 2017; Smith et al., 2014). More studies examining hypersexuality in military samples and veteran samples are needed to fully understand the prevalence, maintaining, and risk factors unique to this sample (Kraus et al., 2017). The potential detrimental health effects of hypersexuality can have severe implications on physical health, mental health, and social well-being for military personnel and veterans.

**Conclusion**

There is a growing body of literature that is addressing sexual functioning in the OEF/OIF/OND veteran population. Sexual dysfunction is a problem that further exacerbates the difficulties already faced by veteran or military member, especially considering the increased distress associated with issues like erectile dysfunction for both the individual and partners. Younger males are more likely to face sexual dysfunction due
to emotional distress or psychological disorders, and the OIF/OEF/OND generation of
veterans currently face a heightened risk for PTSD, SUDs, and HD (Hirsch, 2009; Kraus
et al., 2017; Smith et al., 2014; Zhang et al., 2006). Decreased sexual functioning may
deteriorate overall life satisfaction (Flynn et al., 2016; Fugl-Meyer et al., 1997) and
worsening interpersonal relationships that are necessary for positive mental wellbeing
and healthy coping (Goff et al., 2007; Hayes et al., 2010; Nunnink, et al., 2012).

Current research has identified a few disorders that are associated with sexual
dysfunction (e.g. reduced libido, erectile dysfunction) in both the general and veteran
population and these include PTSD, SUDs, and HD (Fahrner, 1987; Hirsch, 2009;
Letourneau, et al., 1997; Kraus et al., 2017; McIntyre-Smith, St. Cyr, & King, 2015;
Smith et al., 2014). The OEF/OIF/OND generation of veterans are at a heightened risk
for these disorders, and have been shown to have higher prevalence rates of sexual
dysfunction compared to the general population particularly those with a PTSD diagnosis
(Tran et al., 2015). When we examine the literature, each of these potential predictive
factors of sexual dysfunction, common themes of negative affect, avoidance and/or poor
coping skills are associated with or symptomatic of PTSD, SUDs, and HD (e.g. Barlow,
1986, Hayes et al., 1996). Avoidance or numbing of internal experiences such as
memories or emotions is a common feature of PTSD; which can be associated
maladaptive coping strategies such as SUDs or HD, which has a spiraling effect of
deteriorating physical, social, and mental well-being in military members and veterans
(Chawla & Ostafin, 2007; Hayes et al., 1996; Howard, 2007; Kimerling et al., 2014).

Sexual dysfunction and erectile dysfunction have higher prevalence rates in the
OEF/OIF/OND generation of veterans compared to the civilian population (Hosain et al.,
2013; Tran et al., 2015; Wilcox et al., 2014). Within these studies PTSD and underlying symptom clusters (e.g. anhedonia) are associated with erectile dysfunction and service members and veterans with a PTSD diagnosis have higher rates of erectile dysfunction compared to those without a PTSD diagnosis (Tran et al., 2015). Substance use is associated with higher levels of sexual dysfunction which can be through physiological changes caused by the substance or associated with psychological symptoms such as avoidance (APA, 2013; Kimerling et al., 2014). HD has been associated with sexual dysfunction in males (Klein et al., 2015). Each of these disorders has been shown to be prevalent in the military and veteran population and often comorbid with one another. Understanding the association between PTSD (and its symptom clusters), SUDS, and HD with erectile dysfunction can help inform future research and assessments in a clinical setting, particularly with this highly vulnerable population.

**Purpose Statement**

Erectile dysfunction is among the most common sexual dysfunctions that men meet diagnostic criteria for (APA, 2013). Male service members and veterans under the age of 40 represent a highly vulnerable population who struggle with this issue at higher rates than their civilian counterparts (Hosain et al., 2013; Tran et al., 2015; Wilcox et al., 2014). PTS symptoms represent a commonly associated risk factor for this issue. PTS symptoms are hypothesized to account for the majority of the variance in the erectile dysfunction outcome variable for this study, followed by alcohol misuse, drug misuse, and hypersexuality. Specific types of symptoms have been related to erectile dysfunction including anhedonia (emotional numbing), avoidance, negative affect, and externalizing behaviors (Barlow, 1986; Hayes et al., 1996; Howard, 2007; Kimerling et al., 2014; Oster
et al., 2017; Tran et al., 2015). Examining the symptom clusters of PTSD can help to link increases in PTS symptom severity clusters to sexual functioning which can help inform clinical assessments and potentially clinical interventions. This study is examining which disorders are significantly associated with erectile dysfunction, and exploring which PTS symptom clusters are significantly associated with and explain the most variance within erectile dysfunction. The primary purpose of this study is to examine the variance accounted for in erectile dysfunction by PTS symptoms, alcohol and drug misuse, and hypersexuality while controlling for age and deployment status. This study is also conducting exploratory analyses of the seven symptom clusters proposed by Armour et al. (2015), to determine which symptom clusters account for more variance in erectile dysfunction compared to the full range of PTS symptoms. The primary predictions of the current study are:

1. PTS symptoms (PCL-5 scores) will be significantly associated with sexual dysfunction in this sample followed by alcohol use, drug use, and hypersexuality respectively.

2. The following symptoms clusters from the PCL-5, from the hybrid model (Armour et al., 2015) will be significantly associated with sexual dysfunction: avoidance, negative affect, anhedonia, and externalizing behaviors.
CHAPTER III

METHODS

Participants

Veterans and currently serving military males were recruited via Facebook to complete a survey battery focusing on sexual health and relationship quality among males. Facebook has been shown to be an effective and efficient means of recruiting veterans in need of care in previous studies (Pedersen et al., 2015; Pedersen & Kurz, 2016; Pedersen, Naranjo, & Marshall, 2017). The current study is using this sample and a subset of the measures used for the original study. The primary purpose of the original study was to assess the association between relationship satisfaction, sexual satisfaction, and sexual functioning in male service members and veterans. The survey battery that was administered included assessments for substance use, anxiety and depressive disorders, and trauma related disorders. For participants to be eligible for the study they needed to be male, at least 18 years old, and either currently serving or have served in the U.S. armed forces in some capacity (e.g. active duty, reserve, or National Guard). Participants who met inclusion criteria were provided a Utah State University (USU) Institutional Review Board (IRB) approved Letter of Information (LoI) rather than an informed consent document that required a participant to provide their name. A traditional informed consent document would have been the only form for this study that included Personally Identifiable Information (PII) since the rest of the data was not linked to a specific name. Participants were offered $15 as an incentive to complete the survey battery. For those who elected to receive the compensation, they were directed to a
separate Qualtrics survey where they provided their name and address to receive the compensation. The original study and the current study were approved by the USU IRB.

**Measures**

*The PTSD Checklist for DSM-5 (PCL-5)* is a 20-item Likert-type checklist that covers the 20 PTSD symptom criteria in the DSM-5, and contains four subscales that match the symptom clusters in the DSM-5 (Weathers, Litz, Keane, Palmieri, Marx, & Schnurr, 2013; Blevins, Weathers, Davis, Witte, & Domino, 2015). There are two versions of the PCL-5, one includes a section to assess a Criterion A event and the other excludes the Criterion A event. The participants are asked to rate to what degree they were affected by different PTSD symptoms within the past month. The Likert scale ranges from 0 to 4, with a 0 representing “not at all” and 4 representing “extremely.” A total score is summed with greater scores indicating higher levels of PTSD symptom severity. A variety of potential cut-off scores have been identified, a score of 50 or higher has been used for treatment seeking individuals to identify “probable PTSD” (Frankfurt, Anders, James, Engda, & Winskowski, 2015). While in other samples a cut-off score of 40 has been used (Blevins et al., 2015), and cut scores of 31-33 have also been recommended as sufficient for diagnosing PTSD (Bovin et al., 2016). The latter score of 31-33 was used in a veteran sample while others suggest using a higher cut-score based on population (Bovin et al., 2016; Blevins et al., 2015). The PCL-5 has strong test-retest reliability ($r=.82$), and convergent ($rs=.74$ to $.85$) and discriminant ($rs=.31$ to $.60$) validity (Blevins et al., 2015). The PCL-5 data in the current dataset was found to be highly reliable ($\alpha=.97$).

This paper is assessing the seven symptom clusters in the Hybrid Model proposed by Armour et al. (2015). The first symptom cluster is the *intrusion* cluster, consisting of
items 1-5, with a range of 0-20. The second cluster is the *avoidance* cluster, composed of items 6 and 7, and has a range of 0-8. The next symptom cluster is the *negative affect* cluster, composed of items 8-11, and has a range of 0-16. The fourth symptom cluster is the *anhedonia* cluster, comprised of items 12-14, with a range of 0-12. The next symptom cluster is the *externalizing behaviors* cluster, composed of two items (15 & 16), with a possible range of 0-8. The sixth symptom cluster that is tested is the *anxious arousal* cluster, composed of items 17 and 18, with a possible range of 0-8. The final symptom cluster is *dysphoric arousal*, with a range of 0-8, composed of items 19 and 20.

*The Alcohol Use Disorders Identification Test-Consumption (AUDIT-C)* measure consists of the first three items from the AUDIT measure and focuses on typical alcohol consumption focusing on frequency, quantity, and pattern of drinking (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). It is the standard alcohol screening measure used by Veterans Affairs (Bush, et al., 1998). The AUDIT-C is a shorter version of the AUDIT and has been shown to be just as efficient as the full-scale version (Bush et al., 1998; Jeong, et al., 2017). Each item is answered using scaled responses ranging from zero to four, with the wording of the responses varying depending upon the item. A total score is summed, with higher scores indicating increased likelihood of alcohol abuse or dependence. There are two clinically significant cut offs for the AUDIT-C, a score of 7.5 is used to indicate an alcohol use disorder, and a score of 8.5 is used to indicate alcohol dependence when screening a patient seeking care (Jeong et al., 2017). The Cronbach’s alpha for the AUDIT-C in the current dataset is adequately reliable ($\alpha = .701$).

*The Drug Abuse Screen Test 10 (DAST 10)* is a 10-item measure that is used to screen for drug use disorders (Perez-Lopez, Villalobos-Gallegos, Graue-Moreno, Marin-
Navarrete, & Mendoza-Hassey, 2015). Each item has two potential responses, “yes” or “no,” on most items a “yes” is scored as a one and “no” is scored as a zero, item three is reverse scored. A total score is summed, with higher scores indicating increased severity of drug use or dependence. A cut-off score of 3 or higher indicates a possible drug use disorder and represents clinically significant distress or impairment (Perez-Lopez et al., 2015). The test-retest reliability of the DAST-10 has been shown to be adequate ($r_s = .71$ to .78), and has strong internal consistency ($\alpha = .86$ to .94) (Yudko, Lozhkina, & Fouts, 2007). The Cronbach’s alpha for the DAST-10 in the current data set is adequate ($\alpha = .73$) which is lower when compared to previous studies using the DAST-10.

The Sexual Compulsivity Scale (SCS) is a 10-item Likert-type measure that assesses sexually compulsive behavior, intrusive thoughts and preoccupations with sexual activities or urges (Kalichman & Rompa, 2001). Potential responses to each item range from 1 to 4, with the responses labeled as “not at all like me” to “very much like me.” A total score is averaged based on the total score and the total number of items answered, with higher scores indicate increased hypersexuality. Two cut-off scores have been identified based on biological sex, for males a cut-off score of 2.1 or higher represents clinically significant distress or impairment (Kalichman & Rompa, 2001). Depending upon the population the SCS has shown acceptable test-retest reliability ($r_s = .64$ to .95) (Kalichman & Rompa, 2001). The SCS data in the current dataset shows high reliability ($\alpha = .97$).

Outcome variable

The Sexual Health Inventory for Men (SHIM) also knowns as the International Index of Erectile Function (IIEF-5), is a 5-item Likert-type diagnostic tool for erectile
dysfunction and sexual satisfaction over the past 6 months (Cappelleri et al., 2001; Rosen et al., 1999). The responses range from 0 to 5, with 0-point responses generally indicating no sexual activity or the participant did not attempt intercourse, and 5-point responses indicating “Always or almost always.” A total score is summed, with lower scores indicating decreased sexual functioning. When scoring the SHIM there are five severity levels, “none” (scores 22-25) to “severe” (scores 5-7) (Rosen et al., 1999). The SHIM is used as the outcome measure for sexual dysfunction in this study. The SHIM data in the current sample shows high reliability (α =.926).

Covariates

Participant age and whether they deployed during their time in the military serve as the covariates in the study. Depression will not be controlled for in this study for the following reasons: depression is a mental disorder which can remit on its own without therapy; depression is generally episodic in nature and is not as stable or chronic when compared to PTSD and substance abuse disorders; and depression may occur due to avoidance which can be explained by maladaptive coping strategies due to PTSD (American Psychiatric Association, 2013; Hassija, Luterek, Naragon-Gainey, Moore, & Simpson, 2012).

Procedure

The Utah State University Institutional Review Board approved the current study and participants provided informed consent prior to engaging in the larger study. A subset of measures focused on PTSD, substance use, hypersexuality, and sexual functioning from the larger study were used in this study. To maintain anonymity of the participants all data were de-identified prior to analysis.
**Analyses**

Statistical analyses were conducted with R 3.5.1 in RStudio (R Core Team, 2018; RStudio Team, 2015) using the following packages: haven (Wickham & Miller, 2018), tidyverse (Wickham, 2017), furniture (Barrett, Brignone, & Laxman, 2018), sandwich (Zeileis, 2004), and lmtest (Zeileis & Hothorn, 2002). The data were cleaned prior to analysis checking for outliers and any violations of assumptions for linear regressions. Descriptive statistics were used to evaluate sample characteristics and demographics. To test for potential differences between participants included in the final model and participants who were excluded, independent samples t-tests and Chi-Square tests were conducted using the “Table 1” function from the “furniture” package in R. The groups were compared on age, race/ethnicity, service, rank, branch of the military, and deployment status. A total of eight multiple linear regressions were conducted. The first multiple linear regression is regressing erectile dysfunction on PTS symptoms (full PCL-5), alcohol misuse, drug misuse, and hypersexuality while controlling for age and deployment status. The seven subsequent regressions assess each of the seven symptom clusters from the hybrid model (Armour et al., 2015), while controlling for age, deployment status, AUDIT-C, DAST-10, and SCS scores.

Given the number of statistical tests conducted in the seven secondary regression equations, the familywise error rate was addressed using the Benjamini-Hochberg false discovery rate (FDR) procedure (Benjamini & Hochberg, 1995). The power of the FDR method is generally larger than other methods, and is not as overly conservative as the traditional Bonferroni correction (Benjamini & Hochberg, 1995). The FDR approach adjusts \( p \) values to maintain a single overall Type I error rate \( (Q < .05) \) for all of the tests.
in the sets of models. $P$ values are first ranked in ascending order and then corrected according to the total number of tests conducted. FDR adjusted $p$-values are only reported for the symptom cluster regressions, because these analyses are exploratory correcting for inflated Type I error is necessary.
CHAPTER IV

Results

Demographic Information

Veterans and currently serving military males \( (n = 779) \) initiated the survey screening questions. Of those who initiated the screening questions, 556 (71.4%) provided consent to participate in the study and started the survey battery. Age was provided by 504 participants. Of the 556 participants 506 (91%) provided information regarding their race/ethnicity. Five hundred and five (99.8%) military members and veterans provided information regarding their type of service (e.g. active duty, reserves, National Guard). Of the 556 consenting participants 454 (81.65%) provided information regarding their branch of service, 448 (80.58%) provided their current rank or rank at discharge, and 450 (81%) provided information about whether they had deployed or not during their service. One hundred and thirty participants did not complete the Sexual Health Inventory for Men. Of the 556 participants 389 (69.96%) completed the PTSD Checklist for DSM-5. Two hundred and twenty-seven (40.82%) participants did not fully complete the Sexual Compulsivity Scale. Of the 556 veterans and military members who provided consent, 317 (57%) did not complete the Alcohol Use Disorder Identification Test-Consumption, and 262 (47.12%) did not complete the Drug Abuse Screening Test-10. Full information was provided by 213 (38.31%) in this study and comprises the current sample. The entire sample \( (N = 213) \) used in this study was male, and the majority of the sample identified as White (88.2%). The majority of the sample is serving or has served on active duty (81.2%), affiliated with the Army (56.8%), either senior enlisted
(E5-E9, 50.5%) or junior enlisted (E1-E4, 36.7%), and reported at least one deployment (75.6%). The mean age for this sample was 38 (SD = 10.7).

When comparing those who met inclusion criteria and those who did not, on multiple descriptive statistics there was only one variable, age, that approached a statistically significant difference. The participants who completed were included in this study tended to be younger ($M = 38, \ SD = 10.7, \ n = 213$) compared to the participants ($n = 293$) who did not complete all of the measures and demographic information used in this study ($M = 39.8, \ SD = 10.7, \ t(456.26) = 1.918, \ p = .0557$).

**Descriptive Statistics of the Measures**

Table 1 reports the means, standard deviations, and correlations for SHIM, with age used as a covariate, and the predictor variables in the model. The AUDIT-C and DAST-10 were significantly negatively correlated with age. DAST-10 scores and SCS scores were both significantly positively correlated with PCL-5 scores. DAST-10 scores were significantly positively correlated with AUDIT-C scores, and SCS scores were significantly correlated with DAST-10 scores.

**Table 1**  
*Means, Standard Deviations, and Correlations for SHIM scores, Age, PCL-5 scores, AUDIT-C scores, DAST-10 scores, and SCS Scores*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$M$</th>
<th>$SD$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SHIM</td>
<td>20.4</td>
<td>5.8</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Age</td>
<td>38</td>
<td>10.7</td>
<td>-0.28**</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. PCL-5</td>
<td>43.4</td>
<td>20.5</td>
<td>-0.29**</td>
<td>-0.05</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. AUDIT-C</td>
<td>4</td>
<td>2.4</td>
<td>0.12</td>
<td>-0.14*</td>
<td>0.07</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. DAST-10</td>
<td>0.5</td>
<td>1</td>
<td>-0.06</td>
<td>-0.15*</td>
<td>0.14*</td>
<td>0.19**</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>6. SCS</td>
<td>1.5</td>
<td>0.6</td>
<td>-0.14*</td>
<td>-0.08</td>
<td>0.37**</td>
<td>0.06</td>
<td>0.19**</td>
<td>---</td>
</tr>
</tbody>
</table>

*p < .05.

**p < .001.

N= 213.
Clinical Interpretation of the Measures

The mean SHIM score for this sample of 20.4 ($SD = 5.8$), indicates that the mean score for this sample would fall within the “mild erectile dysfunction” category (Cappelleri et al., 2001; Rosen et al., 1999). The mean PCL-5 score for this sample was 43.4 ($SD = 20.5$), a tentative clinically significant cut score for the PCL-5 is 31-33 when working with this population (Bovin et al., 2016). Because there was no assessment for a Criterion A event for this study this score represents clinically significant PTS symptom severity. The average AUDIT-C score for this sample ($M = 4$, $SD = 2.4$), average DAST-10 score ($M = 0.5$, $SD = 1$), and mean SCS score ($M = 1.5$, $SD = 0.6$) each fall below the cut-off scores for clinically significant distress or impairment (Jeong et al., 2017; Kalichman & Rompa, 2001; Perez-Lopez et al., 2015).

Regression Model with Full Measures Results

Erectile dysfunction was regressed on PTS symptoms, alcohol misuse, drug misuse, and sexual compulsivity while controlling for the effects of age and deployment status. After plotting the linear regression, heteroscedasticity was detected. Due to heteroscedastic residuals, heteroscedasticity-consistent standard errors were generated in R using the HC3 method (Darlington & Hayes, 2017; Long & Ervin, 2000; Zhou, Song & Thompson, 2015). This approach adjusts the standard errors to be consistent, helping to maintain the appropriate Type-I error rate. The HC3 method is the recommended version to use in samples $N \leq 250$ (Long & Ervin, 2000). The estimate, $p$-value, standard errors, along with the robust standard errors and robust $p$-values are reported in Table 2.

Table 2. Estimates, Standard Error, $p$-value, Robust Standard Error, and Robust $p$-value

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>$p$-value</th>
<th>Robust SE</th>
<th>Robust $p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age**</td>
<td>-0.165</td>
<td>0.035</td>
<td>$&lt;.001^{**}$</td>
<td>0.04</td>
<td>$&lt;.001^{**}$</td>
</tr>
<tr>
<td>Deployment Status*</td>
<td>-1.166</td>
<td>0.901</td>
<td>.197</td>
<td>0.93</td>
<td>.21</td>
</tr>
</tbody>
</table>
The overall model and individual regressors were assessed for their significance in accounting for the variance in the outcome variable of SHIM scores. Erectile dysfunction severity was regressed onto PTS symptoms, alcohol misuse, drug misuse, severity of sexual compulsivity, and covariates of age and deployment status, $F(6, 206) = 8.202, p < .001$, and accounted for 19.28% of the variance in erectile dysfunction. Higher levels of erectile dysfunction severity were significantly associated with higher PTS symptoms, and age. For a one unit increase in PTS symptoms there was an associated -0.09 decrease in SHIM scores when controlling for all other variables. Prior to adjusting for heteroscedasticity, AUDIT-C scores were approaching significance ($p = .078$), while all other variables were non-significant nor approaching significance. After adjusting for heteroscedasticity, PTS symptoms, ($p < .001$) and the covariate of age ($p < .001$), were the only significant variables. The following regressions are exploratory to determine which symptoms clusters, if any, are significantly associated with erectile dysfunction.

**Regression Model with Intrusion Cluster Results**

Erectile dysfunction severity was regressed on the *intrusion* symptom cluster and covariates of age, deployment status, alcohol misuse, drug misuse, and sexual compulsivity. The regression model was plotted and heteroscedastic residuals were detected within this regression and subsequent regressions. The same HC3 method noted previously was used for all of the symptom cluster regressions. Robust SE’s and robust $p$-
values are reported for each of the regressors, and FDR-adjusted \( p \)-values are reported for the PCL-5 symptom clusters only as they are the items being compared across multiple tests. Each of these values for the intrusion cluster regression are reported in Table 3.

Table 3. Estimates, Standard Error, \( p \)-value, Robust Standard Error, Robust \( p \)-value, & FDR-adjust \( p \)-value

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>( p )-value</th>
<th>Robust SE</th>
<th>Robust ( p )-value</th>
<th>FDR ( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age**</td>
<td>-0.17</td>
<td>0.035</td>
<td>&lt;.001</td>
<td>0.043</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deployment Status*</td>
<td>-0.88</td>
<td>0.89</td>
<td>.33</td>
<td>0.93</td>
<td>.35</td>
<td>.33</td>
</tr>
<tr>
<td>PCL-5 Intrusion**</td>
<td>-0.25</td>
<td>0.076</td>
<td>.001</td>
<td>0.091</td>
<td>.006</td>
<td>.002</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>0.26</td>
<td>0.155</td>
<td>.10</td>
<td>0.19</td>
<td>.17</td>
<td>.17</td>
</tr>
<tr>
<td>DAST-10</td>
<td>-0.47</td>
<td>0.37</td>
<td>.21</td>
<td>0.37</td>
<td>.20</td>
<td>.24</td>
</tr>
<tr>
<td>SCS</td>
<td>-0.85</td>
<td>0.62</td>
<td>.17</td>
<td>0.85</td>
<td>.32</td>
<td>.24</td>
</tr>
</tbody>
</table>

** \( p < .01 \).
N = 213.
*Reference group is “yes”.

The overall regression model was significant, \( F(6, 214) = 7.065, p < .001 \), and accounted for 16.53% of the variance in erectile dysfunction. This model accounts for less variance than the first model that was conducted (\( R^2 = .1928 \) vs \( R^2 = .1419 \)). Higher levels of intrusive PTS symptoms are associated with higher levels of erectile dysfunction severity (\( t(1) = -2.73, p < .001 \)). Older age is associated with higher levels of erectile dysfunction severity, and no other covariates are significantly associated with erectile dysfunction severity in this model.

Regression Model with Avoidance Cluster Results

Erectile dysfunction severity was regressed on PTS *avoidance* symptoms with covariates of age, deployment status, alcohol misuse, drug misuse, and sexual compulsivity. The results of this regression are reported in Table 4, and include the initial estimate, SE, \( p \)-values, robust SE, robust \( p \)-value, and FDR-adjust \( p \)-value.
Table 4. Estimates, Standard Error, p-value, Robust Standard Error, Robust p-value, & FDR-adjust p-value

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>p-value</th>
<th>Robust SE</th>
<th>Robust p-value</th>
<th>FDR p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age**</td>
<td>-0.17</td>
<td>0.035</td>
<td>&lt;.001</td>
<td>0.04</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deployment Statusa</td>
<td>-1.03</td>
<td>0.878</td>
<td>.24</td>
<td>0.95</td>
<td>.28</td>
<td>.24</td>
</tr>
<tr>
<td>PCL-5 Avoidance**</td>
<td>-0.58</td>
<td>0.155</td>
<td>&lt;.001</td>
<td>0.19</td>
<td>.002</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>0.31</td>
<td>0.153</td>
<td>.046</td>
<td>0.18</td>
<td>.085</td>
<td>.08</td>
</tr>
<tr>
<td>DAST-10</td>
<td>-0.45</td>
<td>0.372</td>
<td>.23</td>
<td>0.36</td>
<td>.22</td>
<td>.24</td>
</tr>
<tr>
<td>SCS</td>
<td>-0.95</td>
<td>0.613</td>
<td>.12</td>
<td>0.83</td>
<td>.25</td>
<td>.17</td>
</tr>
</tbody>
</table>

*p<.05
** p < .01.
N = 216.
a Reference group is “yes”.

The overall regression model is significant, $F(6, 217)=7.821$, $p<.001$, and accounted for 17.78% of the variance in erectile dysfunction. Higher levels of avoidance symptoms are associated with more severe erectile dysfunction ($t(1)=-3.06$, $p<.001$). For a one unit increase in avoidance symptoms there is an associated 0.58 decrease in erectile functioning. Age was the only covariate in this model that is significantly associated with worsening erectile dysfunction before and after robustification. Prior to robustification, alcohol misuse was significantly associated with erectile dysfunction, following robustification and the FDR correction it was no longer significantly associated with erectile dysfunction. No other covariates were significant or approaching a significant association with erectile dysfunction.

Regression Model with Negative Affect Cluster Results

Erectile dysfunction severity was regressed on PTS negative affect symptoms while controlling for age, deployment status, alcohol misuse, drug misuse, and sexual compulsivity. Table 5 reports the standard errors, various $p$-values, and estimates for this regression model.
Table 5. Estimates, Standard Error, p-value, Robust Standard Error, Robust p-value, & FDR-adjust p-value

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>p-value</th>
<th>Robust SE</th>
<th>Robust p-value</th>
<th>FDR p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>-0.17</td>
<td>0.035</td>
<td>&lt;.001</td>
<td>0.04</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deployment Status(^a)</td>
<td>-1.01</td>
<td>0.88</td>
<td>.25</td>
<td>0.96</td>
<td>.29</td>
<td>.25</td>
</tr>
<tr>
<td><strong>PCL-5 Negative Affect</strong></td>
<td>-0.36</td>
<td>0.094</td>
<td>&lt;.001</td>
<td>0.11</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>0.26</td>
<td>0.15</td>
<td>.092</td>
<td>0.18</td>
<td>.15</td>
<td>.16</td>
</tr>
<tr>
<td>DAST-10</td>
<td>-0.47</td>
<td>0.39</td>
<td>.23</td>
<td>0.42</td>
<td>.27</td>
<td>.25</td>
</tr>
<tr>
<td>SCS</td>
<td>-0.79</td>
<td>0.63</td>
<td>.21</td>
<td>0.85</td>
<td>.35</td>
<td>.25</td>
</tr>
</tbody>
</table>

\(^{**}\) p < .01.
N = 215.
\(^a\) Reference group is “yes”.

This regression model overall was statistically significant, \(F(6, 216)=7.893,\) \(p<.001,\) and accounted for 17.98% of the variance in erectile dysfunction severity.

Increases in negative affect are associated with worsening levels of erectile dysfunction. For a one unit increase in negative affective symptoms there is an associated 0.36 worsening in erectile dysfunction severity. As with previous regressions in this paper, increased age was associated with worsening erectile dysfunction. No other covariates are significantly associated with or approaching a significant association with erectile dysfunction severity.

Regression Model with Anhedonia Cluster Results

Erectile dysfunction severity was regressed on PTS anhedonia symptoms, while controlling for age, deployment status, alcohol use, drug use, and sexual compulsivity. The overall regression was significant, \(F(6, 216)=9.896,\) \(p<.001,\) and accounted for 21.56% of the variance in erectile dysfunction severity. Increases in anhedonia symptoms are associated with a worsening of erectile dysfunction severity. A one unit increase in anhedonia symptoms is associated with a .54 unit worsening in erectile functioning.
Increased age is the only covariate that is significantly associated with a worsening in erectile dysfunction severity. Table 6 reports the results of the regression model prior to and after robustification, along with the FDR-adjusted $p$-value for the anhedonia symptom cluster.

Table 6. *Estimates, Standard Error, p-value, Robust Standard Error, Robust p-value, & FDR-adjust p-value*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>p-value</th>
<th>Robust SE</th>
<th>Robust p-value</th>
<th>FDR p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age**</td>
<td>-0.16</td>
<td>0.03</td>
<td>&lt;.001</td>
<td>0.04</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deployment Status*</td>
<td>-1.3</td>
<td>0.86</td>
<td>.13</td>
<td>0.91</td>
<td>.15</td>
<td>.18</td>
</tr>
<tr>
<td>PCL-5 Anhedonia**</td>
<td>-0.54</td>
<td>0.11</td>
<td>&lt;.001</td>
<td>0.12</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>0.3</td>
<td>0.15</td>
<td>.05</td>
<td>0.17</td>
<td>.08</td>
<td>.08</td>
</tr>
<tr>
<td>DAST-10</td>
<td>-0.34</td>
<td>0.37</td>
<td>.35</td>
<td>0.38</td>
<td>.37</td>
<td>.41</td>
</tr>
<tr>
<td>SCS</td>
<td>-0.37</td>
<td>0.62</td>
<td>.55</td>
<td>0.82</td>
<td>.65</td>
<td>.55</td>
</tr>
</tbody>
</table>

** $p < .01$.  
N = 215.  
* Reference group is “yes”.

Regression Model with Externalizing Behaviors Cluster Results

Erectile dysfunction severity was regressed upon PTS externalizing behavior symptoms, with the covariates of age, deployment status, alcohol misuse, drug misuse, and sexual compulsivity severity. The overall model is statistically significant, $F(6, 218)=6.77, p<.001$. This model accounts for 15.71% of the variance in the erectile dysfunction scores. Table 7 reports the estimates, standard errors, $p$-values, robust SEs, robust $p$-values, and FDR-adjusted $p$-value for the externalizing behavior cluster.

Table 7. *Estimates, Standard Error, p-value, Robust Standard Error, Robust p-value, & FDR-adjust p-value*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>p-value</th>
<th>Robust SE</th>
<th>Robust $p$-value</th>
<th>FDR $p$-value</th>
</tr>
</thead>
</table>

** $p < .01$.  
N = 215.
Higher levels of externalizing behaviors are associated with an increase in erectile dysfunction severity. For a one unit increase in externalizing behavior severity there is an associated 0.54 decrease in erectile functioning. Age is the only covariate in the model that is significantly associated with erectile dysfunction, no other variables are approaching a significant association with erectile dysfunction severity.

Regression Model with Anxious Arousal Cluster Results

Erectile dysfunction severity was regressed on PTS anxious arousal symptoms while controlling for age, deployment status, substance use, and sexual compulsivity. The overall model is statistically significant, $F(6, 218)=7.246, p<.001$. This model accounts 16.63% of the variance in erectile dysfunction scores within this sample. Table 8 provides the estimates, SEs, and $p$-values from this regression.

Table 8. Estimates, Standard Error, $p$-value, Robust Standard Error, Robust $p$-value, & FDR-adjust $p$-value

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>$p$-value</th>
<th>Robust SE</th>
<th>Robust $p$-value</th>
<th>FDR $p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age**</td>
<td>-0.16</td>
<td>0.04</td>
<td>&lt;.001</td>
<td>0.04</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deployment Status</td>
<td>-1.08</td>
<td>0.89</td>
<td>.23</td>
<td>0.92</td>
<td>.24</td>
<td>.23</td>
</tr>
<tr>
<td>PCL-5 Anxious Arousal**</td>
<td>-0.5</td>
<td>0.15</td>
<td>.001</td>
<td>0.15</td>
<td>.001</td>
<td>.003</td>
</tr>
<tr>
<td>AUDIT-C</td>
<td>0.3</td>
<td>0.15</td>
<td>.05</td>
<td>0.18</td>
<td>.1</td>
<td>.09</td>
</tr>
<tr>
<td>DAST-10</td>
<td>-0.49</td>
<td>0.37</td>
<td>.19</td>
<td>0.33</td>
<td>.14</td>
<td>.22</td>
</tr>
<tr>
<td>SCS</td>
<td>-1.04</td>
<td>0.62</td>
<td>.09</td>
<td>0.74</td>
<td>.16</td>
<td>.13</td>
</tr>
</tbody>
</table>

** $p < .01$.
N = 217.
A Reference group is “yes”.

Higher levels of anxious arousal severity is associated with worse erectile dysfunction severity. A one unit increase in externalizing behavior severity was associated with a 0.49 unit worsening of erectile dysfunction severity ($t(1)=-3.31$, $p<.001$). Increased age was associated with a worsening of erectile dysfunction severity. No other covariates were significantly associated with erectile dysfunction severity.

Regression Model with Dysphoric Arousal Cluster Results

Erectile dysfunction was regressed on the PTS dysphoric arousal cluster, while controlling for age, deployment status, alcohol misuse, drug misuse, and sexual compulsivity. Table 9 reports the estimates, standard errors, $p$-values, robust SEs, robust $p$-values, and FDR-adjusted $p$-value.

Table 9. Estimates, Standard Error, $p$-value, Robust Standard Error, Robust $p$-value, & FDR-adjust $p$-value

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>$p$-value</th>
<th>Robust SE</th>
<th>Robust $p$-value</th>
<th>FDR $p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age**</td>
<td>-0.16</td>
<td>0.03</td>
<td>&lt;.001</td>
<td>0.04</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deployment Status*</td>
<td>-1.27</td>
<td>0.85</td>
<td>.14</td>
<td>0.87</td>
<td>.15</td>
<td>.19</td>
</tr>
<tr>
<td>PCL-5 Dysphoric Arousal**</td>
<td>-0.81</td>
<td>0.15</td>
<td>&lt;.001</td>
<td>0.16</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>AUDIT-C*</td>
<td>0.35</td>
<td>0.15</td>
<td>.02</td>
<td>0.18</td>
<td>.06</td>
<td>.04</td>
</tr>
<tr>
<td>DAST-10</td>
<td>-0.47</td>
<td>0.36</td>
<td>.19</td>
<td>0.36</td>
<td>.2</td>
<td>.23</td>
</tr>
<tr>
<td>SCS</td>
<td>-0.53</td>
<td>0.61</td>
<td>.39</td>
<td>0.79</td>
<td>.51</td>
<td>.39</td>
</tr>
</tbody>
</table>

*p < .05
** p < .01.
N = 217.
* Reference group is “yes”.

The overall regression model is statistically significant, $F(6, 215)=10.78$, $p<.001$, and accounted for 23.13% of the variance in erectile dysfunction. Increasing levels of dysphoric arousal is associated with worsening erectile dysfunction symptoms. For a one unit increase in dysphoric arousal symptoms there is an associated -0.81 decrease in
SHIM scores. Increased age is significantly associated with higher levels of erectile dysfunction. Alcohol misuse following the FDR adjustment was found to be significantly associated with erectile dysfunction, higher levels of alcohol misuse were associated with increased levels of erectile functioning.
CHAPTER V

Discussion

Summary

Sexual health is an important component of overall well-being and relationship satisfaction for many adults including service members and veterans (Hayes et al., 2010; Laumann et al., 1999). The purpose of this study is to expand the current body of literature examining sexual functioning in male military members and veterans. Multiple studies have indicated that PTSD, SUDs, and HD have strong associations with sexual dysfunction in the military and veteran population (e.g. Tran et al., 2015). Erectile dysfunction was chosen in this study as it is one of the most common forms of sexual dysfunction experienced by men in general, and by OEF/OIF/OND veterans under the age of 40 (APA, 2013; Tran et al., 2015; Wilcox et al., 2014). We examined whether a set of variables to include PTS symptoms, SUDS, and HD were significantly associated with erectile dysfunction. Because PTS symptoms have the strongest association, we evaluated which PTSD symptom cluster accounted for the greatest amount of variance in erectile dysfunction. The exploration of which sets of PTS symptoms are strongly associated with erectile dysfunction provides additional information that may be beneficial for screening practices. This exploration can help clinicians when screening OEF/OIF/OND veterans and service members for comorbid disorders to include some form of screening for erectile dysfunction. This study is consistent with the previous literature finding that these disorders together are associated with erectile dysfunction and identified PTS symptoms as having the strongest association with erectile dysfunction. Specifically the
symptom clusters of dysphoric arousal and anhedonia are the most associated with erectile dysfunction.

When PTS symptoms, SUDs, and HD are put together into a single model they are significantly associated with erectile dysfunction. This finding supports previous research, which has indicated a relationship between these factors with sexual dysfunction in veterans (Howard, 2007; Kimerling et al., 2014; Tran et al., 2015; Wilcox et al., 2014). Previous research has indicated that specific types of symptoms (e.g. anhedonia, avoidance) are associated with male sexual dysfunction (Barlow, 1986; Kimerling et al., 2014; Tran et al., 2015; Wilcox et al., 2014). When examining symptom clusters based upon the Hybrid Model of PTSD (Armour et al., 2015), all of the symptoms clusters were significantly associated with erectile dysfunction. These results support both of the predictions of this study. However, it should be noted that all of the symptom cluster models were statistically significant, not only the four included in the research prediction. The relationship between some of the symptom clusters (anhedonia, avoidance, and negative affect) and erectile dysfunction coincide with previous research such as Barlow’s (1986) examination of symptoms related to sexual dysfunction in men. Barlow (1986) noted that avoidance of internal cues is associated with sexual dysfunction, and other research has noted avoidance symptoms as potentially associated with sexual dysfunction in individuals with a PTSD diagnosis (Kimerling et al., 2014). Studies examining sexual dysfunction in this population noted that emotional numbing (anhedonia) and intrusion symptoms as possible underlying associations between these two issues (Tran et al., 2015; Wilcox et al., 2014). The average age of participants in this study is 38 years old ($SD = 10.7$) and the association between PTSD and erectile
dysfunction is similar to previous studies that have found a relationship between PTSD and erectile dysfunction in younger males in this population (e.g., Hirsch, 2009). These results are significant given the sample in this study is a non-clinical sample, the relationship between symptom clusters in a clinical sample may follow a similar pattern and others may prove to be important as well compared to the results of this study.

PTSD, SUDs, and HD have high prevalence rates in this population (Kraus et al., 2017; Nelson & Oehlert, 2008; Seal, Berenthal, Miner, Sen, & Marmar, 2007; Seal et al., 2009; Smith et al., 2014; U.S. Department of Veteran Affairs, 2018). Higher levels of psychological distress, such as PTSD, in younger males (under the age of 40) has been associated with erectile dysfunction in this population (Nunnink et al., 2012; Zhang et al., 2006). Future research examining symptom clusters of PTSD in a clinical sample and their relationship to erectile dysfunction or other forms of sexual dysfunction (e.g. reduced libido) is an important next step. The results of this study may help inform clinical work such as screening practices in settings where veterans and service members seek health care.

There is a growing body of literature which indicates potential risk factors for sexual dysfunction in male veterans under the age of 40. These factors include PTSD, substance use, and sexual compulsivity (Howard, 2007; Lehrner et al., 2016; Tran et al., 2015; Wilcox et al., 2014). Some studies have hypothesized symptoms of PTSD that may contribute to the development or maintenance of sexual dysfunction in these younger males, these symptoms include anhedonia and intrusion symptoms (Hirsch, 2009; Tran et al., 2015; Wilcox et al., 2014). The results of this study provide a step forward in exploring symptom clusters using data from service members and veterans in a non-
clinical sample. Studies examining each of the PTSD symptom cluster models in a clinical sample may be able to indicate which sets of symptoms should be focused upon if sexual dysfunction is suspected to be present. The Hybrid Model as proposed by Armour et al. (2015) has shown strong association with anger and impulsivity (Armour et al., 2016). These constructs are common symptoms in some subtypes of PTSD and impulsivity is commonly linked with substance use which is a high prevalence rate disorder for males in this population (Miller et al., 2003; Seal et al., 2009). Future researchers should examine which of the proposed models of PTSD symptom clusters provide a better fit for the relationship between sexual dysfunction and PTSD.

Sexual dysfunction represents a struggle that is damaging incredibly important interpersonal social support systems for service members and veterans who are struggling with a variety of comorbid psychological and physical illnesses. The field of psychology has increased its focus on this important issue within the past decade and has shown that for males under the age of 40, psychological distress is highly associated with multiple forms of sexual dysfunction (e.g. Hirsch, 2009; Howard, 2007; Manowar Hasain, 2013; Tran et al., 2015; Wilcox et al., 2014; Zhang et al., 2006). This study takes a small step forward by directly examining disorders that are associated with erectile dysfunction and which symptom clusters of PTSD are accounting for more of this relationship. By understanding the relationship between these symptoms, it can potentially improve clinical assessments and provide clinicians data to inform assessments for sexual functioning issues. More research is needed to explore the strong relationship between PTSD and sexual dysfunction, which may lead to improved intervention technologies for those who are struggling with these disorders.
Limitations

The data in this study is cross-sectional. Due to this, the results of this study must be tempered as other factors such as lack of treatment or life stressors may have exacerbated the scores for some participants in this study. Additionally with one time point, it is unknown as to the stability of the scores on the measures used in this study, future research collecting data from multiple time points may provide stronger evidence for the associations found in the current study.

Attrition in the sample from the initial 556 participants who provided consent to the final number of participants \( n = 214 \) who completed all of the measures for this study represents the largest limitation of this study. The data in this study came from an existing survey battery that was primarily designed to assess relationship quality and sexual health in the veteran population. Future research with a shorter survey battery focusing on only a few measures may prevent the attrition found in this study.

The overlap in symptoms between PTSD and Major Depressive Disorder (MDD) presents a significant clinical assessment challenge (Kimerling et al., 2014). Due to the nature of this study, and not having technology parse out depression and PTSD from the participants, the data from the depression measure and PTSD measure will likely remove any significant predictive value from one another. Future research utilizing clinical interviews may be able to clearly distinguish between and provide diagnoses of PTSD and MDD respectively, which can clarify the existence of either disorder in the sample.

PCL-5 scores in this study do not represent a diagnosis of PTSD since no Criterion A event was assessed for in this study. Due to this, future researchers utilizing PCL-5 scores or similar measures should conduct a clinical interview to screen for the
presence of PTSD and be able to provide a diagnosis. At best, the PCL-5 scores in this sample only represent PTS symptom severity, so the tentative association between PTSD and erectile dysfunction in this study should only represent a potential association.

Facebook is a useful recruiting method (Pedersen et al., 2015; Pedersen & Kurz, 2016; Pedersen, Naranjo, & Marshall, 2017). However, there may be factors about this sample that may not allow the results to generalize to the larger veteran population. For example, access to the Internet and social media may exclude participants from the larger population who may have more severe psychological distress, who are older, or who do not utilize social media for a variety of reasons. Future researchers can recruit from multiple sites to help improve the generalizability of the results of a study, for example recruiting from Facebook, VA Hospitals and local community organizations may better capture a sample that represents the larger population.

This sample overall represents a non-clinical sample, the average scores on the AUDIT-C, DAST-10, and SCS were below clinical cut-off scores. The average SHIM score for the sample was in the mild range for erectile dysfunction. Restrictions in the range of scores may have lessened the associations between these measures with the outcome. Future researchers that collect data from both clinical and non-clinical samples may be able to determine what relationships, if any, exist between SUDs, HD and erectile dysfunction.
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