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EXAMINATION OF DIFFERENCES IN THE CLINICAL PRESENTATION OF VETERANS WITH COMBAT-RELATED AND MILITARY SEXUAL-RELATED POSTTRAUMATIC STRESS DISORDER

BY

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Submitted to the graduate degree program in Psychology and Research in Education and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Abstract

The primary goal of this study was to examine the psychodiagnostic properties of the Minnesota Multiphasic Personality Inventory (MMPI-2) F-2-8 (F: Infrequency, 2: Depression, 8: Schizophrenia) profile as well as the clinical cutoff scores on the Keane PTSD scale (PK) and the Post-Traumatic Stress Disorder (PS) scales for posttraumatic stress disorder (PTSD) assessment in a sample of U.S. military veterans with PTSD diagnoses related to combat experience and how they differ from those veterans with PTSD diagnoses identified as survivors of military sexual trauma. This study used a retrospective archival design to access and analyze MMPI-2 profiles of veterans drawn from the VA Informatics and Computing Infrastructure (VINCI). This study had three independent variables, PTSD diagnosis, gender, and trauma type, which had three levels: combat trauma (n = 4,339), military sexual trauma (n = 2,083), and no trauma identified (n = 23,085). Results showed that all three PTSD measures analyzed (PK, PS, F-2-8) were statistically effective at differentiating PTSD diagnosed from non-PTSD diagnosed veterans. In addition, the F-2-8 profile showed significantly higher elevations for veterans with PTSD who are survivors of MST compared to veterans with combat PTSD and veteran controls. However, when veterans with PTSD were split by gender, male survivors of MST showed significantly higher elevations on all three measures compared to male combat veterans, while there were no significant differences between MST and combat for females on any of the three measures. Further areas for study and implications of these findings for treatment of veterans in the VA system are also explored.

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This study would not have been possible without the generous support of many people who, in one way or another, helped me along in my journey toward completing this dissertation.

After receiving honorable discharges from the United States military, I am grateful for the support, encouragement and inspiration I received from so many fellow students and faculty throughout my educational experiences. The flexibility and countless opportunities provided at Metropolitan State College of Denver where I finished with a bachelor's degree in communication studies afforded me the chance to engage with other nontraditional students and to learn how to once again be a student. I was able to see and feel from those around me that our past does not have to determine our future, and this value became engrained within my character. It was through a combination of events and introspection that the passion within me was reignited to work in the social services field, most directly with fellow veterans and current members of the US military. During this season of life I was blessed to come across two amazing individuals. Were it not for mentorship, compassion, and friendship of Drs. Karen Crawford and Starla Quinn, I am sure my path would not have been as clear. I owe you both so much more than I could ever acknowledge and I thank you for your support.

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Thank you to the members of my dissertation committee, whose assistance was paramount in bringing this study to bear. This document started with the supportive,

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Upon first entering the halls at KU, I quickly found myself pulled to the calm and gentle guidance of Dr. Thomas Krieshok, my current academic advisor. Dr. Krieshok has been a supportive and encouraging mentor, providing a solid foundation to me as a clinician and a mentor as my research progressed. As an advisor, mentor and friend I am grateful to you.

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Table of Contents

Chapter I

Introduction

The human response to psychological trauma varies in severity, form, and expression for individuals confronted with a traumatic experience. According to Hoge et al., (2004), posttraumatic stress disorder (PTSD) may be the most common psychiatric syndrome to develop following trauma. However, other conditions frequently co-occur, or develop independently, with PTSD, including other anxiety disorders, unipolar depression, substance-use, and personality disorders (Breslau, Davis, Andreski, & Peterson, 1997). Predominant negative effects vary widely across individuals, spanning the spectrum from anger and rage to shame and sadness as well as the re-experiencing of certain events (e.g., flashbacks, nightmares). Historically, the assessment of PTSD has been a difficult task, primarily because of the many ways in which it can present. Because PTSD is a complex disorder with diverse symptomology, the clinical interview may be inconclusive in establishing a diagnosis. In addition, reliability of diagnosis can be diminished by subjective judgments of what constitutes a sufficiently traumatic event.

Numerous studies have investigated clinical presentations in individuals struggling with PTSD in an attempt to explore the long-term effects of trauma. Most of these have focused on the combat experiences of military veterans. More recently, another group of veterans is beginning to emerge, survivors of military sexual trauma (MST). Peterson, Voller, Polusny, and Murdoch (2011) suggest that male survivors of adult sexual trauma are an understudied population when compared with female survivors of adult sexual trauma, and encourage exploration of this group. Literature about sexual trauma in general has been used to develop only a preliminary understanding of how MST may be conceptualized. This study will compare

MMPI-2 scores of two groups of veterans diagnosed with PTSD: combat veterans and survivors of reported military sexual trauma. In doing so, this study will investigate potential differences in displayed psychopathology of PTSD between the two trauma groups, as assessed using the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2) (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989).

PTSD is defined as a "set of conscious and unconscious behaviors and emotions associated with dealing with the memories" of a major trauma or catastrophe (Figley & Kiser 2013). Such trauma may include combat, assault, automobile accident, or natural disaster. The central features of PTSD include (a) re-experiencing of the event in dreams, intrusive thoughts, or flashbacks (feeling as if the trauma were recurring); (b) avoidance of activities associated with the trauma; (c) psychological numbing of emotions and detachment from significant others; and (d) increased psychological arousal, manifested by hypervigilance, sleep disruption, poor concentration, and other symptoms of anxiety (American Psychiatric Association, 1994). These symptoms can reflect a highly debilitating disorder and require a careful assessment by trained mental health professionals in addition to diagnostic measures. PTSD diagnostic difficulties will be discussed throughout this paper. The veterans this study identifies as diagnosed with PTSD will all have received a DSM-IV diagnosis and therefore DSM-V criteria will not be addressed, but will be included in the discussion section.

Current US military operations continue to be the longest sustained combat operations in United States history since the Vietnam War (Hoge et al., 2004). At present, research has shown that the frequency and intensity of exposure to traumatic experiences is associated with risk for PTSD and other impairment in individuals. While most service members become productive and effective members of society, others carry their military service experiences with them as they

begin their transition to civilian life as a veteran. Prevalence of diagnosed PTSD related to a male veteran's active duty service experiences has been estimated to range from 18% to 30% (Hoge et al., 2004). As such, veterans with PTSD are heavy health service utilizers and have a variety of comorbid mental health and medically related conditions. According to Buckley, Holohan, Greif, Bedard, & Suvak (2004) potential chronic impairments include lower employability, income disparities, problems in relationships, poor problem solving abilities, aggressive behavior, and poor self-care and overall quality of life. The most troubling aspect of service-related PTSD appears to be its persistent and chronic course. Specific symptom clusters, especially avoidance symptoms, might be associated with the course of PTSD. In addition, the occurrence of new traumatic events differentiates PTSD cases identified as chronic from those in remission. According to one study by Perkonigg at al., (2005) 52% of the PTSD cases in their study remitted during the follow-up period, and 48% showed no significant remission of PTSD symptoms. With those responding in the study that were identified as having chronic PTSD, data showed that they were more likely to experience new traumatic event(s) during follow-up, have higher rates of avoidance symptoms at baseline and to report more help seeking compared to respondents in remission. Rates of those studied displayed a greater number of somatoform disorders, i.e., having a mental illness that caused bodily symptoms, including pain in addition to other anxiety disorders were also significantly associated with a chronic course of PTSD (Perkonigg, et al., 2005).

PTSD was first recognized as a diagnostic entity by military physicians treating combat veterans during World Wars I and II. Upon exposure to life threatening combat situations, these veterans displayed a variety of symptoms, such as anxiety, avoidance, depression, and sleep disturbance. Treating physicians termed this condition "shell shock" or "combat neurosis"

(Keane & Wolfe, 1990). Their principal means of assessing the disorder was a standard clinical interview. Interviewing currently remains a critical component of PTSD assessment. Objective psychological measures can aid the diagnostic process and provide a standardized method and more reliable means for evaluating PTSD.

Numerous PTSD diagnostic measures have been tested by researchers. In the National Vietnam Veterans Readjustment Study, Kulka and colleagues (1990) tested the reliability and validity of the most commonly used scales for combat-related PTSD. These scales included: (a) the Mississippi Combat-Related PTSD scale (Keane, Caddell, & Taylor, 1988), (b) the MMPI PTSD Scale (Keane, Malloy, & Fairbank, 1984), (c) the Stress Response Rating Scale (Weiss, Horowitz, & Wilner, 1984), (d) the Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979), and the Global Assessment Scale (Endicott, Spitzer, Fleiss, & Cohen, 1976). Each scale was found to possess adequate psychometric properties for diagnosing combat-related PTSD and subsequently deemed reliable and valid.

The MMPI and MMPI-2

Of the several PTSD scales available, the MMPI-2 has several advantages. First, it is a comprehensive assessment instrument which provides information regarding a wide variety of clinical domains and personality factors. The breadth of this information is a distinct advantage over information gathered from an instrument such as the Mississippi Scale (Keane, et al, 1988), which assesses only symptoms of combat-related PTSD. Second, the comprehensive nature of the MMPI-2 allows for its availability and use in a wide variety of settings. Third, unlike other instruments, the MMPI-2 contains validity scales, which provide critical information regarding the overall value of the data obtained. Fourth, the MMPI-2 is the most widely administered psychological test in the world (Greene, 1991; Lubin, Larsen, Matarazzo, & Seever, 1985). As

such, it is often used as a generic screening assessment or to test various clinical hypotheses. These advantages may explain why the MMPI-2 has been employed so extensively in PTSD research.

Several types of PTSD appear more prevalent in research and clinical settings. Combat-related PTSD has been studied most extensively, particularly with the MMPI-2 and other assessment instruments. The study of sexual assault-related PTSD has increased in recent years, but lacks the accumulation of research for combat veterans. Previous research has documented a common F-2-8 MMPI-2 three-point code type for combat-related PTSD (Albrecht, Talbert, Boudewyns, Touze, Albrecht, Hyer, & Lemmon, 1994; Blanchard, Wittrock, Kolb, & Gerardi, 1988; Keane et al. 1984). That is, scales F (measuring infrequent responses), 2 (Depression), and 8 (Schizophrenia) tend to show levels of elevation above the remaining clinical and validity scales. With the exception of a preliminary study reviewing only five MMPI-2 profiles (Wolfe, Mori, & Krygeris, 1994), no studies have been published suggesting a common code-type for sexual traumas inside or outside of the military.

A second difference between the groups is the role of the traumatized individual (Figley & Kiser, 2013). In combat trauma, the combatants may be survivors of trauma as well as agents who inflict trauma; in contrast, sexual trauma survivors react to events that are imposed upon them (Figley & Kiser, 2013). Figley and Leventman (1980) hypothesized that the victim/agent role is more likely to be associated with survivor guilt and shame, while the pure victim role is more likely to be associated with paranoia and anxiety. According to Peterson et al., (2011) the psychological effects of sexual assault specifically have been well documented for both men and women, and show that men specifically who have been assaulted often have high rates of depression and anxiety symptoms.

A third difference relates to behavioral and emotional symptom differences that are not fully explained in the literature. For example, Galovski and Lyons (2004) and Layfer, Gallops, and Frey-Wouters (1984) suggest a greater likelihood of hypervigilance, survivor guilt, aggressive behavior, and substance abuse in combat trauma. This is in contrast to sexual trauma, for which researchers (Herman, 1992; Bremner, 1999) suggest a greater likelihood of dissociative states and psychological numbing.

Certainly, all of the above symptoms or associated factors of PTSD are likely to occur to varying degrees in both groups. However, there may be relative differences between the groups that the MMPI-2 will capture. In their review of MMPI-2 PTSD profiles, McGaffrey, Hickling, and Marrazzo (1989, p. 75) conclude, "Studies are needed that further delineate the similarities and differences between combat-related and civilian-related forms of PTSD." In so doing the field of psychology may be better prepared to assist with the variety of traumas and clients they may encounter.

MMPI-2 PTSD Scales

In addition to overall profiles, the updated MMPI-2 has two specialized PTSD scales. Keane et al. (1984) devised an empirically based PTSD scale that correctly classified 82% of the combat veterans in their sample in terms of accuracy of PTSD diagnosis. The validity of this scale, termed the PK scale, has been supported in several studies of combat veterans (Blake et al., 1995; Foa, Cashman, Jaycox, & Perry, 1997; Sutker, Bugg, & Allain, 1991). Their results indicated a 56% overall classification rate (78.6% sensitivity and 33.3% specificity), scarcely better than chance in diagnostic accuracy. The PK scale has rarely been applied to a non-veteran population. Therefore, it is unknown whether the validity of this scale would generalize to a

sexual trauma population. Numerous researchers have suggested further study of this issue (Berk, et al., 1989; Keane & Wolfe, 1990; Wilson & Walker, 1990).

Schlenger and Kulka (1987) devised a second PTSD measure, the PS scale, which incorporates 45 items of the PK scale, plus 15 additional items that were found to differentiate PTSD from non-PTSD veterans in their data set. Though there remains a lack of empirical support, the PS scale is included as one of the basic supplementary scales on the MMPI-2 standard interpretive report (Butcher et al., 1989). Schlenger reported in a personal communication with Graham (1990) that the PS scale correctly classified 81% of the combat veteran in his sample. Since no publications are available, it is not possible to determine if this scale has been previously applied to a sexual trauma population within a research context. This study is the first evaluation of the PS scale's clinical utility in determining group differences in PTSD.

In addition to these scales, Keane et al. (1984) combined three of the clinical scales into a unitary measure of PTSD referred to as the "standard decision rule." The scales included were F (Infrequent Responses), 2 (Depression), and 8 (Schizophrenia). In the original validation and cross-validation, the standard decision rule correctly classified 74% of the veterans in their sample (Keane et al, 1984). Subsequent studies have found similar validity rates with combat veterans (Cannon, Bell, Andrews, & Finkelstein, 1987; Craeger, et al., 2003; Vanderploeg, Sison, & Hickling, 1987), but few studies have applied the F-2-8 profile to sexual assault survivors according to Kirz, Drescher, Klien, Gusman & Schwartz (2001).

Chapter II: Review of the Literature

Combat-related Posttraumatic Stress Disorder

The first description of PTSD was completed by Grinker and Spiegel (1945), who noted a post-combat syndrome of depression, anxiety, and survivor guilt among World War II veterans. In the original Diagnostic and Statistical Manual of Mental Disorders (DSM-I; American Psychiatric Association, 1952), this syndrome is referred to as "traumatic neurosis." By 1968, however, interest and research in this area had ebbed and traumatic neurosis was omitted from DSM-II (APA, 1975). Following years of lobbying by Vietnam veterans, the Veterans Administration began to recognize the disorder, spurring increased research by the early 1970s. Merbaum's (1977) study was the first to demonstrate elevated MMPI profiles among combat veterans. In 1980, PTSD was once again recognized as a diagnostic category in DSM-III (APA, 1980).

The diagnostic criteria for PTSD in DSM-III included the following (APA, 1980, p. 238): (a) experiencing a stressor that would "evoke significant symptoms of distress in almost anyone;" (b) re-experiencing the event either through intrusive recollections, dreams, or flashbacks; (c) psychological numbing either through constricted affect, feelings of interpersonal detachment, or decreased interest in normal activities; and (d) having at least two of the following symptoms: sleep disturbance, survivor guilt, memory impairment, startle response, avoidance of activities associated with the trauma, or worsening of symptoms by exposure to events associated with the trauma.

Subsequent revisions of these diagnostic criteria in DSM-III-R (APA, 1987) and DSM-IV (APA, 1994) have been relatively minor. In DSM-IV (APA, 1994, p. 209), the traumatic event was redefined as an event or events that "involved actual or threatened death or serious injury, or

a threat to the physical integrity of self or others." Additionally, the person's response must involve "intense fear, hopelessness, or horror." Duration of the symptoms must be greater than one month and must involve "significant distress or impairment" in the person's functioning, New symptoms were added to the diagnostic subcategories including: physiological reactivity to events associated with the trauma, poor memory of the traumatic event, "sense of foreshortened future," and anger control problems.

The clear delineation of the symptoms of PTSD in the DSM-III served to legitimize the diagnosis and spurred further research on epidemiology, assessment, phenomenology, and psychophysiological correlates of PTSD (Keane & Wolfe, 1990). A landmark epidemiological study, the National Vietnam Veterans Readjustment Study (NVVRS), was mandated by Congressional legislation in 1983 and completed in 1990 (Kulka, Schlenger, Fairbank, Hough, Jordan, Marmat, & Weiss, 1990). In the NVVRS, Kulka and colleagues (1990) reported PTSD incidence rates of 15.2% for Vietnam veterans, with a lifetime prevalence of 30%.

Factors which appear to increase the risk of developing PTSD can be grouped into three major categories: (a) predisposition, (b) nature of the traumatic event, and (c) recovery environment (McFarlane et al., 2005). The present study focuses on the nature of the traumatic event, classifying trauma as combat-related or military sexual trauma-related. In regard to combat-related PTSD, combat exposure clearly emerges as a significant predictor of subsequent PTSD outcome (Schlenger, et al., 1987). However, additional risk factors include witnessing or participating in abusive violence (Green, 1990), deprivation (Schlenger et al., 1992), and loss of meaning and control (Egendorf, Kadushin, Laufer, Rothbart, & Sloan, 1981). Similarities in and differences between these component factors may reveal the psychological mechanism at work in various kinds of traumas.

Military Sexual Assault-Related Posttraumatic Stress Disorder

The majority of research related to sexual assault has focused on female survivors; however, there is reason to believe that differences related to PTSD may exist between combat and military sexual trauma populations. First, there are significant gender differences in the rate or type of trauma experienced. For instance, males more frequently report PTSD related to combat experiences while females more frequently report sexual assault. Peterson and colleagues (2011), suggest that problems that may be unique to male survivors of sexual assault may include confusion concerning sexual identity, masculinity, and sexual orientation after an assault, especially if the perpetrator was male. An especially concerning finding is that survivors of sexual assault are significantly more likely to report suicidal ideation and attempt suicide (Peterson et al., 2011). As noted previously, a difference exists between the groups in the role of the traumatized individual (Figley & Kiser, 2013). Whereas those individuals reporting combat trauma may be the aggressors, or agents who inflict trauma as well as survivors of trauma. As for sexual trauma survivors, they tend to react to events that are imposed on them (Figley & Kiser, 2013). Figley and Leventman (1980) hypothesize that the victim/agent role is more likely to be associated with survivor guilt and shame, whereas the pure victim role is more likely to be associated with paranoia and anxiety.

In 1991, the U.S. Navy conducted a limited investigation into sexual assault allegations stemming from a 1991 Tailhook convention that took place in Las Vegas, Nevada. The report by Healy (1992) found that 14 female Navy officers were forced to walk down a gauntlet of male Navy aviators while having their breast and buttocks grabbed at and eventually stripped of their clothing. An admiral, who had openly criticized the orders to allow women in the military, issued mild reprimands to the assailants. Further investigation by Navy officials found the admiral had

failed to widen the probe, and refused to allow senior officers to be interviewed. This admiral was eventually forced to resign from his commission as Navy officials became concerned about attacks upon the Navy's reputation. Since that time, disturbingly high rates of adult sexual assault have been documented among women serving in the military (Polusny & Murdock, 2005).

When military sexual assault occurs outside the context of war, it usually entails the misuse of power and authority within the military structure. Kulley (2000) found that those of higher positions such as an officer were more likely to use blackmail or the authoritative position to coerce the victim into submission. Kulley found these victims feel trapped and unable to seek assistance due to the potential negative consequences of seeking justice for the sexual assault forced upon them. The prevalence of adult sexual assault experienced among female veterans has been estimated as high as 41% (Coyle, 1996); one study found the prevalence among males to be 6.7% (Wolfe et al. 1998). In another study, Smith, Redd, DuHamel, Vicksberg and Ricketts (1999) reported a lifetime prevalence of sexual assault of 12% among 129 combat veterans consecutively referred for PTSD. However, 92% of these assaults occurred prior to combat exposure, so it remains unclear whether these assaults actually occurred during or before military service. In a more recent survey by Murdock and colleagues (2004), a sample of 3337 male and female veterans applying for VA benefits were screened for sexual assault while in the military. They found that 4.2% (140) of those screened veterans who reported being sexually assaulted were men. This figure is consistent with figures reported by researchers reporting male sexual assault in the community (Mezey & King, 1989; Isely & Gehrenbeck-Shim, 1997; Pescola, Westfal, & Kuffner, 1999).

In the past decade, Congress began addressing the concern of sexual trauma in the military. The Veterans Administration on Health Care implemented a preventative health care screening for sexual victimization. By 1992 Congress made it a priority to provide mental health counseling for those sexually traumatized while serving in the armed forces (Suris & Lind, 2008). During the first year of sexual assault screening, only female veterans were screened. In years to follow, males began to be screened as well. The Veterans Administration found a high prevalence of male sexual assault cases, more than anticipated. Mental health counseling for survivors of MST is now provided for veterans of all sexes.

The act of sexual assault warfare is more commonly practiced than realized according to Dalgleish (2004). Rape in the battlefield is a projection of power and control; the intention is to break down the will of the prisoner/victim by any means possible (Groth-Marnat, 1999). Burnett and Peel (2001) examined 6000 individuals who were sexually assaulted in a war zone region, many of whom were men. They found that many of the men reported a sense of being stripped of their manhood and suffered severe psychological ramifications.

Male sexual assault within the military is an issue of power and control that the assailant renders upon the victim. In wartime, it is meant to humiliate and dehumanize the prisoner. Within the armed forces, it is often an abuse of authority, from the commanding officer to the private. In either case, the act of rape is shown to be an aggressive act, a theme that is pervasive throughout the research literature on male sexual assault.

Leskela, Dieperink, & Thuras (2002) came across an interesting psychological effect of sexual assault on male survivors, especially where multiple aggressors were involved. Men who experienced violent gang rape while in the military responded with greater hypersensitivity and homophobia. They also had a greater tendency to externalize their anger. On the other hand, men

who had been raped by a single individual did not express outward anger but presented with more inner focused, self-loathing thinking.

Dilemma of underreporting

A prominent problem of sexual assault is the issue of underreporting. Despite the increased social acceptance of women reporting rapes, men are generally less likely than women to report their traumatic sexual experience (Mezey & King, 1989; Mitchell, Hirchman, & Hall, 1999; Whatley & Riggio, 1993). Similar to the phenomenon of sexual revictimization documented in women, high rates of childhood sexual abuse have been found among men reporting adult sexual assault. Elliott, Mok, and Briere (2004) found that men who had experienced adult sexual assault were five times more likely to report a history of childhood sexual abuse than men with no adult sexual assault history. Sexually revictimized men also report more severe psychiatric consequences than those men with a history of childhood sexual abuse only or adult sexual assault only (Coxell, King, Mezey, & Gordon, 1999). In research by King and Woolett (1997**),** they found that 77% of men sought no help at all after they were assaulted.

The difficulties in getting male survivors of sexual assault to report the crime are often due to the need to first report the assault to the police and then to a health care worker, such as a physician or nurse. Reporting the event can be traumatizing due to the need to revisit the event multiple times. Mezey and King (1989) found that more male survivors preferred not reporting the traumatic event to police officers than female survivors. This was in part because the survivors felt that a male police officer would blame the survivors for the assault that took place. Tomlinson and Harrison (1998) found survivors reluctant to disclose their rape to health care professionals due to a lack of trust that their health provider would know and understand how to

deal with the traumatic event. In a study performed by Kaufman and colleagues (1980), they found five of their subjects did not report the fact that they were raped to emergency staff, they only sought treatment for their non-genital traumas.

Another issue raised in the literature with regard to underreporting is the differences between heterosexual and homosexual men reporting their rape experience. Among heterosexual males, definitive figures have been difficult to ascertain through official rape statistics (Anderson & Swainson, 2001). "Straight men don't want to be seen as gay, so they don't report… Law enforcement isn't very sympathetic to the needs of men who are assaulted. Reporting is inconvenient, and most survivors feel it won't accomplish anything anyway (Donnelly & Kenyon, 1996)."

Additionally, differences exist concerning the etiology of PTSD in the way in which it is identified in a combat versus a sexual assault situation. The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association [APA], 1994) indicates that the original trauma must pose a threat to life or physical integrity to meet criteria for PTSD. According to DSM-V criteria for PTSD, the person was exposed to: death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence. Whereas a threat to life appears more consistent with combat trauma (i.e., DSM-IV), a threat to physical integrity appears more characteristic of sexual trauma (i.e., DSM-V). DSM-IV adds that triggering traumatic event(s) may be experienced in groups, as is the norm in combat trauma, or alone, as is typical of sexual trauma. DSM-IV also makes a distinction between traditional stressor events (e.g., combat or disaster) and "interpersonal stressors" (APA, 1994, p. 425), such as sexual assault or physical abuse. These differences in etiology may cue different symptoms.

The psychological effects of sexual assault have only recently been conceptualized as a form of PTSD (Foa, Rothbaum, Riggs, & Murdock, 1991). As noted above, PTSD was originally devised to identify a syndrome corresponding to combat-related posttraumatic reactions. However, research indicated that other trauma groups display a similar symptom constellation.. Sexual assault survivors appear to manifest a significant number of DSM-IV (APA, 1994) criteria for PTSD. The survivors view their assaults as life threatening (Kilpatrick & Veronen, 1984), experience clinically significant depression and anxiety (Atkeson, Calhoun, Resick, & Ellis, 1982), demonstrate numbing and reduced interpersonal involvement (Kilpatrick, Resnick, & Veronen, 1981), and report intrusive thoughts and avoidance. These symptoms significantly mirror combat-related PTSD.

A separate grouping of symptoms is found in the sexual trauma population. Herman (1992) describes sexual trauma survivors as manifesting significant dissociation, somatization, self-mutilation, suicidality, and revictimization. None of these factors are listed as core symptoms of PTSD in DSM-IV (APA, 1994), although they are included as "associated features," more commonly following an "interpersonal stressor" such as sexual assault.

Herman (1992) lists three distinctions between sexual trauma and traditional PTSD cases. First, in sexual trauma cases the symptoms tend to be more complex and tenacious. This claim appears to be Herman's clinical opinion, as no research support is provided. Second, sexual trauma leads to significant changes in personality with regard to identity and interpersonal relatedness. Numerous authors have described the development of personality disorders in this population, most commonly borderline personality disorder (Briere, 1988; Bryer, Nelson, Miller, & Krol, 1987; Meissner, 1988). Sexually traumatized individuals maintain fragmented interpersonal boundaries and form intense, but unstable, relationships (Herman, 1992). Third,

survivors of sexual assault are vulnerable to revictimization. Russell (1986) corroborates this claim, reporting that the risk of rape, sexual harassment, and battering is doubled for survivors of sexual assault.

Regarding prevalence, several research teams have found significant rates of PTSD among sexual assault survivors. Rothbaum, Foa, Murdock, Riggs, and Walsh (1990) report that 94% of sexual assault survivors met diagnostic criteria for PTSD shortly after the event and 47% maintained symptoms three months later. An average of 17 years after being sexually assaulted, 16.5% of survivors met criteria for PTSD (Kilpatrick, Saunders, Veronen, Best, & Von, 1987). In a one review, Resnick, Kilpatrick, Dansky, Saunders, and Best (1993) document prevalence of PTSD due to sexual assault ranging from 12.4% to 16.5%. Lifetime incidence of PTSD for these samples ranged from 9.4% to 38.5%. This research clearly supports PTSD as a possible sequalae of sexual assault and indicates prevalence rates similar to combat trauma.

Assessment of PTSD

PTSD was introduced as a diagnostic category in DSM-III (APA, 1980). However, diagnosis of PTSD has continued to be a difficult and somewhat controversial task for mental health practitioners. Numerous factors contribute to these challenges.

Unlike other diagnoses, PTSD relies upon an etiologic event or trauma to establish diagnosis (DSM-IV, 2000). This event must "involve actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (APA, 2000). O'Donahue and Elliott (1992) challenge the degree to which events can be reliably and consistently defined as traumatic or nontraumatic. For example, most people would agree that combat is a traumatic, life-threatening event. However, many soldiers never serve on the front lines, but are stationed within striking distance of the enemy and perceive themselves to be at risk. Clearly, a great degree of

subjectivity is involved in determining the level of trauma necessary and sufficient for a diagnosis of PTSD.

Given the difficulty of diagnosing PTSD, it is not surprising that clinicians have looked increasingly to structured interviews and objective measures for assistance. A number of measures, such as the Mississippi Scale (Keane, Caddell, & Taylor, 1988) and the Impact of Events Scale (Horowitz, Wilmer, & Alvarez, 1979) have been specifically devised to evaluate PTSD. Such instruments, however, lack validity scales to discern fabricated symptoms and are neither widely known nor accepted in the greater mental health community (Silver & Salamone-Genevese, 1991).

Ideally, a well-known and established instrument could be adapted for the purpose of evaluating PTSD. The MMPI-2, an instrument with validity scales and known psychometric properties, has generated the greatest amount of PTSD-related research (Silver & Salamone-Genevese, 1991). This measure appears to be a promising and logical choice for further study.

The MMPI and MMPI-2

The MMPI is currently the most widely used objective personality measure for research and clinical purposes (Butcher, et al., 1989; Graham, 1990; Grenne, 1991). Originally devised by Hathway and McKinley (1940), the initial MMPI was a 566 item true/false instrument that was empirically derived to classify individuals on a variety of scales of pathology. Test items were selected if participants with a particular psychological disorder differentially endorsed the item compared to response rates of persons without the disorder. Often times the comparison groups consisted of family members who brought the patient in for the appointment. As an example, if depressed participants endorsed item 40 more frequently than other persons, that item would be included on Scale 2 (Depression). One psychometric difficulty with the MMPI is that item 40

might also discriminate on Scale 7 (Psychasthenia) and therefore be included in this scale as well. The heavy item overlap among scales results in high intercorrelations and limits the unique contribution of each individual scale for predictive purposes (Graham, 1990).

The original MMPI was composed of four validity scales and ten clinical scales. The validity scales were designed to indicate deviant test-taking attitudes or response sets (Graham, 1990). The Cannot Say scale indicated the number of unanswered items in the test. Greene (1991) suggested that 15 omissions be used as a cut-off for invalidating an MMPI profile. The L scale indicates the deliberate attempt to portray oneself in a favorable light, the F scale reveals the number of deviant or unusual responses, and the K scale indicates more subtle attempts to deny pathology and present oneself favorably (Graham, 1990).

Little research has been conducted on the behavioral correlates of the individual clinical scales (Greene, 1991). More frequently, clinicians and researchers have focused on overall clinical profiles and codetypes. Codetypes are the two or three highest scales that reach clinical significance (T scores above 65). However, the individual scales provide a great deal of data with regard to personality type and degree of psychopathology. The clinical scales include Scale 1 (Hypochondriasis), Scale 2 (Depression), Scale 3 (Hysteria), Scale 4 (Psychopathic Deviate), Scale 5 (Masculinity-Femininity), Scale 6 (Paranoia), Scale 7 (Psychasthenia), Scale 8 (Schizophrenia), Scale 9 (Hypomania), and Scale O (Social Introversion). A detailed description of each of these scales (as well as the content and supplementary scales) is not pertinent to this study.

Three validity scales were added in the MMPI-2 restandardization project. Scale Fb is essentially a continuation of the F scale on the latter part of the test and indicates deviant or unusual responses. The VRIN scale (Variable Response Inconsistency) indicates the tendency to

respond inconsistently to items with similar or opposite content (Graham, 1990). The TRIN scale (True Response Inconsistency) indicates the tendency to agree or disagree regardless of item content.

New content scales for the MMPI-2 were developed by Butcher et al. (1989). These scales replaced the original content scales for the MMPI developed by Wiggins (1969). Content scales reflect the pooling of individual items that demonstrate clinically significant content themes or dimensions. The content scales demonstrate adequate validity and higher reliability than the clinical scales themselves; internal consistency and test-retest reliability coefficients for the 15 scales range from high to very high (Graham, 1990). The content scales include the following: Anxiety, Fears, Obsessiveness, Depression, Health Concerns, Bizarre Mentation, Anger, Cynicism, Antisocial Practices, Type A Personality, Low Self Esteem, Social Discomfort, Family Problems, Work Interference, and Negative Treatment Indicators.

Supplementary scales for the MMPI have also been added to the standard clinical and validity scales. Various authors have constructed approximately 450 supplementary scales, several of which are included in the standard MMPI interpretative report (Greene, 1991). Of these, the PK and PS PTSD scales are included in this analysis.

MMPI-2 Restandardization

The MMPI-2 (Butcher et al., 1989) was developed to provide a larger, more nationally representative normative sample, as well as updating item content (Greene, 1991). The new sample consisted of 2,600 individuals randomly solicited in California, Minnesota, North Carolina, Ohio, Pennsylvania, Virginia, and Washington. This sample was significantly more representative of the US population in terms of socioeconomic status and ethnicity than the original MMPI sample. Sixty-eight items were reworded and thirteen items dropped from the

test. The PK scale was affected by these changes (3 items omitted). This study will add to the initial efforts to validate the PK scale using MMPI-2.

Several additional changes occurred in the restandardization project. T-scores on the MMPI-2 were transformed to uniform T scores rather than linear (as was the case on the MMPI). The uniform T scores are based on the same scale score distribution, resulting in equivalent T scores and equivalent percentiles across clinical scales (Butcher et al., 1989). Thus, a T score of 80 on two separate scales will be equivalent in percentile and indicate the same degree of deviation from the norm.

Additionally, the test-retest reliability coefficients (at one-week intervals) are higher on the MMPI-2, ranging on the clinical scales from .67 to .92 (Graham, 1990). The internal consistency of the clinical scales has remained relatively consistent across the MMPI and MMPI-2. These values tend to range between .60 and .90 (Butcher, et al., 1989). Scales 1, 7, 8, and 0 have relatively high internal consistency, while scales 5, 6, and 9 have relatively low internal consistency (Butcher, et al, 1989).

The validity of the MMPI-2 is supported by its congruence with the original MMPI, which has shown external judgments of pathology to coincide with MMPI profiles (Little & Schneidmen, 1959; Graham, 1967). Additionally, Graham (1990) has reported behavioral correlates (based on expert ratings) with MMPI-2 profiles. These findings suggest adequate validity for the instrument as a whole.

Use of MMPI/MMPI-2 for Assessing PTSD

While the general data support comparability of the MMPI and MMPI-2, only a few studies have addressed this issue in relation to the diagnosis of PTSD. These studies (Litz et al., 1991; Albrecht, Talbert, Boudewyns, Touze, Albrecht, Hyer, & Lemmon, 1994) demonstrate

high levels of congruence between instruments overall. Interestingly, Litz et al. (1991) found high congruence on the PK scale as well, while Albrecht et al. (1994) found significantly higher scores on the MMPI-2 PK compared to the MMPI PK. Albrecht et al. (1994) hypothesized an order effect to account for this difference. They administered the MMPI at the beginning of treatment and the MMPI-2 in the middle of treatment, after trauma issues had surfaced. The higher PK scores were possibly influenced by this ordering.

Prior to the development of PTSD scales, the MMPI validity and clinical scales were evaluated for their utility in diagnosing PTSD. Initially, researchers and clinicians were concerned about the validity of PTSD profiles having elevated F scale. As additional data accrued, over reporting was found to be a pervasive and consistent trait among chronic PTSD populations (Hyer, Boudewyns, & Woods, 1991). In their sample of Vietnam combat trauma survivors, Hyer et al., (1991) found 9 out of 10 clinical scales and the F scale to have mean T scores of 70 or above. These investigators suggest that over reporting be viewed as a symptom component of PTSD, rather than as malingering or a factitious response set. Elevated F scales may represent high levels of general distress or a cry for help, and are corroborated on virtually every MMPI study of combat trauma groups (see Blanchard et al., 1988; Burke & Mayer, 1985; Sutker, Bugg, & Allain, 1991).

The clinical scales of the MMPI were generally found to be elevated (Burke & Mayer, 1985; Wilson & Walker, 1990). Researchers hypothesize that this overall profile elevation reflects the significant level of pathology and impairment of chronic PTSD populations. When examined for significant two-point or three-point code types, the 8-2/2-8 and F-2-8/8-2-F profiles appeared to predominate. This profile is discussed in detail below.

The Standard Decision Rule

The Standard Decision Rule was devised by Keane et al. (1984). They employed two independent raters plus psychophysiological measures to diagnose 100 Vietnam veterans with PTSD. This sample was compared with a control group of 100 veterans receiving psychiatric care for diagnoses other than PTSD. Keane et al., (1984) identified an elevated F (T=66) – 2 (T=78) – 8 (T=79) profile, which became known as the Standard Decision Rule. The Standard Decision Rule (F-2-8) correctly classified 74% of the validation and cross-validation samples in identifying PTSD from non-PTSD samples.

It is worth noting that Keane et al. employed strict procedures to determine diagnosis. Two independent raters using a structured clinical interview (designed to assess symptoms of PTSD) had to obtain 100% interrater agreement in identifying PTSD from non-PTSD, otherwise the participant was excluded from the study. Participants who obtained interrater agreement were then tested on psychophysiological measures (e.g., heart rate and galvanic skin response) to determine their level of arousal when confronted with combat-related stimuli. Participants who tested in the positive range for PTSD on the two interviews and the psychophysiological measures were included in the sample. Unlike many subsequent studies, Keane et al., (1984) insured adequate validity and reliability of the PTSD diagnosis in their sample. Keane and Wolfe (1990, p. 169) stress the "reliability of the a priori methods used for determining group inclusion." For example, group inclusion based on chart diagnosis is a much less rigorous method and dictates caution in interpreting results.

Several researchers have corroborated the Standard Decision Rule of Keane et al., (1984) on samples of veterans, although to varying degrees. Cannon et al. (1987) found similar rates among a combat population diagnosed by chart review. Employing Keane et al.'s (1984) mean F,

2, and 8 scores as cut-offs, they obtained 81% sensitivity and 41% specificity. Vanderploog, Sison, and Hickling (1987) utilized a clinical interview and chart review to ascertain a diagnosis of PTSD among their combat sample. They found a sensitivity rate of 57% and specificity rate of 81%. Blanchard et al., (1988) used a structured clinical interview to obtain their sample of PTSD veterans. They found a sensitivity rate of 66% and a specificity rate of 95% on the Standard Decision Rule. Finally, in the validation pretest of the National Vietnam Veterans Readjustment Study, Kulka and colleagues (1990) utilized structured clinical interviews plus chart review to diagnose 137 veterans with PTSD. They did not test the Standard Decision Rule, but descriptive data indicate significant elevations on scales 2 and F. Surprisingly mean scores for scale 8 were relatively low in this sample.

According to Wilson and Walker's (1990) review of the literature, the 2-8/8-2 codetype with additional elevations on F appears to be the prototypical PTSD profile. They reason that scale 2 (Depression) reflects the "restricted affect" of the typical PTSD patient, while scale 8 (Schizophrenia) reflects the patient's "intrusive recollections" (Wilson & Walker, 1990).

Only one study has been published using the MMPI-2 to address the diagnosis of combat-related PTSD. Albrecht et al. (1994) employed a structured clinical interview to establish a PTSD diagnosis and found an F-8-7 three-point-codetype, with additional elevations on scale 2 (mean T=89) in their sample. Albrecht et al. (1994) did not test the Standard Decision Rule for accuracy of diagnosis; however, these results indicate that the Standard Decision Rule likely extends to the MMPI-2 as well.

The studies reviewed above generally support the Standard Decision Rule with respect to combat veteran samples. However, it is less clear whether the decision rule will apply equally well to noncombat trauma groups, such as the military sexual trauma group in this study. There

remain only a limited number of studies (Koretsky & Peck, 1990; McCaffrey, Hickling, & Marraco, 1989; Wolfe et al. 1994) that have tested the decision rule with a noncombat trauma sample. Wolfe et al. (1994) obtained MMPI-2 profiles of five women veterans traumatized by sexual assault and diagnosed with PTSD by clinical interviews. They did not test the accuracy of the Standard Decision Rule, but did find a mean three-point codetype congruent with this decision rule (F-2-8). Given their small sample size and reliance on interviews to establish diagnosis, the results of Wolfe et al. (1994) must be considered highly tentative.

In another study of noncombat trauma, Koretsky and Peck (1990) diagnosed a sample of 22 civilians with PTSD based upon clinical interview and review of chart records. Traumatic events included violent criminal victimization (39%), industrial accidents (28%), and train or car accidents (33%). The Standard Decision Rule correctly classified 45% of PTSD participants and 94% of non-PTSD controls. Thus, the F-2-8 profile demonstrated high specificity, but poor sensitivity in this civilian sample.

Finally, McCaffrey et al (1989) obtained a sample of twelve patients traumatized by car accidents (10), boating accidents (1), or physical assault (1). They too relied on clinical interview and chart review to establish diagnosis. McCaffrey et al. (1989) concluded that MMPI assessment rules developed for combat trauma may have limited applicability for civilian trauma groups. These results, as well as those of Koreysky and Peck (1990) and Wolfe et al. (1994), are tempered by the limitations of their study designs, i.e., relatively small participant samples and subjective diagnostic techniques.

PTSD Scales

The development of PTSD scales for the MMPI has proven to be a challenging task. Although the PK scale has received mixed research support, more findings support PK for

diagnosing combat-related PTSD than refute it. Nonetheless, many MMPI experts are uncertain of the value of the PTSD scales. For example, Greene (1991, p. 212), a noted MMPI researcher, states that PK and PS are "saturated with first-factor variance as measures of general maladjustment and emotional distress rather that PTSD per se." He stated that these scales should be used cautiously and recommends further study of their properties.

Keane et al. (1984), who devised the PK scale, used two independent raters plus psychophysiological measures to diagnose 100 Vietnam veterans with PTSD. This sample was compared with a control group of 100 veterans receiving psychiatric care for diagnoses other than PTSD. Keane et al., applied a chi-square analysis to determine that 49 MMPI items discriminated between the two samples. They found an optimal raw score of 30 (equivalent to T=87 for males) to best classify participants in both their validation and cross-validation samples. This cutting score correctly classified 82% of the validation and cross-validation samples, an even higher percentage than the Standard Decision Rule (74%). Separate rates for sensitivity and specificity were not provided.

In an attempt to replicate Keane et al.'s (1984) findings, Gayton, Burchstead, and Mathews (1986) applied the cutting score of 30 to their sample of combat veterans diagnosed with PTSD. They found very poor classification rates of 57% for PTSD veterans and 55% for non-PTSD veterans. Their results seriously called into question the clinical utility of the PK scale. However, their study had two major flaws – a small participant pool (19 PTSD patients) and reliance on medical charts to establish PTSD diagnosis - which render their results questionable.

Although Silver and Salamone-Genevese (1991) remedied these two problems, their results were similarly disappointing. They employed two clinical interviews plus a DSM-III-R

checklist of symptoms to establish the diagnosis of 117 PTSD veterans. Their results indicated a 56% overall classification rate (78.6% sensitivity and 33.3% specificity), scarcely better than chance in diagnostic accuracy.

Additional problems with the PK scale are indicated by Moody and Kish (1989). They examined MMPI data in a Veterans Administration Alcohol/Drug Treatment program. The authors speculated a 15% PTSD co-morbidity percentage within their sample, which significantly weakens the generalizability of their results to a primary PTSD population. Nonetheless, their results are noteworthy. Moody and Kish (1989) found a +.82 correlation between PK and the Welsh Factor A (Anxiety) scale, which is a measure of generalized psychological maladjustment. This intercorrelation indicates that the PK and Welsh A scales have about 65% of their variance in common (Moody & Kish, 1989), despite having only eight shared items. Moody and Kish (1989) conclude that the PK scale measures general psychopathology, rather than PTSD per se.

In response to Moody and Kish (1989), Kenderdine, Phillips, and Scurfield (1992) compared MMPI data of PTSD veterans with and without comorbid substance abuse. They relied on discharge diagnosis following extended stays to determine diagnostic categories. This group of researchers found significant differences on the PK scale among substance abuse with mean scores for the four groups at 15.72 for substance abuse only, 30.54 for PTSD only, 31.54 for PTSD plus substance abuse, and 33.0 for PTSD with substance abuse in remission. The data suggests that despite symptom overlap between PTSD and substance abuse, the PK scale has clinical utility in differential diagnosis and each of the PTSD subgroups reflected significant differences when compared to the substance abuse only group.

Additional support for the PK scale is provided by numerous researchers. However, optimal cutting scores tend to vary, and the strength of the findings for PK rarely approaches those of Keane et al. (1984). The strongest support for PK is provided in the validation pretest for the National Vietnam Veteran Readjustment Study (NVVRS, 1990; Schlenger & Kulka, 1987), wherein a sensitivity rating of 90.1% and a specificity rating of 68.9% was obtained. These rates are based on a clinical population, and decreased somewhat in sensitivity on the community-based sample of the NVVRS. For example, Watson, Kucala, and Manifold (1986) found a 64% classification hit rate in differentiating PTSD from non-PTSD veterans. They also found lower mean PK scores (21 for PTSD patients, 15 for psychiatric controls) than did Keane et al. (1984), necessitating the use of a lower cutting score. Blanchard et al. (1988) indicated a similar classification rate of 66% for the PK scale. Hyer et al (1986) found a classification rate of 69%.

Cannon and colleagues (1987) found sensitivity of the PK scale to be 76% and specificity to be 64%. They obtained a high false-positive rate (patients with a PK score above 30 who were not diagnosed with PTSD) of 74%. However, this study is flawed by low level of rigor by which their sample was obtained. Cannon et al. (1987) relied on the medical chart diagnosis of PTSD for inclusion in their data set. More reliable data are garnered from studies using structured clinical interviews or data corroborated by multiple sources as in Keane et al.'s (1984) sample.

Vanderploeg et al. (1987) corroborated these numbers in a study utilizing two independent raters to ascertain a diagnosis of PTSD. This higher level of rigor lends support to their findings. Vanderploeg et al. (1987) report an overall classification rate for the PK of 77%. They report specificity data for the PK of 54.5%, indicating relatively high false-positive rates.

Only one study of veterans has published data regarding the PK scale using the MMPI-2. Albrecht et al. (1994) report a mean raw score of 38 on the PK in a sample of Vietnam veterans diagnosed with PTSD on the Structured Clinical Interview for DSM-III-R (SCID; Spitzer, Williams, Gibbons, & First, 1985). Albrecht et al. (1994) did not test the PK for accuracy of diagnosis. Nonetheless, 38 is significantly above the cutting score of 30 suggested by Keane et al. (1984). Thus, the PK scale appears to possess clinical utility on the MMPI-2 as well as the MMPI.

The studies reviewed above generally support the PK scale with respect to combat veteran samples. However, it is less clear whether the PK scale will retain its validity with noncombat trauma groups, such as the military sexual trauma group in this proposed study. The studies of Wolfe et al. (1994), Koretsky and Peck (1990), and McCaffrey et al. (1989) are the only ones undertaken with civilian trauma groups. These studies are presented in greater detail in the "Standard Decision Rule" section, but will be reviewed briefly below. Although Wolfe et al. (1994) did not test the accuracy of the PK or the PS, they report mean raw scores of 29 and 41 respectively. This preliminary finding is based on five MMPI-2 profiles of women veterans diagnosed by clinical interview with military sexual related trauma.

The Koretsky and Peck (1990) study tested the PK scale with a civilian trauma sample (comprised of crime victims, industrial accidents, and car accident victims). The PK scale correctly classified 88% of PTSD participants and 86% of non-PTSD controls. This study provides initial support for the sensitivity and specificity of the PK scale with a civilian sample.

However, McCaffrey et al. (1989) obtained a relatively low mean raw score (25.1) on the PK scale and failed to statistically discriminate their 12 participant PTSD sample (mainly car accident victims) from the non-PTSD sample. Consequently, McCaffrey et al. (1989) question

the validity of the PK scale for civilian-related trauma. These and other research teams (Lyons & Keane, 1992; Watson et al., 1986) tend to agree that different cutting scores need to be developed for different trauma populations.

The PS scale was developed by Schlenger and Kulka (1987) at the Research Triangle Institute in North Carolina. The 60 items included in the PS scale incorporate 45 items also contained in the PK scale. These 60 items were found by Schlenger et al., (1987; 1989) to discriminate PTSD in Vietnam veterans from non-PTSD Vietnam veterans. Butcher et al., (1989) reported internal consistent coefficients of .89 (for males) and .91 (for females) in the MMPI-2 normative samples. Test-retest reliability was .92 (for males) and .88 (for females). However, no specific cutting scores have been reported, and there are no studies indicating that PS has been tested within a sexual trauma population.

Problems with Previous Research

There are a number of problems with the existing research base examining MMPI assessment of PTSD. First, almost all previous research has used samples of combat veterans. Consequently, we know a great deal about the utility of the MMPI for combat trauma, but very little about the MMPI and other trauma groups. Second, many of the existing studies have used small sample sizes with limited generalizability. Third, many studies have relied on inadequate procedures for establishing the diagnosis of PTSD. Validity and reliability are weakened when researchers depend upon hospital chart diagnosis or a single clinician rater.

Given these limitations, it is not surprising that several authors have made recommendations for further research. For example, Wilson and Walker (1990) state, “Further studies should include larger samples and compare profile configuration for different groups of traumatized individuals.” Similar comments and suggestions for future research in this area are

noted in McCaffrey et al. (1990) and Wilson et al. (1985). The present study incorporates these suggestions and offers a comparative analysis of PTSD trauma groups using the MMPI-2, specifically the Standard Decision Rule (F-2-8), PK and PS scales.

This study also extends the results of Koretsky and Peck (1990) and McCaffrey et al. (1989) by using a larger sample size and a more homogeneous sample of military sexual trauma survivors, employing stricter diagnostic criteria, and adding the PS scale to the analyses.

Chapter III : Method

This study applied a retrospective archival design to access and analyze MMPI-2 profiles of veterans in the Veterans Administration health record system. All information was drawn from the VA Informatics and Computing Infrastructure (VINCI). VINCI stores data on veterans and their eligible dependents who receive services at VA facilities. Data are entered into VINCI about these patients by VA personnel beginning with their first patient encounter at the VA. Data stored include demographic information, diagnoses, disability compensation, and assessment results.

This study examined three independent variables. The first, veteran cohort, contained three levels: combat, military sexual trauma and no combat or military sexual trauma identified. The second, PTSD indicator, had two levels: PTSD and non-PTSD, and was determined from ICD-9 diagnosis codes in VINCI. The third, gender, had two levels: male and female, and was also pulled from the VINCI demographic database.

Participants

The clinical sample consisted of archival data obtained from the Veterans Affairs Medical Center, housed in VINCI. The cohort each veteran was assigned to in this study (i.e. combat, MST, non-combat and non-MST) is an identifier derived from combat and MST indicators assigned by a VA mental health clinician after such a determination is warranted (i.e., clinician assessment) and further confirmed by VA eligibility personnel. Combat and MST 'flags' remain in the veteran's official medical file. Those veterans identified with both combat and MST flags were excluded from this study. In addition, there are two places to store MST flags in VINCI: one is in the veteran's health record, and one is in the veteran's demographic

information. For this study, veterans had to have MST flags in both of these places to be included in the MST cohort, and veterans with MST flags in only one of these places were excluded from the sample. Since MST is a self-reported item, only including veterans with MST flags in both places was done in hopes of improving the credibility of the MST cohort.

For veterans meeting the inclusion criteria, the data query began in January 2015, and included MMPI-2 assessment dates between January 1, 2002 and December 31, 2012. More than 50 veterans were identified within each cohort, which was the number determined necessary for the analyses for this study using a power analysis. This power analysis was computed assuming three levels of factor for power (i.e. the three different cohorts), and six levels of factors to be crossed with the cohort (the two different MMPI-2 scales, two levels of PTSD diagnosis, and two genders). An alpha of .05 was used. A sample size of at least 50 for each cohort results in a power of 1.000 for an effect size of 0.75 or higher.

The combat trauma and the military sexual trauma groups were comprised of both male and female veterans in order to allow for gender comparisons. The MMPI-2 does provide separate male and female norms in the uniform T-score transformations, and the researcher recognized that the separate norms may partially control for gender effects.

Veterans were excluded if their MMPI-2 profile was deemed invalid. The standard rule-out criteria offered by Butcher and colleagues (1989) and Graham (1990) was used to screen out invalid profiles, which included those with more than 15 omitted items or T-scores above 90 on scales L, K, VRIN, or TRIN. Previous research suggests not discriminating by using specific cut-off scores for the F and Fb scales, as it has been shown that elevation is a natural finding in the disorders being investigated. This position is supported in numerous studies (Albrecht et al., 1994, Burke & Mayor, 1985; Hyer et al., 1986; Hyer et al., 1989), a number of which report

mean T-scores above 100 on the F scale. Perkonig and colleagues (2005) posit that high F scores in this population suggest genuine distress rather than symptom exaggeration.

Measure

In assessing psychopathology, the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2) is a widely used instrument in personality assessment. The MMPI-2 is a standardized 567-item true-false questionnaire that elicits a range of self-descriptions to quantitatively measure an individual's emotional adjustment and test-taking attitude and is intended to assess the psychopathology and personality characteristics of those completing it. Older versions of the MMPI (Form R, Group Form) were not included in the data set, as these versions were normed on a smaller, less representative sample and did not include several questions now included on the PS scale. The psychometric properties of the MMPI-2 were discussed at length in Chapter II.

As previously mentioned in the literature review, this study examined the F-2-8 profile, and the PK and PS scales of the MMPI-2. The inclusion of validity scales in these analyses is based on findings of previous researchers (e.g., Keane et al., 1984) indicating differences on these scales for clinical diagnoses of PTSD. The PK and PS scales were included because they are specifically designed content scales to assess PTSD.

Procedure

This study utilized retrospective data and required the use of protected health information (PHI) such as ICD-9 diagnosis code and dates of birth. Social security numbers were not accessed or used in this analysis; instead, a VA-created identifier (Patient ICN) was used for each record. All data, including PHI, were stored on a secure VINCI drive to which only the principal, co-investigator and authorized VA research personnel had access. The data were accessed via a secure VINCI server. The investigator performed all data work and statistical

analyses on the secure VINCI workspace using SQL, SPSS and Microsoft Excel. The only paper records associated with this study were SPSS results printouts, on which no PHI was included.

The initial query for veterans with MMPI-2 results in VINCI from January 1, 2002 through December 31, 2012, which was performed by VA SQL programmers given the research design needs outlined in Chapter I, produced 124,004 unique records. A cursory review of this query showed that the data produced from it appeared to be reasonable. However, this query included veterans who had multiple MMPI-2 results in VINCI from different VA locations during this time period. The VA has a unique, non-SSN identifier titled PatientICN that was used to remove these duplicates to ensure that only one MMPI-2 result would be considered per individual veteran. VA SQL programmers performed this consolidation step of the analysis as part of the VINCI request for this research design. The number of veterans in this revised population resulted in n=43,837. Again, the query results appeared to be reasonable so were taken as-is from this point by the investigator without further assistance from VA SQL programmers.

The population above was then adjusted to remove 154 duplicates (n=77 with two records each, totaling 154 records in total). Duplicates occurred due to multiple MMPI-2s being taken by certain veterans, and different demographic/health factors being associated with those veterans as of their MMPI-2 administration date which would result in them being classified into different cohorts (for example, the Combat cohort for one of their MMPI-2s, and the Absent cohort for a different MMPI-2). Since it would be difficult to determine a single, reliable cohort for these veterans, they were excluded from this analysis. The number of veterans in this revised population resulted in n=43,683.

This group was then divided into cohorts based on information relating to their combat history and MST status in VINCI. The cohorts are defined in Table 3.1.

Table 3.1

Cohort Descriptions

Cohort name	n	Included in initial testing population?	Cohort description
MST	2,358	Yes	These records had an MST flag in both their demographic and health records in VINCI. They had a combat flag of "N".
Combat	4,882	Yes	These records had a combat flag of "Y" in VINCI. They did not have an MST flag on either their health records nor demographic records in VINCI.
Absent	26,227	Yes	These records had a combat flag of "N" in VINCI. They did not have an MST flag in either their health records nor demographic records in VINCI.
MST via health factors only	12	No	These records had an MST flag in their health records in VINCI, but not in their demographic records. They had a combat flag of "N".
MST via PatientSub only	978	No	These records had an MST flag in their demographic records in VINCI, but not in their health records. They had a combat flag of "N".
No group	9,226	No	These records either had missing combat and/or MST flags or had a combination of MST and combat flags in their data in VINCI. Also, they may be non-veterans with MMPI-2 profiles in VINCI.

For purposes of this analysis, veterans in the MST cohort, Combat cohort, and Absent cohort were included. The Absent cohort is referred to as the Control cohort in these analyses. Veterans in the other three cohorts described above were excluded since their data in VINCI was incomplete or not conclusive enough to determine a reliable cohort in which to include them.

For these records, T-score results of their MMPI-2 for the following scales were queried from VINCI:

1. PK – Posttraumatic stress disorder - Keane
2. PS – Posttraumatic stress disorder - Schlenger
3. F – Infrequency
4. 2 – Depression
5. 8 – Schizophrenia
6. L – Lie
7. K – Defensiveness
8. VRIN – Variable Response Inconsistency
9. TRIN - True Response Inconsistency

Since the MMPI-2 is typically administered electronically by the VA, these T-scores were pulled as-is from VINCI and were not recalculated for purposes of this analysis. The T-scores ranged from 30 to 120, which was deemed to be reasonable.

Some of these records did not have T-score results for the MMPI-2 summarized in VINCI. Possible reasons for this include invalid MMPI-2 results, that survey T-score results were not performed or stored in VINCI, or that the record was a test case. One observation is that of the 1,197 records that were on the survey administration SQL database but not the T-score results SQL database, they did have results by individual MMPI-2 question entered into

Table 3.2

Population Adjustments for Missing Data Elements

Population Adjustment	MST	Combat	Control	Total
Initial count after removing excluded cohorts	2,358	4,882	26,227	33,467
Remove PatientICNs that were missing from demographic database (assume test cases)	(28)	(75)	(523)	(626)
Remove PatientICNs that were on demographic database but did not have an MMPI-2 profile on the survey administration nor T-score results databases (assume invalid/incomplete results)	(97)	(211)	(1,336)	(1,644)
Remove PatientICNs that were on demographic database and on survey administration database, but not on T-score results database	(80)	(202)	(915)	(1,197)
Remaining records after removing those with no MMPI-2 T-scores in VINCI	2,153	4,394	23,453	30,000

VINCI in the survey question SQL database. It is unclear why they did not have T-scores calculated since they had results by question answered elsewhere in VINCI. For purposes of this analysis, all of these records were excluded. The remaining n's for each cohort after removing records for various reasons relating to missing T-score results are in Table 3.2.

The number of questions answered on the MMPI-2 was also queried. The MMPI-2 has 567 unique items. The number of items answered by the veterans in the analysis ranged from 0

Table 3.3

Population Adjustments for Invalid Number of MMPI-2 Responses

Population Adjustment	MST	Combat	Control	Total
Initial count after removing those with no MMPI-2 T-scores in VINCI	2,153	4,394	23,453	30,000
Remove records with fewer than 552 or more than 567 MMPI-2 items answered in VINCI	(47)	(10)	(71)	(128)
Remaining records after removing those with fewer than 552 or more than 567 MMPI-2 questions answered in VINCI	2,106	4,384	23,382	29,872

to values greater than 567, according to VINCI. For purposes of this analysis, only MMPI-2 results with from 552 to 567 items answered were considered. The following set of numbers contains the number of items answered by veterans outside of this range, who were excluded (0, 1, 568, 569, 570, 576, 581, 602). Possible reasons for these number of items being entered into VINCI include entering race and/or ethnicity into additional "questions" instead of a single question, the number of questions in a battery being reported instead of the number of MMPI-2 questions only, or administrative error. This reduced the number of veterans in each cohort as shown in Table 3.3.

Next, some veterans had T-scores for only certain scales in VINCI (i.e. had a T-score for the F scale but not the PK scale). These were deemed to be incomplete records. Only veterans with complete MMPI-2 t-scores in VINCI were included in the analysis. This reduced the number of veterans in each cohort as shown in Table 3.4.

Table 3.4

Population Adjustments for Incomplete T-score Results

Population Adjustment	MST	Combat	Control	Total
Initial count after removing those with fewer than 552 or more than 567 MMPI-2 questions answered in VINCI	2,106	4,384	23,382	29,872
Remove records with incomplete T-score results	(1)	(0)	(2)	(3)
Remaining records after removing records with incomplete T-score results	2,105	4,384	23,380	29,869

Then, MMPI-2 results with K, L, TRIN and/or VRIN t-scores above 90 were excluded since a score at this level results in an invalid MMPI-2 result according to the Standard Rule Out criteria discussed previously. This reduced the number of veterans in each cohort as shown in Table 3.5. A summary of the determination of the testing population, as described above, is in Table 3.6.

At this point, ICD-9 codes for PTSD diagnosis were pulled from VINCI and compared to this population. A summary of headcounts by cohort, gender, and PTSD status appears in Table 3.7.

In the final testing population, the earliest MMPI-2 administration date is October 2007, despite the research request asking for an 11 year dataset (January 1, 2002 through December 31, 2012). The reason for this is that the VA decided to backfill MMPI-2 results (in addition to other data) into VINCI, however at the time these data were queried from VINCI, only responses dating back to approximately October 2007 had been loaded into VINCI. As a result, all of the

Table 3.5

Population Adjustments for Standard Rule Out Criteria

Population Adjustment	MST	Combat	Control	Total
Initial count after removing records with incomplete T-score results	2,105	4,384	23,380	29,869
Remove records with K, L, TRIN, and/or VRIN T-scores above 90	(22)	(45)	(295)	(362)
Remaining records after removing records with K, L, TRIN, and/or VRIN T-scores above 90	2,083	4,339	23,085	29,507

MMPI-2 assessments included in this analysis were conducted from October 2007 through December 31, 2012.

Research Questions

The research questions examined in this study are as follows:

Research Question 1: Can MMPI-2 measures identify veterans diagnosed with PTSD?

Hypothesis 1a: There will be no mean differences on the MMPI-2 PK scale between veterans diagnosed with PTSD and those without a PTSD diagnosis.

Hypothesis 1b: There will be no mean differences on the MMPI-2 PS scale between veterans diagnosed with PTSD and those without a PTSD diagnosis.

Hypothesis 1c: There will be no differences in the percentage of veterans categorized above the critical cutoff on the MMPI-2 F-2-8 profile between veterans diagnosed with PTSD and those without a PTSD diagnosis.

Table 3.6

Summary of Population Adjustments and Final Testing Population

Population Adjustment	MST	Combat	Absent	Total
Initial count of PatientICN				43,837
Remove PatientICNs with duplicate cohorts				(154)
Remove excluded cohorts	2,358	4,882	26,227	(10,216)
Remove records with no T-scores in VINCI	(205)	(488)	(2,774)	(3,467)
Remove records with less than 552 or more than 567 items answered on the MMPI-2	(47)	(10)	(71)	(128)
Exclude records with incomplete MMPI-2 T-score results in VINCI	(1)	(0)	(2)	(3)
Exclude records with F, L, TRIN, and/or VRIN T-scores above 90	(22)	(45)	(295)	(362)
Final testing population	2,083	4,339	23,085	29,507

Research Question 2: Among veterans diagnosed with PTSD, can MMPI-2 measures differentiate between those with a combat history, those with a military sexual trauma history, and those with no trauma type indicated?

Table 3.7

Testing Population By Cohort, Gender, PTSD Diagnosis

Gender	PTSD Diagnosis	MST	Combat	Control	Total
Male	Yes	620	3,040	11,286	14,946
	No	228	1,125	10,241	11,594
	Total	848	4,165	21,527	26,540
Female	Yes	992	91	625	1,708
	No	243	83	933	1,259
	Total	1,235	174	1,558	2,967

Hypothesis 2a: There will be no mean differences on the MMPI-2 PK scale between veterans diagnosed with PTSD identified as combat, those identified as military sexual trauma, and veterans with no trauma indicated.

Hypothesis 2b: There will be no mean differences on the MMPI-2 PS scale between veterans diagnosed with PTSD identified as combat, those identified as military sexual trauma, and veterans with no trauma indicated.

Hypothesis 2c: There will be no differences in the percentage of veterans categorized above the critical cutoff on the MMPI-2 F-2-8 profile between veterans diagnosed with PTSD identified as combat, those identified as military sexual trauma, and veterans with no trauma indicated.

Chapter IV: Results

This study explored two primary research questions. The first research question involved validating various MMPI-2 PTSD scales and the F-2-8 profile on the testing population. The second research question involved identification of differences on the MMPI-2 between veterans with combat-related PTSD, those with military sexual trauma-related PTSD, and a control group. Six hypotheses were developed to answer these questions. Gender differences were also examined as post-hoc analyses. This chapter discusses the results of one-way ANOVAs on the MMPI-2 PK and PS scales, and chi-squared results of the combined F-2-8 profile. These measures are then analyzed by cohort, gender, and PTSD diagnosis in order to address the research questions considered in this study.

Research Question 1

Hypotheses 1a and 1b. The first hypotheses being tested are that the MMPI-2 PK and PS, will not statistically differentiate PTSD diagnosis from non PTSD diagnosis in a sample of US military veterans. The entire sample was analyzed, using PTSD diagnosis as the independent variable, without separating the population by cohort. The PK and PS scales were tested, using univariate ANOVAs, as displayed in Table 4.1. The null hypothesis that there is no statistical difference between PTSD and non-PTSD on the PK and PS scales is rejected for both scales. Significant differences in T-score results were observed between PTSD and non-PTSD veterans on both of these scales.

Tables A.1 – A.3 in Appendix A were developed the same way as Table 4.1, but split the population by cohort. These results support rejection of the null hypothesis, that there are no significant statistical differences on the PK and PS MMPI-2 scales even when looking at PTSD

Table 4.1

ANOVA for PK and PS Scales by PTSD Diagnosis

Scale	PTSD	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	No	12,583	72.71	19.264	3494.885	<.001	.106
	Yes	16,654	84.91	16.163			
PS	No	12,583	74.03	18.897	3316.131	<.001	.101
	Yes	16,654	85.74	15.992			

vs. non-PTSD veterans in each cohort individually.

Hypothesis 1c. Headcounts by PTSD diagnosis for the F-2-8 profile appear in Table 4.2.

A chi-square analysis was performed using the combined F-2-8 binary score on the population above. The resulting Pearson chi-square result was 1,037.434, which has a significance of less than .001. This result supports rejection of the null hypothesis that there is no significant difference in F-2-8 percentage above the critical cutoff between PTSD and non-PTSD veterans. Effect size, measured by phi, is 0.188.

Headcounts by PTSD diagnosis, gender, and cohort for the F-2-8 profile appear in Table A.4 in Appendix A. Table A.5 in Appendix A contains the results of the chi-square analysis of the combined F-2-8 binary score for those with a PTSD vs. non-PTSD diagnosis code, split by cohort. These results mean that the null hypothesis that there is no difference between PTSD and

Table 4.2

Headcounts of PTSD Diagnosis by F-2-8 Profile

F-2-8 Profile	No PTSD Dx	PTSD Dx
Above cutoff	2,890	6,694
Below cutoff	9,963	9,960

non-PTSD veterans on the F-2-8 profile for each cohort individually is rejected. Significant differences in chi-square results were observed between PTSD and non-PTSD veterans in all cohorts for this profile.

Post-hoc analysis on Gender. Post-hoc analyses were performed to address whether the results described above would be consistent across gender. First, Table 4.3 shows key statistics for main and interaction effects of gender and PTSD for the PK and PS scales. Then, for the PK and PS scales, analyses of variance were performed similar to the testing for these scales described previously. The results appear in Tables 4.4 – 4.5. These results confirm rejection of the null hypothesis, and show that there are significant differences between PTSD and non-PTSD veterans, even when males and females are considered separately. The negligible effect size should be considered when interpreting these results, due to the large sample size.

A chi-square analysis was performed using the combined F-2-8 binary score, using gender as an additional independent variable. The resulting Pearson chi-square for males was 937.698, which has a significance of <.001, and phi of 0.188. This result supports the rejection of the null hypothesis that there is no significant difference in F-2-8 profiles between PTSD and non-PTSD male veterans. The resulting Pearson chi-square for females was 108.665, which has a significance of <.001, and a phi of 0.191. This result supports the rejection of the null

Table 4.3

Main and Interaction Effects for PK and PS Scales by PTSD Diagnosis and Gender

Scale	Source	Degrees of Freedom	Type III Sum of Squares	F-score	Significance
PK	Gender	1	27817.968	90.788	<.001
	PTSD	1	125507.725	409.615	<.001
	Gender * PTSD	1	84.040	0.274	.600
PS	Gender	1	29460.973	99.166	<.001
	PTSD	1	116119.124	390.857	<.001
	Gender * PTSD	1	221.743	0.746	.388

hypothesis that there is no significant difference in F-2-8 profiles between PTSD and non-PTSD female veterans.

Research Question 2

Hypotheses 2a and 2b. The second set of research hypotheses are that the MMPI-2 PK and PS scales will not significantly discriminate trauma type at a clinically meaningful rate.

First, this study examined veterans identified as Combat or MST with a PTSD diagnosis, and analyzed their results on the PK and PS MMPI-2 scales. Results are displayed in Table 4.6. The F-scores result in the null hypothesis failing to be rejected for the PK and PS scales. In other words, there was no significant difference between MMPI-2 scores for veterans with PTSD who were in combat compared to veterans with PTSD who are survivors of MST.

Table 4.4

ANOVA for PK and PS Scales by PTSD Diagnosis - Males

Scale	PTSD	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	No	11,594	73.08	19.465	3164.262	<.001	.107
	Yes	14,946	85.43	16.274			
PS	No	11,594	74.42	19.122	3013.236	<.001	.102
	Yes	14,946	86.31	16.147			

Next, the hypothesis that the MMPI-2 PK and PS scales will not significantly discriminate combat related PTSD participants from PTSD participants with no trauma type indicated at a clinically meaningful rate was tested. Results are displayed in Table 4.7. The F-scores result in the null hypothesis failing to be rejected for the PK and PS scales. In other words, there was no significant difference between MMPI-2 PK and PS scores for veterans with PTSD who were in combat compared to veterans with PTSD with no trauma type indicated.

The next research hypotheses are that the MMPI-2 PK and PS scales will not significantly discriminate MST-related PTSD participants from PTSD participants with no trauma type indicated. Results are displayed in Table 4.8. The F-scores result in the null hypothesis failing to be rejected for the PK scale, but the null hypothesis is rejected for the PS scale. In other words, there was no significant difference between MMPI-2 PK score for veterans with PTSD who were survivors of MST compared to veterans with PTSD with no trauma type indicated. There is a significant difference between MMPI-2 PS score for veterans

Table 4.5

ANOVA for PK and PS Scales by PTSD Diagnosis - Females

Scale	PTSD	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	No	1,259	69.25	16.927	371.100	<.001	.111
	Yes	1,708	80.35	14.382			
PS	No	1,259	70.49	16.264	349.067	<.001	.105
	Yes	1,708	80.74	13.581			

with PTSD who were survivors of MST compared to veterans with PTSD with no trauma type indicated. The negligible effect size should be considered when interpreting these results, due to the large sample size.

Hypothesis 2c. Headcounts for those in each cohort with a PTSD diagnosis for the F-2-8 profile appear in Table 4.9. The first research hypothesis tested is that the MMPI-2 F-2-8 profile will not significantly discriminate MST-related PTSD participants from PTSD participants with a combat trauma type indicated. A chi-square analysis was performed using the combined F-2-8 binary score on the population. The resulting Pearson chi-square result was 14.144, which has a significance of <.001, and phi of .055. This result supports rejection of the null hypothesis that there is no significant difference in F-2-8 profiles between combat PTSD and MST PTSD veterans.

A chi-square analysis was performed using the combined F-2-8 binary score on the combat and control cohorts. The resulting Pearson chi-square result was 7.034, which has a

Table 4.6

ANOVA for PK and PS Scales for Combat and MST Veterans with PTSD

Scale	Cohort	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	Combat	3,131	84.53	16.490	0.005	.941	<.001
	MST	1,612	84.50	15.294			
PS	Combat	3,131	85.48	16.332	1.756	.185	<.001
	MST	1,612	84.84	14.689			

significance of .008, and phi of .022. This result supports rejection of the null hypothesis.

The next research hypothesis tested is that the MMPI-2 F-2-8 profile will not significantly discriminate MST-related PTSD participants from PTSD participants with no trauma type indicated. A chi-square analysis was performed using the combined F-2-8 binary score on the MST and control cohorts. The resulting Pearson chi-square result was 5.410, which has a significance of .020, and phi of .020. This result supports rejection of the null hypothesis.

Post-hoc analysis on Gender. In addition, this study examined whether gender for those diagnosed with PTSD in the MST and Combat cohorts was of significance. Table 4.10 contains the results for the PK and PS scales, reflecting gender as an additional independent variable.

For females, this study has failed to reject the null hypothesis that either of these scales is significantly different between females with combat PTSD compared to MST related PTSD. For males, the null hypothesis that there is no significant difference between combat PTSD compared to MST related PTSD veterans is rejected for both scales. There are significantly higher scores

Table 4.7

ANOVA for PK and PS Scales for PTSD Diagnoses in Combat vs. Control Cohorts

Scale	Cohort	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	Control	11,911	85.06	16.189	2.635	.105	<.001
	Combat	3,131	84.53	16.490			
PS	Control	11,911	85.93	16.067	1.975	.160	<.001
	Combat	3,131	85.48	16.332			

on both scales for MST PTSD male veterans compared to combat PTSD male veterans. The negligible effect size should be considered when interpreting these results, due to the large sample size.

Headcounts for those in the Combat and MST cohorts with a PTSD diagnosis by gender for the F-2-8 profile appear in Table 4.9. A chi-square analysis was performed using the combined F-2-8 binary score on the population, using gender as an additional independent variable. The resulting Pearson chi-square for males was 69.291, which has a significance of less than .001 and phi of .138. This result supports the rejection of the null hypothesis that there is no significant difference in F-2-8 profiles between combat PTSD and MST PTSD male veterans. The resulting Pearson chi-square for females was 0.250, which has a significance of .649 and phi of .015. This result confirms that for females the null hypothesis that there is no significant difference in F-2-8 profiles between combat PTSD and MST PTSD female veterans is not rejected.

Table 4.8

ANOVA for PK and PS Scales for PTSD Diagnoses in MST vs. Control Cohorts

Scale	Cohort	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	Control	11,911	85.06	16.189	1.758	.185	<.001
	Combat	1,612	84.50	15.294			
PS	Control	11,911	85.93	16.067	6.746	.009	<.001
	Combat	1,612	84.84	14.689			

Table 4.11 contains the ANOVA results for the PK and PS scales for the combat and control group veterans with PTSD, reflecting gender as an additional independent variable. For both males and females, the null hypothesis that there is no significant difference between combat PTSD compared to control group PTSD veterans is rejected for both scales. For males, there are significantly higher scores on both scales for the control group PTSD veterans compared to combat PTSD veterans. For females, there are significantly higher scores on both scales for the combat PTSD veterans compared to control group PTSD veterans. The negligible effect size should be considered when interpreting these results, due to the large sample size.

A chi-square analysis was performed using the combined F-2-8 binary score on the combat and control PTSD cohorts, using gender as an additional independent variable. The resulting Pearson chi-square for males was 10.709, which has a significance of less than .001 and phi of .027. This result supports the rejection of the null hypothesis that there is no significant difference in F-2-8 profiles between combat PTSD and control group PTSD male veterans. The

Table 4.9

Headcounts of Veterans with PTSD by F-2-8 Profile and Gender

Cohort	Gender	F-2-8 above cutoff	F-2-8 below cutoff
MST	Male	347	273
	Female	353	639
Combat	Male	1,153	1,887
	Female	30	61
Control	Male	4,651	6,635
	Female	160	465

resulting Pearson chi-square for females was 2.211, which has a significance of .137 and phi of .056. This result confirms that for females the null hypothesis that there is no significant difference in F-2-8 profiles between combat PTSD and control group PTSD female veterans is not rejected.

Table 4.12 contains the ANOVA results for the PK and PS scales for the MST and control group veterans with PTSD, reflecting gender as an additional independent variable. For both males and females, the null hypothesis that there is no significant difference between MST PTSD compared to control group PTSD veterans is rejected for both scales. For both genders, there are significantly higher scores on both scales for the MST PTSD veterans compared to control group PTSD veterans. The negligible effect size should be considered when interpreting these results, due to the large sample size.

Table 4.10

ANOVA for PK and PS Scales for Combat and MST Veterans with PTSD by Gender

Scale	Gender	Cohort	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	Male	Combat	3,040	84.60	16.560	45.270	<.001	.012
		MST	620	89.46	15.708			
	Female	Combat	91	82.53	13.669	0.535	.465	<.001
		MST	992	81.40	14.180			
	Gender * Cohort					10.182	.001	.002
PS	Male	Combat	3,040	85.55	16.415	38.881	<.001	.011
		MST	620	90.01	15.278			
	Female	Combat	91	82.99	13.098	0.905	.342	.001
		MST	992	81.60	13.332			
	Gender * Cohort					10.062	.002	.002

Table 4.11

ANOVA for PK and PS Scales for Combat and Control Veterans with PTSD by Gender

Scale	Gender	Cohort	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	Male	Control	11,286	85.44	16,193	6.390	.011	<.001
		Combat	3,040	84.60	16,566			
	Female	Control	625	78.37	14.602	6.543	.011	.009
		Combat	91	82.53	13.669			
	Gender * Cohort					7.326	.007	<.001
PS	Male	Control	11,286	86.31	16.094	5.319	.021	<.001
		Combat	3,040	85.55	16.415			
	Female	Control	625	79.05	13.885	6.484	.011	.009
		Combat	91	82.99	13.098			
	Gender * Cohort					6.590	.010	<.001

Table 4.12

ANOVA for PK and PS Scales for MST and Control Veterans with PTSD by Gender

Scale	Gender	Cohort	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	Male	Control	11,286	85.44	16,193	36.496	<.001	.003
		MST	620	89.46	15.708			
	Female	Control	625	78.37	14.602	17.058	<.001	.010
		MST	992	81.40	14.180			
	Gender * Cohort					0.917	.338	<.001
PS	Male	Control	11,286	86.31	16.094	31.178	<.001	.003
		MST	620	90.01	15.278			
	Female	Control	625	79.05	13.885	13.607	<.001	.008
		MST	992	81.60	13.332			
	Gender * Cohort					1.223	.269	<.001

A chi-square analysis was performed using the combined F-2-8 binary score on the MST and control PTSD cohorts, using gender as an additional independent variable. The resulting Pearson chi-square for males was 52.549, which has a significance of less than .001 and phi of .066. This result supports the rejection of the null hypothesis that there is no significant difference in F-2-8 profiles between MST PTSD and control group PTSD male veterans. The resulting Pearson chi-square for females was 17.648, which has a significance of less than .001, and phi of .104. This result supports the rejection of the null hypothesis that there is no significant difference in F-2-8 profiles between MST PTSD and control group PTSD female veterans.

Summary

This chapter provided results of hypothesis testing for both research questions examined in this study, including both ANOVAs and chi-squared statistics. It also included post-hoc analyses on gender differences on the MMPI-2 measures tested for US military veterans. Due to the large sample size, effect sizes were reported to aid in interpretation of results, since many of the null hypotheses were rejected.

Chapter V: Discussion

A summary of the key findings, limitations, and conclusions of this research are detailed in this chapter. This includes a discussion of MMPI-2 PTSD measures and the differences in results between combat, MST, and control group veterans observed. Limitations in data collection and accessibility, the research design, and generalizability will be discussed. Finally, future directions for VA clinicians and other practitioners will be examined.

Summary of Results

Descriptive analyses of the data yielded several important group differences. To begin, the PK, PS, and F-2-8 measures were validated in this population, as there were statistically significant differences on these measures for those diagnosed with PTSD compared to those not diagnosed with PTSD. This was also true when the sample was further separated by gender and cohort. In addition, there did not appear to be a "stronger" measure for identifying PTSD, suggested by the equal performance of the PK scale, the PS scale, and the F-2-8 profile. This supports the work of Albrecht et al., 1994; Keane et al., 1984; and Schlenger & Kulka, 1987. However, when effect size is considered, the F-2-8 profile performed better than the PK and PS scales, since the F-2-8 profile resulted in a small effect size (phi between .1 and .3), per Cohen (1988). The PK and PS scales did not result in a significant effect size under the standards developed by Cohen (1988), since partial eta squared was less than .2.

Prior to splitting the population by gender, only the F-2-8 profile differentiated combat and MST veterans, with the MST group higher than the combat group, though the effect size was insignificant. Once the sample was analyzed by gender, however, female combat and MST samples were indistinguishable on any of the three measures, but were still distinguishable from the control group. This may, in part, speak to the roles U.S. military women have held compared

to their male counterparts. Until recently, women soldiers were not allowed to take part in combat specific operations, thus the nature of their combat experiences may have been different (Miller, 1998), as reflected in the much smaller sample of female combat veterans in this study. Although women are excluded from serving in direct combat specialties, such as infantry or armor, and are therefore not at the same risk as male soldiers, they do serve in a variety of support positions where they travel outside military bases, work alongside combat soldiers, come under direct fire and may become casualties. As the role of women in combat continues to change in the US military, further opportunities in this area will become apparent. An unanswered question remains as to whether there are gender differences in the risk of PTSD and other mental health problems among men and women exposed to similar levels of combat trauma.

Compared to combat PTSD males, males with PTSD related to military sexual trauma (MST) showed higher means on all three measures. The effect size for the F-2-8 profile was small, making it a potential stronger measure than the PK and PS scales, which had effect sizes that were not significant. This finding may indicate that males screened with the measures used in this study, especially the F-2-8 profile, may benefit from additional screening for MST specifically, and subsequent services may then be identified and provided, if present.

When compared to the control group of PTSD-diagnosed veterans, combat scores on the PK and PS scales were not significantly higher, but the F-2-8 profile was significantly higher, prior to splitting by gender. Once split by gender, for females all measures were elevated in combat veterans. For males, the control group actually had slightly higher PK and PS scales (though only significantly higher for PK). None of these measures resulted in significant effect

sizes observed. What PTSD in veterans looks like absent combat or MST could contribute to this, but was not further explored as a part of this study.

When compared to the control group of PTSD-diagnosed veterans, MST scores on the PK scale were not significantly higher, but the PS scale and F-2-8 profile were both significantly higher, prior to splitting by gender. Once split by gender, for both genders all measures were elevated in MST veterans. This further supports the findings discussed earlier, that MST veterans in general score significantly higher on all measures, even when compared to other PTSD diagnosed veterans. In-part, this finding may be an effect of the internal response of the victim role in MST experiences. None of these measures resulted in significant effect sizes observed though.

Since nonsignificant or small effect sizes were observed for most tests performed, differences in observed results for these groups and measures may not be perceptible. This study utilized partial eta squared to examine effect size for the ANOVAs performed on the PK and PS scales. All effect sizes were less than .20, indicating very small effect size. Further studies on smaller populations should be explored, where effect sizes may be larger and thus could more strongly validate results observed in this very large sample.

Overall, this study identifies the importance of mental health clinicians considering gender when interpreting MMPI-2 results for veterans diagnosed with PTSD. In addition, it supports the usage of the PK, PS, and F-2-8 measures in PTSD assessment in US military veteran populations. Finally, it points towards elevated MMPI-2 profiles for male survivors of MST, compared to a different types of trauma. For females, elevated MMPI-2 profiles for MST survivors are shown when compared to a control group but not to the combat group. Thus, the

measures tested may be less effective at differentiating trauma type in female veterans with PTSD.

Limitations - Data

This study sought to examine empirically based diagnostic differences between MST and combat trauma, and it is not without limitations. The first limitation is that the identification of MST is based on self-report. While this study required subjects classified as MST to have MST reported both in demographic and health records in VINCI, a method for substantiating such claims has not yet been identified and presents a limitation to the validity of this research. The large sample size helps to mitigate this concern, so even if a minority of subjects were incorrectly identified as MST, the results likely would not be significantly affected.

Secondly, this study did not access information on chronicity and severity of trauma, nor time since trauma occurrence. Thus, the effects of multiple traumatic events, additional life trauma history, and severity of traumatic events were not accounted for.

Thirdly, this study did not account for variability in lifetime exposure to traumatic events. PTSD diagnoses for some veterans may be based on traumatic events experienced prior to military service. The internal validity of the study may be weakened somewhat by the archival design. Participants were selected on the basis of their veteran status as well as an identifier flag (i.e., Combat or MST) in VINCI. Random assignment to groups was not possible. Therefore, history and selection (i.e., differences that may have existed among veterans prior to testing) were not controlled for.

Fourthly, the number of females in the combat cohort diagnosed with PTSD was relatively low compared to other subgroups (91 records). As female combat exposure is

emerging and changing for the US military, further research should be conducted to explore the unique characteristics and needs of this trauma group.

These limitations are not believed to have invalidated the study given the psychometric properties of the instruments used and the significant sample size, which help to control for such mediating differences. Moreover, it is believed that the variations of findings within this study are representative of actual group differences between veterans as in a broader sample.

An advantage of this design compared to other literature reviewed was its large sample size, which is helpful in two ways. First, this design increases the statistical power of the analyses. Second, this design reduced the likelihood of obtaining systematic differences between groups that may not really exist (i.e., Type I error).

Limitations – MMPI-2

Both research hypotheses examined the diagnostic accuracy of PTSD measures, but utilizing only one instrument – the MMPI-2. The reader is cautioned that this does not imply sole use of the MMPI-2 to establish diagnosis of any kind. Research strongly supports multimodal assessment of PTSD, utilizing structured clinical interviews, objective measures, and psychophysiological evaluation (Keane, Wolfe, & Taylor, 1987; Keane & Wolfe, 1990; Penk et al., 1989). Additionally, the MMPI-2 is a self-report measure and is therefore subject to biases that are inherent in its methodology (response sets, social desirability, etc.). This problem was mediated somewhat by using the validity scales of the MMPI-2 to screen out invalid profiles (see detailed discussion Chapter III). The results may lend themselves to further testing in multi-method confirmatory studies. At issue is whether MMPI-2 PTSD measures should be incorporated as a component of the overall assessment process. Thus, reliance solely on MMPI-2 data does not appear to be a major problem.

Limitations – External Validity

An additional limitation of the study relates to external validity. Since the sample included only US military veterans who had complete MMPI-2 results on VINCI from late 2007 through December 31, 2012 and were seeking treatment from the VA healthcare system, the generalizability of this study is limited. In addition, the majority of US military veterans do not receive regular health services from the VA, according to Shen, Hendricks, Wang, Gardner, & Kazis (2008), therefore, these results may not reflect US military veterans as a whole but instead may be biased towards those who seek VA services. Despite this limitation, the findings of this study are applicable and important among military veterans as both combat PTSD and MST are unique traumatic events that affect this population. While the results of this study will extend to combat and MST survivors, they may not generalize beyond these samples. Survivors of natural disasters, major automobile accidents, or other traumas may display PTSD in different ways.

Possible implications

Since psychological services within the VA are designed to assist in the improvement of symptoms and overall well-being, it is important to continue expanding the knowledge of the unique characteristics of veterans with PTSD and their effects on the progression of mental health treatment. The focus of this study was to provide a more comprehensive understanding of PTSD, and how specific trauma category (e.g., combat versus sexual assault) might display on an MMPI-2 assessment. By increasing awareness of PTSD MMPI-2 measures and validating them among the testing population, this study helps identify differences that might inform subsequent treatment. By having more information on these populations, the efficacy of mental health diagnosis and treatment might be increased.

Accurately understanding the effects trauma may have on an individual with PTSD has wide ranging implications for PTSD research and clinical practice. Treating PTSD patients as a single group can mask important relationships that could be seen if genuine subtypes exist. Although several treatment approaches have been shown to improve PTSD symptoms, most studies are highly selective in their recruitment and show only modest gains (Buckley, et al., 2004). Developing clear diagnostic subtypes of PTSD is a crucial step toward matching effective treatments with patients who could benefit from them. In other words, our ability to treat patients with PTSD effectively may be significantly enhanced if we have a better understanding of the personality configurations (i.e., a particular subtypes) of the people we are trying to treat.

A second concern involves research on the etiology of PTSD directly. A large body of literature has identified a number of variables that contribute to risk and/or resilience (Breslau et al., 1997). Such studies fail to identify important predictors by assuming that different types of PTSD can be grouped homogeneously. An accurate understanding of subtypes has substantial implications for both research and practice with patients with PTSD.

The Diagnostic and Statistical Manual (DSM-IV) criteria for PTSD include several different types of trauma exposure, identified as Criterion A. Since its inclusion in DSM-III, there has been much debate on the categorization and clinical description of PTSD (Litz et al., 1991) due to the variability in types of exposure events, their severity, and variability in resulting symptomatology. Among veterans, two unique and potentially severe Criterion A events are combat exposure in a war zone and sexual trauma (including abuse and assault).

Buckley and colleagues (2004) additionally describe differences between interpersonal and impersonal traumas, stating that impersonal traumas include events such as natural disasters and accidents, while interpersonal traumas include physical and sexual assaults. Perkonig, et al.,

(2005) also described attachment traumas, which are denoted as interpersonal trauma in an attachment relationship, including events like childhood sexual abuse and the association of betrayal in an attachment relationship. Importantly, research indicates that interpersonal traumas result in more negative outcomes than impersonal traumas, suggesting that the type of trauma or Criterion A event can influence severity of PTSD symptoms that result. This study supports these conclusions, as MST males with PTSD were shown to have significantly higher elevations in the measures tested compared to combat males.

As many as 41% of service members have been exposed to a traumatic combat event (Hoge et al., 2004). MST is recognized as being inclusive of sexual assault and sexual harassment that occurs at any time during military service. The testing population for this study contained 848 males (3.2% of males) and 1,245 females (41.6% of females) identified as survivors of MST. On average, studies show that 23% of women and 1-3% of men experience military sexual trauma (e.g., Elhai, Flitter, Gold, & Sellers, 2001; Litz et al., 1991). These percentages are somewhat misleading, however, given that the number of men in the military far exceeds the number of women in the military, such that the actual number of men who experience MST is equivalent to or slightly higher than the number of women who experience MST. However, despite having similar incidences of assault, there is a decreased likelihood that males will *report* MST or sexual assault (Hoyt, Klosterman & Williams, 2011). An area for further exploration is the discrepancy in the proportion of female survivors of MST in the testing population compared to prior studies. No adjustments were made to the female testing population to account for this significant difference in MST prevalence from prior studies.

Conclusion

The Veterans Affairs (VA) system has attempted to adjust to meet the needs of a new generation of veterans, many of whom have been diagnosed with PTSD. The VA currently serves nearly 4 million veterans in hundreds of facilities across the United States (U.S. Medicine, 2009). Over 20 percent of OEF-OIF veterans have received a diagnosis of PTSD while over 17 percent have received a diagnosis of major depression (Seal et al., 2009). Seal et al. also found that veterans entering the VA system had a sharp increase in mental health diagnoses, from about 6 percent in April 2002 to nearly 37 percent in March 2008. This influx of veterans has caused a significant strain on the VA system. Given the great need for mental health treatments in general and PTSD treatments in particular, the VA system began a new initiative to research and promote evidence-based treatments for PTSD in 2010 (Veteran's Health Administration, 2010).

Hopefully, the results of this study will speak to the clinical usefulness of the MMPI-2 for diagnosing and describing PTSD. While this information is useful to the clinician, it does little to build theory related to PTSD. The etiology, natural course, and treatment of PTSD remain important topics of study, but are beyond the scope of the present investigation. This study intends to add a small piece of knowledge to the armamentarium of the practicing clinician.

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Appendix A

Table A.1

ANOVA for PK and PS Scales by PTSD Diagnosis - Control Cohort

Scale	PTSD	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	No	11,174	72.66	19.305	2812.733	<.001	.109
	Yes	11,911	85.06	16.189			
PS	No	11,174	74.03	18.939	2664.435	<.001	.103
	Yes	11,911	85.93	16.067			

Table A.2

ANOVA for PK and PS Scales by PTSD Diagnosis - Combat Cohort

Scale	PTSD	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	No	1,208	72.15	18.797	453.583	<.001	.095
	Yes	3,131	84.53	16.490			
PS	No	1,208	73.39	18.465	443.449	<.001	.093
	Yes	3,131	85.48	16.332			

Table A.3

ANOVA for PK and PS Scales by PTSD Diagnosis - MST Cohort

Scale	PTSD	n	Mean	Std. deviation	F-score	Significance	Partial Eta Squared
PK	No	471	75.35	19.305	114.953	<.001	.052
	Yes	1,612	84.50	15.294			
PS	No	471	75.87	18.899	118.232	<.001	.054
	Yes	1,612	84.84	14.689			

Table A.4

Headcounts of PTSD Diagnosis and Cohort by F-2-8 Profile

PTSD	F-2-8 Profile	MST	Combat	Control
No	Above cutoff	328	968	8667
	Below cutoff	143	240	2507
Yes	Above cutoff	912	1948	7100
	Below cutoff	700	1183	4811

Table A.5

Chi-Square for F-2-8 Profile by PTSD Diagnosis and Cohort

Statistic	MST	Combat	Control
Pearson Chi-Square	25.819	126.948	858.474
Significance	<.001	<.001	<.001