

THE IMPACT OF COMBAT INJURY AND TRAUMA ON MARITAL
RELATIONSHIPS

by

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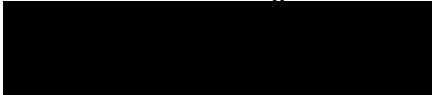
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ABSTRACT

The Impact of Combat Injury and Trauma on Marital Relationships

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Background: Military couples have unique relationships and face many external stressors including periods of separation, deployments, and sometimes combat injuries. Combat injuries incurred during Operation Iraqi Freedom and Operation Enduring Freedom (OIF/OEF) can be severe with treatment oftentimes requiring years of rehabilitation. Service members and their spouses also experience symptoms of posttraumatic stress and depression more so than civilian counterparts. Combat physical injuries and mental health symptoms can have a profound impact on the marital relationship such as increased distress, change in household responsibilities, feelings of isolation, reduced satisfaction, decreased sexual drive, and interpersonal conflicts or miscommunication.

Objective: The present study evaluated the effects of service members' physical injury and service members' and spouses' mental health symptoms on dyadic adjustment and intimate safety (i.e., the individual's comfort level interacting with their spouse).

Methods: The current study is a secondary analysis of previously collected data from 38 couples recruited for a military family intervention study (Families Overcoming Combat Under Stress – Combat Injury; FOCUS-CI). Service members and spouses were individually administered measures of posttraumatic stress symptoms (PCL-C) and depression (BSI Depression scale) as well as measures of marital functioning (RDAS and

ISQ). Clinicians also rated service members' physical injury severity (ISS).

Results: Overall, results of the current study indicated that spouses' posttraumatic stress symptoms and service members' depression symptoms were consistently predictive of intimate safety and dyadic adjustment ($p < 0.05$). Physical injury severity did not predict a linear relation with dyadic adjustment ($p = 0.33$), but did predict categorization into dyadic adjustment group ($p = 0.05$). Results indicated that worse physical injury predicted the categorization of couples in a non-distressed group. Mental health symptoms did not mediate relations between physical injury and dyadic adjustment ($p = n. s.$). Intimate safety did not moderate relations between mental health symptoms and dyadic adjustment ($p = n. s.$). Exploratory analyses indicated that physical injury and mental health symptoms were primarily predictive of the Revised Dyadic Adjustment Scale construct of Satisfaction ($p < 0.05$).

Discussion: Other research studies support the findings that posttraumatic stress and depression symptoms can have profound effects on marital adjustment. Physical injury severity and its relation to mental health symptoms and dyadic adjustment should be further explored in future studies, particularly in regards to couples undergoing rehabilitation for severe, life-threatening injuries. It is considered that severe life-threatening injuries may bring the couple closer together and act as a protective factor to help couples better adjust. Overall, these findings provide evidence for the need for comprehensive evaluation and treatment of both service members and spouses' mental health symptoms during hospitalization and rehabilitation for physical injuries. Implications for the effects of injury severity and mental health symptoms on predicting intimate safety and dyadic adjustment are discussed, with future directions identified.

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CHAPTER 1: Introduction

Marriage is viewed as the primary adult relationship offering an opportunity for acceptance and belonging (Noller & Feeney, 2002). The need to develop and maintain close interpersonal relationships with a sense of acceptance and belonging has been described as a fundamental need and motivation for well-being (Baumeister & Leary, 1995; Ryan & Deci, 2002). Well-being is defined as the “complete physical, mental, and social well-being, and not merely the absence of disease or infirmity” (World Health Organization, 2006). Healthy marriages are statistically significantly related to greater well-being (Carr & Springer, 2010), less psychological distress (D. R. Johnson & Wu, 2002), life longevity (Gardner & Oswald, 2004), general physical health (Hughes & Waite, 2009), and improved emotional and sexual health (Waite & Gallagher, 2000). Less is known about the characteristics and qualities of individuals or couples that contribute to healthy marital relationships (Fincham & Beach, 2010; Karney & Crown, 2007; Wright, Simmons, & Campbell, 2007) as well as the factors promoting healthy marital relationships when couples are undergoing stressful or difficult times. Researchers recognize the need for a better understanding of communication and intimacy within marital relationships as well as which factors influence relationship adjustment during times of distress or illness.

One such population that often experiences distress is military couples, especially those in which the service member has incurred combat injuries. A new generation of service members with combat injuries has emerged in the past 15 years, with unique wounds and injuries. The most common tactic used during combat against U. S. troops and its allies during OIF/OEF are improvised explosive devices (IEDs). An estimated 65 percent of combat injuries are a result of IEDs (Bunker & Sullivan, 2005; DeBruyne & Leland, 2015; Gondusky & Reiter, 2005). A combat injury profoundly alters the lives of both service members and their spouse. Together, service members and their spouse face difficult emotional and practical problems from the initial distress to the recovery phase

and longer-term injury adjustment. The path from injury to recovery can have a major impact on marital relationships, including intimacy, communication, and relationship distress. It is thought that marital adjustment during recovery from injury or illness may be affected by physical injury and recovery as well as mood symptoms (i.e. depression or posttraumatic stress). The present study assessed how U. S. service members' combat physical injury, posttraumatic stress, and depression impact the marital relationship. Furthermore, the present study assessed how spouses' symptoms of depression and posttraumatic stress impact the marital relationship.

Unique to the present study was the focus on mental health symptoms and marital relationships within a military injured population. The present study's objective was to expand the concept that service members' combat injuries (physical and mental) affect not only the individual but the marital relationship of the service member as well. The purpose of this dissertation was to examine factors of marital adjustment and understand how combat physical injury and mental health symptoms impact military marital relationships. It was also important to understand how spouses' mental health symptoms of posttraumatic stress and depression impact marital adjustment. The introduction begins with a review of general factors contributing to marital adjustment, including communication and intimate safety. Then there is a discussion about marital relationships specific to the military population, including particular stressful factors experienced by military couples. Next, combat exposure and injuries endured by service members are discussed, which can include amputations, burn injuries, blindness, traumatic brain injury, posttraumatic stress, and depression. Spouses' symptoms of depression and posttraumatic stress are also explored in the literature. These concepts are then tied together in order to understand how combat injury and mental health symptoms impact marital functioning.

MARITAL RELATIONSHIP CONSTRUCTS

It is first important to understand key terms used to describe healthy marital

relationships. Healthy marital relationships are characterized by qualities such as marital adjustment, good communication skills, and intimate safety (i.e. spouse's sense that they are safe being their authentic and vulnerable self with their spouse; Cordova, Gee, & Warren, 2005; see below). During the early 1970s there was a great need for further research and adequate measures of marital adjustment. Spanier (1976) addressed this need by operationalizing the term 'marital adjustment' and distinguishing it from other concepts. This led to the development of the Dyadic Adjustment Scale, a widely used global measure of marital adjustment. Although the measure has since been revised (Busby, Crane, Larson, & Christensen, 1995), many of Spanier's research and conceptualizations of marital adjustment remain important. Marital adjustment is considered a process within the relationship, rather than an unchanging state, and can be evaluated at any time point on a dimension of well adjusted to maladjusted (Spanier, 1976). Research indicates that *marital adjustment* relies on the qualities of consensus, cohesion, and satisfaction within the relationship (Busby et al., 1995). Spanier (1976) concluded that couples who agree on major topics of importance (*consensus*), have common interests or activities (*cohesion*), and experience happiness or joy (*satisfaction*) within their marital relationship are more likely to adjust appropriately to changes.

In addition to marital adjustment, *communication* is another important aspect among healthy marital relationships. Communication is an interactive process including both self-disclosure of information by one spouse followed by a spouse response (Segrin, Hanzal, & Domschke, 2009). The construct of *intimate safety* measures the comfort and vulnerability one spouse feels in discussions with their spouse (Cordova et al., 2005). Intimate safety includes comfort in disagreeing with a spouse, discussing sexual intimacy, and comfort level with spouse in social situations. Each of these concepts is discussed in greater detail in the following marital relationship sections.

Marital Adjustment

Marital adjustment is a multifaceted construct. Throughout the course of a marriage, both positive and negative life events occur both inside and outside the marriage that have the potential to affect the interpersonal relationship between spouses (Minuchin, Nichols, & Lee, 2007). Events such as trauma may impact either one or both spouses, which consequently impact marital adjustment (Johnson & Williams-Keeler, 1998). Marital adjustment includes several dimensions: consensus, cohesion, and satisfaction (Spanier, 1976). Marital consensus refers to the agreement on matters of importance to marital adjustment. Based on research by Spanier (1976), important topics impacting adjustment were religious matters, major decision-making, sexual relations, demonstrations of affection, conventionality (correct or proper behavior), and career decisions. Marital cohesion refers to collaborative interests or activities within the relationship. Examples include working on projects together, exchanging ideas or conversation, and being involved in outside interests together. Deal, Wampler, and Halverson (1992) indicated cohesion “was the most powerful predictor of marital similarity”, finding a higher level of adjustment among couples was due to similar perceptions and interests.

The concept of marital satisfaction has received extensive attention in the research literature. Marital satisfaction can be described as “the extent to which a spouse feels enjoyment, contentment, and love in their marital relationship” (Hendrick & Hendrick, 1988). The term marital satisfaction is sometimes used interchangeably with marital quality or marital happiness (Feeney, 2002; Leinonen, Solantaus, & Punamäki, 2003). Furthermore, research indicates that there is a high correlation between marital satisfaction and adjustment (Segrin & Flora, 2011). Although it could be considered only one important component of overall marital adjustment, marital satisfaction is often assessed as an indicator or outcome of success within marriages. It is most often used as a dependent variable in research, but can also be used as a predictor. In this regard, marital

satisfaction has been found to be a significant predictor of multiple outcomes, including spouses' psychological, developmental, social, and physical health (Cummings & Davies, 2010). Predictors of satisfaction in marriage include high levels of reported self-disclosure, spouse disclosure, spouse responsiveness, and intimacy (Ehrensaft, Langhinrichsen-Rohling, Heyman, O'Leary, & Lawrence, 1999; Feeney, Noller, & Ward, 1997; Veroff, Sutherland, Chadiha, & Ortega, 1993). The following section includes a discussion of the concept of marital communication, including research on self-disclosure and spouse responsiveness.

Marital Communication

Communication is an important aspect of marital relationships. Whereas early researchers focused on individual personality traits as predictors of marital success (i.e., race, age, employment status; Cherlin & Furstenberg Jr., 1988; Glenn & Shelton, 1985; South & Spitze, 1986), more recently, researchers have focused on how interpersonal communication processes impact overall marital outcomes (Jacobson, Gottman, Gortner, Berns, & Shortt, 1996; Kiecolt-Glaser, Gouin, & Hantsoo, 2010; Segrin et al., 2009). Research on marital interpersonal communication is based on the premise that interaction patterns between spouses are the central factor leading to marital satisfaction and adjustment (Feeney, 2002). A consistent body of research has documented the relation between communication and marital quality. Research on nonclinical populations has suggested *communication*, including frequency, style, and content between spouses, can determine satisfaction within a marriage (Bodenmann, 2005; Gottman, Ryan, Swanson, & Swanson, 2005; Gottman & Notarius, 2000; Gottman & Notarius, 2002; Laurenceau, Barrett, & Rovine, 2005; Whitehead & Popenoe, 1999). The literature generally shows that couples indicating they are “happily” married communicate differently than couples reporting “unhappy” marriages (Fitzpatrick, 1988; Gottman & Notarius, 2002). Communication concepts researched by Fitzpatrick (1988) include verbal and nonverbal communication patterns of power, conflict resolution, submission, and gaining

compliance. Research on marital communication has split into two branches: one branch highlighting positive communicative behaviors that reflect and promote closeness, support, and intimacy; and a second branch focused on negative communication behaviors that demonstrate distance, power, and demandingness. Positive communicative behaviors can include self-disclosure, verbal expressions of closeness, nonverbal expressions of affection, giving gifts for love, and spending time together (Noller & Feeney, 2002). These communicative behaviors can promote closeness between marital spouses. Negative communicative behaviors revolve around power dynamics and control to assert dominance, often utilizing demand-withdrawn patterns (Gottman & Notarius, 2002).

One aspect of communication is self-disclosure of thoughts, feelings, and emotions. Self-disclosure within marital relationships is associated with increased understanding, maintenance of emotional intimacy, and connection (Segrin & Flora, 2011). Disclosure of information to a significant other is associated with overall greater marital satisfaction (Joseph & Afifi, 2010) and more specifically, the depth and quality of self-disclosure is important in predicting marital satisfaction (Caughlin & Petronio, 2004). Compared to distressed couples, non-distressed and satisfied couples demonstrate more self-disclosures in their communication, especially while discussing relational issues (Birchler, Clopton, & Adams, 1984). Self-disclosures that communicate positive information and feelings toward their significant other are also associated with increased marital satisfaction (Schumm, Bell, & Gade, 2000). Inversely, avoiding the disclosure of certain information negatively impacts relationship satisfaction (Dailey & Palomares, 2004). Even though full disclosure may not always be beneficial in relationships (e.g., sharing criticisms or complaints that may hurt a spouse's feelings), too much avoidance of disclosure may have long-term negative consequences in marital relationships (Finkenauer & Hazam, 2000).

In addition to self-disclosure, how the spouse reciprocates and responds is also important in marital relationships. Spouse responsiveness offers an opportunity for spouses to validate each other through an interactive process in order to increase intimate safety. To facilitate greater intimacy, the spouse responsiveness must: 1) support an environment of emotional safety (Cordova & Scott, 2001), and 2) provide accurate understanding (Reis & Patrick, 1996). The ideas of emotional safety and intimacy within the marital relationship are discussed in greater detail in the following section.

Intimacy and Intimate Safety

Researchers have focused on a variety of different aspects in their attempts to define intimacy, including behavioral (Cordova & Scott, 2001; Mirgain & Cordova, 2007; Sullivan, 1953), psychological (Prager, 1995), emotional (Kersten, 1991), and social factors (Patterson, 1990). A behavioral conceptualization is used in the present study in order to ensure measurability of the factors that comprise the intimacy process. Thus, intimacy is conceptualized as *a behavioral process in which one person engages in vulnerable behavior in relation to his or her spouse* (Cordova & Scott, 2001). The process of *intimacy* occurs when spouses respond to expressions of vulnerability in supporting and affirming ways (Mirgain & Cordova, 2007). When one spouse is accepting and non-punitive, intimate behaviors are reinforced and occur more frequently (Hawrilenko, Gray, & Córdova, 2016). Other researchers have also similarly defined intimacy as a system or process. Chelune, Robison, Kommor (1984) described intimacy as a “system that emerges out of the interactions between two people” and Reis and Patrick (1996) defined intimacy as “an interactive process in which, as a result of a spouse’s response, individuals come to feel understood, validated, and cared for.” Thus, intimacy is not defined by the characteristics of an individual, but rather as an attribute that influences and is influenced by the individuals within the overall intimacy system. Therefore, it is important to conceptualize intimacy as an interactive process or system rather than a static state within a marital relationship.

Intimate safety refers to a spouse's sense that they are safe being their authentic and vulnerable self with their spouse (Cordova et al., 2005). An expression of *vulnerability* is needed to begin the intimacy process and responding to that vulnerability in a reassuring way begins the process of developing feelings of intimate safety (Cordova et al., 2005). It would be expected that a higher degree of intimate safety leads to increased approach behaviors (i.e., a form of behavior in which a person becomes closer to another person), especially in times of inevitable stressors and discomfort. In contrast, a lower degree of intimate safety is expected to lead to fewer approach behaviors and possibly withdrawal from the relationship, especially in times of feeling hurt. A lack of intimate safety can create a unique emotional challenge: increasing levels of interpersonal vulnerability can cause intimate spouses to become more sensitive to being hurt by each other. Thus, without intimate safety, the closer two people are to each other, the more capable they are of hurting one another (Cordova et al., 2005). It is intimate safety, the sense that a person can feel safe and authentically vulnerable with their spouse, that is assessed in the present study.

Sexual intimacy is one component of intimate safety (Cordova et al., 2005). While developing a measure of intimate safety, Cordova and colleagues (2005) wanted the items on the measure to represent a range of domains in which particular vulnerable behavior might occur within relationships. Thus, sexual intimacy is one of the subscales included in the Intimate Safety Questionnaire, which is used in the present study. Some researchers have chosen to include sexual intimacy as one component, or subscale, within intimate safety (Cordova et al., 2005; Litzinger & Gordon, 2005). Other measures have combined emotional and sexual intimacy into one global measure of intimate safety (Laurenceau, Feldman, Barrett, & Rovine, 2005). Research indicates that there is a strong positive association between emotional intimacy and sexual intimacy (Haning et al., 2007).

Spouses' positive communication is generally associated with higher levels of intimate safety, particularly communication regarding vulnerabilities and validation (Laurenceau, Feldman Barrett, & Pietromonaco, 1998; Laurenceau, Feldman Barrett, & Rovine, 2005; Mitchell et al., 2008). One way in which couples can communicate intimate safety is through empathy. Examples of how spouses can demonstrate empathy include communicating they see things from their spouse's point of view and are able to experience feelings of sympathy and compassion for their significant other (Cordova et al., 2005; Mirgain & Cordova, 2007). Other researchers have suggested behaviors such as offering advice to a significant other (Stafford & Dainton, 2000) and calling a spouse by a nickname (Feeney et al., 1997) also communicates intimacy and closeness. These *intimate* and *close* behaviors help promote the perception of intimate safety, which highly correlate with increased marital adjustment and satisfaction (Cordova et al., 2005; Mirgain & Cordova, 2007).

One potential barrier to establishing emotional intimacy within a relationship is fear of intimacy, which is considered to be an antecedent of intimacy difficulties (Descutner & Thelen, 1991). It is defined as "the inhibited capacity of an individual, because of anxiety, to exchange thoughts and feelings of personal significance with another individual who is highly valued" (Descutner & Thelen, 1991). Within this framework, intimacy is expected to occur through the combined existence of three components: communication of personal information (content), strong feelings about the personal information (emotional valence), and high regard for the intimate other (vulnerability; Descutner & Thelen, 1991). Increased fear of intimacy has shown significant correlations with loneliness, low self-disclosure, and low social intimacy (Descutner & Thelen, 1991). Results have also indicated a lack of significance between self-disclosure and fear of intimacy; however, the correlation between the two constructs was in the expected direction. This may indicate that although fear of intimacy negatively impacts interpersonal relationships, it may not always predict whether or not someone

self-discloses personal information. Service members experiencing symptoms of posttraumatic stress tend to experience increased fears regarding intimacy compared to service members without posttraumatic stress symptoms (Riggs et al., 1998; Solomon, Mikilincer, Fried, & Wosner, 1987). Further exploring spouses' symptoms, Riggs and colleagues (1998) found that spouses also experienced increased fear of intimacy when the service member spouse experienced PTSD. In assessing how service members and spouses' posttraumatic stress symptoms affect marital relationships, Riggs (2014) later found that fear of intimacy mediated this association (Riggs, 2014). Overall, fear of intimacy may be an underlying reason for service members and spouses' difficulties with intimate safety, which then subsequently impacts couples' dyadic adjustment.

THE UNIQUE CULTURE OF MILITARY MARITAL RELATIONSHIPS

The present study focused on military couples' adjustment. In an effort to facilitate a greater understanding of marital relationships for military couples, a discussion of the unique nature of military marital relationships is warranted. Military couples live a lifestyle unlike most others. Families often undergo frequent moves, deployments, frequent periods of family separation, and geographic isolation from support systems offered by extended family (Black, 1993). Service members are often stressed by the demands of the military mission. Spouses of military personnel may deal with unpredictable schedules, inconsistent presence of their significant other, and potentially living somewhere that does not meet their needs (Flake, Davis, Johnson, & Middleton, 2009). Furthermore, service members and their families are young compared to the average civilian married population, receive a lower pay, and have a high incident of young children living in the home (Black, 1993; Hogan & Seifert, 2010). In fact, service members and their significant others are three times more likely to be married at an earlier age than their civilian counterparts (Hogan & Seifert, 2010). Given that over half (52%) of service members are younger than 25 years old and research indicating marriages at younger ages are more likely to result in divorce than those wedded later in

life (Hogan & Seifert, 2010), the military population is especially at risk for marital distress (Karney & Crown, 2007).

In terms of OIF/OEF deployments, three out of five service members leave behind families in support of the combat mission (Johnson et al., 2007). It is estimated that service members have deployed multiple times between three to 24 months in support of OIF/OEF (Jumper et al., 2005). Military families face the threat that their loved ones may be injured or killed, either in combat or training. Approximately 120,000 service members have been killed and about 310,000 service members have been injured over the past 50 years (DeBruyne & Leland, 2015). Although the rate of combat deaths has decreased over time, the rate of injuries has increased due to advances in medical technologies (Warden, 2006). In other words, a greater number of service members are being wounded than ever before, and are forced to live with their injuries. Historically, spouses were more likely to be widowed if their significant other went into combat. Currently, service members are less likely to die in combat than they are to be wounded. Thus, research studying military marriages beyond deployment is lacking. Although there are more survivors in modern times, those who are wounded are often left with debilitating conditions. As a result, many military families face additional stressors/difficulties beyond deployment that can be detrimental to marital relationships.

It is important to remember that children within these couples' relationships can also be profoundly impacted (Huebner & Mancini, 2008). Although data concerning children will not be included, all couples in the present study had at least one child. Deployments and particularly, length of deployments has been associated with increased rates of mental health care visits and reduced academic performance (De Pedro et al., 2011; Gorman, Eide, & Hisle-Gorman, 2010; Mansfield et al., 2011). Gorman and colleagues (2011) found that mental health disorders increased by 11% for children of deployed parents, with stress disorders increased by 18% and behavioral disorders increased by 19%. Symptoms experienced by children through secondary traumatization

include hypervigilance, dissociation, irritability, and behavioral outbursts (Klaric et al., 2008). This can lead to problems regarding developmental, emotional, neurotic, and dysfunctional behavior. In terms of children who have a parent that has incurred a physical injury during combat, research indicated that distress was associated with pre-injury, deployment related family distress, and high family disruption post-injury, rather than the injury severity (Cozza et al., 2010). Furthermore, approximately 15% of children within combat-injured families had clinical levels of emotional and behavioral problems (Cozza et al., 2011). This research provides evidence that combat physical injury affects the entire familial system and children should be included in the assessment and treatment of mental health difficulties within combat-injured families. Although the following study will not include data concerning children, it is important to keep in mind that it adds an additional stressor on service members and their spouses.

The next section briefly discusses the concept of combat exposure followed by more detailed sections concerning combat physical injury (i.e., amputations, burns/blindness and TBI) and mental health difficulties (i.e., PTSD and depression). Following both the combat physical injury and mental health sections, is a discussion about the impact of combat injury on the marital relationship.

THE EFFECTS OF COMBAT EXPOSURE ON SERVICE MEMBERS

As previously mentioned, service members often undergo a great deal of stress, particularly during periods of deployment. Over the course of the next few sections, it will be important to better understand combat exposure that service members endure as well as the physical injuries and mental health symptoms incurred during combat deployments. Once an understanding has been established, marital relationships are factored in to better understand how combat exposure, physical injuries, and mental health difficulties impact marital relationships. Exposure to combat is common among deployed service members. Current and recent service members who have deployed to Iraq or Afghanistan report combat exposure rates up to 65%, depending on the branch of

service and location of deployment (DeBruyne & Leland, 2015; Charles W. Hoge, Auchterlonie, & Milliken, 2006). Service members involved with OIF/OEF, relative to service members involved in previous conflicts, may have increased frequency and severity of combat exposure, which may be due in part to the asymmetric warfare experienced by service members in Afghanistan and Iraq. This type of warfare lacks a traditional front line and is often characterized by acts of terrorism and the need for counterinsurgency tactics because of the differing size and strategies of opposing forces. Further, current deployed service members may now serve in combat zones full-time for months, sometimes beyond a year, before withdrawing from combat (Office of the Surgeon General, 2006). Research has demonstrated that combat exposure from the most recent era of wars in Iraq and Afghanistan is linked to not only physical injuries but also increased rates of PTSD, depression, alcohol abuse, eating disorders, and chronic pain (Jacobson et al., 2008; Jacobson et al., 2009; Smith et al., 2008; Wells et al., 2010).

Although this study focused on understanding marital stressors and adjustment, it is important to also acknowledge the stressors service members individually undergo before, during, and after combat deployment. The Office of the Surgeon General identified specific combat and operational stressors that service members may experience (Brusher, 2007). Combat stressors include personal injury, killing of combatants, witnessing the death of an individual, death of another unit member, and injury resulting in the loss of a limb. Operational stressors include environmental factors such as prolonged exposure to extreme geographical environment (e.g., desert heat or arctic cold), reduced quality of life and communication over extended periods of time, prolonged separation from support systems, and exposure to significant injuries of others. It is important to note that service members may also experience stressors due to difficulties or conflicts back home (e.g., sickness or death in the family, children's behavioral problems, marital infidelity or conflict, etc.). These stressors place demands on the brain, evoking cognitive and emotional reactions (Brusher, 2007). Service

members can continue to experience combat stressors post-deployment. Approximately 17% of service members continue experiencing negative post-combat operational stress even 12 months after returning from deployment (Office of the Surgeon General, 2006). This concept is important as combat physical injuries and mental health symptoms are further discussed.

COMBAT-RELATED PHYSICAL INJURIES AND MARITAL RELATIONSHIPS

The following section will focus on combat-related physical injuries followed by a review of how those physical injuries impact marital adjustment. Mental health symptoms, including posttraumatic stress and depression experienced by service members and spouses are considered separately in the present study. This section begins with a general overview of understanding the effects of combat physical injury on the service member and on the marital relationship. Specific injuries most commonly incurred during combat include amputations, burns, blindness, and traumatic brain injury (TBI).

Combat Physical Injury and the Effects on Service Members

The recent conflicts in Iraq and Afghanistan have placed an increasing strain on the U. S. military, with the number of U. S. military wounded in action estimated at over 50,000 as of February 2015 (not including TBI; DeBruyne & Leland, 2015). With the changes in military tactics and the evolution of protective gear with technology (Cohen, Griffith, Larkin, Villena, & Larkin, 2005), the nature of combat injuries has changed. Service members are better able to survive injuries due to advances in medical technologies, leading to a decreased death rate (Starks, 2005). Roadside bombs, commonly known as improvised explosive devices (IEDs), are considered the most deadly weapon used against U. S. deployed troops, accounting for up to 65 percent of combat injuries during OIF and OEF (DeBruyne & Leland, 2015). Other injuries are a result of high-velocity weapons, rocket propelled grenades, small-arms fire, and suicide

bombings (Bunker & Sullivan, 2005; Gondusky & Reiter, 2005). Compared to the Vietnam War and World War II, there are fewer gunshot wounds and an increased rate of explosive-related injuries (Owens et al., 2008). The demographic information for most combat physically injured service members is male, junior enlisted personnel of the Army or Marine Corps (Armed Forces Health Surveillance Center, 2011). Improvements in the military's equipment and medical evacuation procedures have made it possible for many severely injured service members who might have died in previous conflicts to survive their injuries.

The most common physical injuries sustained during combat exposure in OIF/OEF include amputations, traumatic brain injury (TBI), burns, and/or blindness. Amputations are the loss of a limb and can be broken into two categories: major amputations (loss of a hand, foot, or other major body part) or minor amputations (loss of fingers, toes, or other minor body parts). From 2000 to 2011, there were approximately 6,000 amputations among U.S. service members involved in OIF/OEF (Armed Forces Health Surveillance Center, 2011), one-third of them major amputations. OIF/OEF service members have an average of five to six surgeries post amputation (Reiber et al., 2010). Combat amputations differ drastically from amputations acquired in a civilian setting. After stabilization of injuries in the combat zone, initial treatment is provided in a field hospital before the injured service member is moved to a facility where primary and long-term care can be provided (Dougherty, 2002; Flood & Saliman, 2002). Amputations can cause long-term physical health effects including impaired mobility, chronic pain, and skin problems. Although prosthetics are highly beneficial in helping aid amputees, there are some negative aspects such as skin irritation, which causes sores and wounds (Saradjian, Thompson, & Datta, 2008). Amputees may struggle with pain due to amputation decades after the event, including phantom limb pain, residual limb pain, back pain, and contralateral joint pain (Perkins, De'Ath, Sharp, & Tai, 2012). Furthermore, these combat-related amputations are often accompanied by other life-

threatening injuries such as spinal cord and internal organ injuries, blindness or loss of hearing, traumatic brain injuries, or posttraumatic stress disorder (Armed Forces Health Surveillance Center, 2011).

Traumatic brain injuries (TBIs) are considered a signature injury of OIF/OEF due to the high exposure to improvised explosive devices (IEDs) during deployment and the increased trunk protection and survival made possible by body armor. TBIs result from a blow to the head often causing ringing in the ears, headaches, dizziness, memory gaps, disorientation, balance difficulties, and blurred vision. TBIs diagnosed from conflicts in Iraq and Afghanistan between 2003-2013 totaled 191,052 (Brundage, Taubman, Hunt, & Clark, 2015) with upward estimates of 320,000 TBIs, the majority (59-70%) characterized as mild TBIs (Hoge et al., 2008; Schwab et al., 2007; Tanielian & Jaycox, 2008; Terrio et al., 2009). These estimates are oftentimes not accurately reported as physical injuries incurred during combat due to the invisible nature of the wound.

Burns are also a significant injury sustained during combat exposure, historically accounting for between 5% and 20% of combat casualties (Cancio et al., 2005; Champion, Bellamy, Roberts, & Leppaniemi, 2003; Kauvar et al., 2006). Without immediate medical attention, prognosis for severe burns is poor. Hospitalization and rehabilitation for burn injuries can be very demanding and difficult. Burn injuries involve severe pain throughout a prolonged period of recovery. Severe burn injuries can entail lengthy hospital stays, multiple surgeries, and years of extensive rehabilitation. Individuals who endure burns may experience both physical disfigurement and psychological pain (Fauerbach et al., 2007; Ullrich, Askay, & Patterson, 2009). If deep burns occur, there is a possibility of nerve damage or loss, which results in chronic and disabling neuropathic pain (Fauerbach & McCann, 2009). The patient must undergo painful medical procedures such as debridement (removal of dead skin), showers, and bandage changes several times per day. Burn injuries must be managed aggressively, often involving scrubbing off dead layers of burnt skin. In terms of combat-related eye

injuries, incidence rates from the U. S. Military between 2000 and 2010 were a total of 182,525 ambulatory and 4,030 hospitalized eye injuries (Hilber, 2011).

Although it is important to understand specific types of combat injuries, polytrauma is so common that it can be difficult to study injuries in isolation. The U. S. Department of Veterans Affairs defines polytrauma as “two or more injuries that have been sustained in the same incident/event that affect multiple body parts or organ systems.” Injuries can be manifested in a variety of areas, including (but not limited to) functional and physical disabilities, cognitive deficits, or mental health issues (U. S. Department of Veterans Affairs, 2013). Polytrauma can include injuries such as amputations, fractures, burns, hearing loss, and TBI (Friedemann-Sánchez, Sayer, & Pickett, 2008) as well as mental health issues (Lew et al., 2009; Palmer, Happe, Paxson, Jurek, & Olson, 2016). The prevalence rate of polytrauma in combat is unknown due to all the various types of injuries that can be included within a polytrauma. Approximately 92% of service members’ injured in the current study’s sample were characterized as polytrauma injuries based on physical injuries alone. One of the most frequent co-occurring polytrauma injuries is a TBI paired with a physical injury (Okie, 2005). Polytraumas often require a high level of integration and coordination of clinical care and other support services as well as much-needed support from family members. Depending on the severity and complexity of the injuries, service members often undergo years of hospital stays, lengthy rehabilitation, and extensive clinic visits during the recovery process and can be left with long-term debilitating polytrauma. Due to the high rates of polytrauma within combat physical injury populations as well as the difficulty in parsing apart the influences of each specific type of injury, the current study focused on the overall severity of all physical injuries as a whole rather than specific types of injuries.

Combat Physical Injury and Effects on Marital Relationships

Combat injury not only impacts service members, but also has profound acute and long-term effects on marital and familial relationships (Braithwaite & Harter, 2000).

Spouses and family members play a vital role in all phases of treatment including hospitalization, rehabilitation, and long-term care. Their support is a fundamental element of rehabilitation (Sproul, Malloy, & Abriam-Yago, 2009). The presence of a significant other spouse during hospitalization improves patient coping and satisfaction (Dahl, Wickman, & Wengström, 2012) as well as increases the survival rate (Muangman et al., 2005). Although this research emphasizes the positive benefits of marital support throughout the recovery process, the caregiving and support process is an emotionally and physically exhausting one that has received considerable attention (Badr, Acitelli, & Taylor, 2007; Dreyer & Nortvedt, 2008; Phillips, Fussell, & Rumsey, 2007; Ponsford & Schönberger, 2010; Schonberger, Ponsford, Olver, & Ponsford, 2010). Spouses oftentimes experience significant emotional reactions such as shock, grief, guilt, anxiety, and depression (Dreyer & Nortvedt, 2008; Phillips et al., 2007). Beyond the initial distress of combat injury, a major challenge families face is the period of rehabilitation and recovery of the injured service member, which can oftentimes last for years. Although family members may be aware their deployed service member could become injured, few anticipate them having to undergo lengthy hospitalizations and long-term rehabilitation and care (Collins & Kennedy, 2008). Some physical injuries, such as moderate to severe TBI, may not improve (Verhaeghe, Defloor, & Grypdonck, 2005), and can cause a long-term impact on family stress due to the continued need for treatment by professionals, often 10-15 years after injury (Verhaeghe et al., 2005).

The recovery period puts great pressure on the family system, oftentimes forcing the family to have separate living locations and leave behind jobs, house, children, and other family members (Collins & Kennedy, 2008). Logistically, burn centers, polytrauma centers, and major military hospitals for combat injuries are often located far from home (Klein et al., 2009), which may be a struggle for families to provide adequate social support (Phillips et al., 2007). Even after discharge, the individual may require daily medical appointments and rehabilitation. Survivors often require additional special care

at home, including dressing changes and functional limitations (Blakeney, Rosenberg, Rosenberg, & Faber, 2008; Foster & Chaboyer, 2003). New routines must be developed to adjust to life outside of the hospital. An amputee may still have severe mobility limitations, which likely requires a constant caregiver (Sandhu, Kemp, Ball, Burgess, & Perkins, 2013). Blind individuals often have impaired functioning and need continued assistance in some routine daily tasks such as cooking, shopping, picking out clothes, and commuting to work (Salive et al., 1994).

Within the United States, providing care to individuals with disabilities is often provided by family members, especially their wives (Ebrahimzadeh et al., 2013; Russo, Vitaliano, Brewer, Katon, & Becker, 1995). Caregiving spouses' duties often shift from everyday marital tasks to having additional caregiving duties, which require major life adjustments (Ebrahimzadeh et al., 2013). This can often cause a shift in role dynamics such that the spouse becomes the primary caretaker, which may cause an imbalance due to lack of reciprocity (Yorgason, Booth, & Johnson, 2008). This can be anxiety-provoking for spouses and require a period of role adjustment (Buschenfeld, Morris, & Lockwood, 2009; Pereira & Rebelo Botelho, 2011). Spouses may not feel as though they can safely provide care (Kurichi et al., 2013). However, amputees who were married were more likely to be discharged home earlier compared to patients who were not married (Kurichi et al., 2013). Even when patients were lower functioning, if they had spouses who were willing to become the primary caregiver, then they were more likely to be discharged home (Kurichi et al., 2013).

Level of distress may actually be higher in spouses compared to injured service members due to both primary stressors (i.e., physical work of providing care, etc.) and secondary stressors (i.e., decrease in household income, loss of social activities, etc.) related to the effects of the injury (Badr et al., 2007). Familial consequences of injury in the civilian sector include mood disturbances (Schonberger et al., 2010), increased anxiety and depression (Ponsford & Schönberger, 2010), social isolation (Marsh, Kersel,

Havill, & Sleigh, 2002), poor family functioning (Kreutzer, Serio, & Berquist, 1994), and reduced life satisfaction (Livingston et al., 2010). Spouses of burn-injured individuals indicated experiencing negative impacts, including anxiety and stress, increased household responsibilities, and reduced social life (Phillips et al., 2007). Family members may experience guilt and depression that persists through the recovery period (Rossi, Vila Vda, Zago, & Ferreira, 2005). Family members may even be at risk for developing posttraumatic stress disorder due to the high levels of distress they undergo (Ceranoglu & Stern, 2006). Family members of burn-injured individuals have also been found to have a suppressed immune function 72 hours after patient admission (Shelby, Sullivan, Groussman, Gray, & Saffle, 1992).

Spouses of injured service members oftentimes feel that they are responsible for managing the marital relationship (Du Rocher Schudlich, Papp, & Cummings, 2011). Furthermore, a spouse may feel the need to protect the service member from getting upset by hiding negative emotions, attempting to “shield the spouse from negativism to avoid distress and strain” (Hagedoorn et al., 2000). This stems from the concept of *communal coping*, that is, the idea that individuals operate within groups or dyads, and as a result, the distress felt by one person will affect the others in the group (Lyons, Mickelson, Sullivan, & Coyne, 1998). Research in both military and non-military populations has shown that spouses in the role of caregiver who feel the need to overprotect the injured spouse will experience higher levels of stress, negative health symptoms, and decreased marital satisfaction for both spouses (Coyne & Smith, 1994; Joseph & Afifi, 2010; Suls, Green, Rose, Lounsbury, & Gordon, 1997). These results suggest that it is important to maintain a primary role as a spouse and a secondary role as a caregiver, rather than vice versa. One factor mediating the relation between caregiver stress and caregiver’s psychological health is couple identity or the idea of “we-ness.” As couples become more committed to each other, their cognitive view tends to shift from being an individual to being part of a couple and the connection with the spouse becomes an extension of the

self (Acitelli, Rogers, & Knee, 1999). In one study, caregivers who viewed themselves as part of the couple felt a greater sense of responsibility to provide care, rather than as a burden (Badr et al., 2007). Higher couple identity partially mediated the negative association between overload and caregiver mental health and fully mediated the positive association of self-esteem and caregiver mental health (Badr et al., 2007).

Research has shown that individuals with major physical injuries often experience a lack of motivation for interconnectedness, decreased sexual interest or drive in marital relationship, tendency to isolate, and loss of autonomy (Senra, Oliveira, Leal, & Vieira, 2012). These issues ultimately impact interpersonal and marital adjustment. In terms of sexual activities, amputees report a decrease in intercourse, impaired sexual functioning, decreased mobility, as well as decreased interest and increased fear of sexual intercourse (Davidson, Jones, Cornet, & Cittarelli, 2002). Approximately 75% of amputees (51 men and 25 women) reported a decline in sexual intercourse following limb loss (Williamson & Walters, 1996). The mechanics of having sex with a significant other can change due to having to adjust body positions, balance and movement, and cope with phantom pain sensations (Shell & Miller, 1999). Furthermore a negative body image or worry about how others will react to the injuries may lead to problems regarding both physical intimacy and emotional closeness, which in turn can also impact the spouse (Shell & Miller, 1999). Some spouses will have concerns about their spouse's physical appearance after injury (Goyatá & Rossi, 2009; Phillips et al., 2007). In several studies, wives reported sexual concerns due to their injured spouse, who often experienced a diminished sex drive and performance issues (Blumenfield & Schoeps, 1992). It has been suggested that sexual difficulties may stem more from discomfort and anxiety, rather than any physical limitation (Williamson & Walters, 1996). Similar to other injuries discussed, health care professionals, including mental health professionals, exhibit discomfort and lack confidence in discussing sexual activities or interventions with individuals who had an amputation (Ide, 2004; Miller & Byers, 2012; Williamson & Walters, 1996). Spouses

have often reported that providers and other health professionals fail to address issues of sex and intimacy for injured individuals (Magnan & Reynolds, 2006; Southard & Keller, 2009; Stead, Brown, Fallowfield, & Selby, 2003).

For TBIs, because of their impact on the injured service member's cognitive and interpersonal functioning, their spouse may be adversely impacted by the inability to have effective communication and a reciprocal emotional relationship with their significant other (Verhaeghe et al., 2005). The onset of a spouse's blindness may also cause difficulties and psychological stress for a couple (Goodman & Shippy, 2002; Strawbridge, Wallhagen, & Shema, 2007). One difficulty that marital relationships undergo after the blindness of one spouse is the absence of nonverbal communication (Subramani, 2010), since couples are often able to use subtle visual cues among each other to communicate about thoughts or emotions (Fichten, Judd, Tagalakis, & Amsel, 1991). Individuals who become visually impaired are unable to recognize or participate in nonverbal communication (Fichten et al., 1991). Under some circumstances, this may cause interpersonal conflicts or misinterpretations. Alternative modes of communication must be developed between the couple in order to overcome this barrier.

In sum, the need to provide care and support to an injured spouse can be extremely distressing for both the injured person and their spouse. Despite this burden, having the support of family members and spouses can be very beneficial to the recovery of injured service members. Approximately 88% of burn injured patients rate family as a very important factor for their recovery process (Sproul et al., 2009). A significant other providing social support has been described as a way to promote inner strength and a will to live (Alpers, Helseth, & Bergbom, 2012). Unmarried patients with burn injuries have reported significantly poorer health and quality of life compared to married patients (Moi & Nilsen, 2012; Moi, Wentzel-Larsen, Salemark, Wahl, & Hanestad, 2006). Dyadic relationships considered caring and loving have a positive effect on the recovery process, including better health and quality of life (Kildal, 2003; Moi, Wentzel-Larsen, Salemark,

& Hanestad, 2007). As a result there is a positive correlation between stable relationships and better psychological adjustment after injury (Kildal, 2003; Wallis et al., 2006), which also results in increased self-esteem and confidence (Kildal, 2003; Noronha & Faust, 2007).

COMBAT-RELATED PSYCHOLOGICAL DISORDERS

The previous section reviewed the prevalence and consequences of physical injury on the injured individual, spouse, and on the marital relationship. The following section shifts focus to literature on combat-related psychological disorders and the effects on marital relationships. It begins with a general discussion of combat-related psychological disorders followed by a more detailed description of specific psychological disorders that occur during or after combat, including posttraumatic stress disorder and depression. A section follows it on how these psychological disorders can impact marital relationships.

Combat-Related Psychological Disorders and the Effects on Service Members

It is estimated that approximately 300,000 service members and veterans from Iraq and Afghanistan currently have PTSD, major depression, and/or other mental health deficits (Tanielian & Jaycox, 2008). Both service members and their spouses are susceptible to mental health symptoms, including depression, anxiety, PTSD, and relationship difficulties following return from deployment (McNulty, 2005; Renshaw, Rodrigues, & Jones, 2008). Specifically, it is estimated that 35% to 45% of service members and spouses reunited after deployment to Iraq or Afghanistan met criteria for at least one mental health problem (Gorman, Blow, Ames, & Reed, 2011; Milliken, Auchterlonie, & Hoge, 2007). Posttraumatic stress disorder (PTSD) and major depressive disorder (MDD) are the most prevalent psychiatric diagnoses among U. S. service members deployed during OEF/OIF (Andersen, Wade, Possemato, & Ouimette, 2010; Hoge et al., 2006; Maguen et al., 2010; Milliken et al., 2007; Seal et al., 2009). Of the

over 300,000 veterans from OEF/OIF who have sought mental health treatment post-deployment, approximately 70,000 were diagnosed with PTSD (Cohen, Marmar, Ren, Bertenthal, & Seal, 2009). Furthermore, the frequent co-occurrence of PTSD and major depression among service members has been well-established, suggesting that over 50% of veterans diagnosed with PTSD have comorbid depression (Grieger et al., 2006; Ikin, Creamer, Sim, & McKenzie, 2010; Seal, Bertenthal, Miner, Sen, & Marmar, 2007). The following sections will provide a more in-depth understanding of posttraumatic stress and depression.

Combat Psychological Disorders and Effects on Marital Relationships

Life after deployment can have both its highs and lows, especially in regards to re-adjustment within marital relationships. Some couples report stronger marital relationships post-deployment while others report the opposite (Newby et al., 2005). Research consistently indicates that increased psychological problems experienced by service members post-deployment are associated with poorer marital relationship functioning (Allen, Rhoades, Stanley, & Markman, 2010; Knobloch & Theiss, 2011). Higher levels of psychological distress is linked to decreased marital satisfaction (Kurdek, 2005). The degree of marital distress reported by service members four months post-deployment was positively associated with symptoms of posttraumatic stress, depression, and aggression (Foran, Wright, & Wood, 2013). Upon follow-up nine months after deployment, service members experiencing increased marital distress and symptoms were more likely to have intentions to divorce or separate from their spouse. The following sections provide a review of how PTSD and depression impact the service member and marital relationships.

Combat-Related Posttraumatic Stress Disorder

The diagnostic criteria for posttraumatic stress disorder (PTSD), as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; APA,

2013), includes a history of exposure to a traumatic event meeting specific stipulations as well as symptoms from each of four symptom clusters: intrusion (i.e., re-experiencing), avoidance, negative alterations in cognitions and mood, and alternations in arousal and reactivity. Intrusions include re-experiencing the traumatic event through memories that often manifest through recurrent dreams related to the incident, flashbacks, or other intense or prolonged psychological distress. Avoidance refers to individuals' behaviors to try to avoid any memories, thoughts, or feelings associated with the incident as well as avoidance of any external reminders (i.e., people, places, objects). Negative alterations in cognitions and mood can manifest in a multitude of ways including persistent and distorted beliefs about oneself, others, or the world. It can include self-blame, estrangement from others, diminished interests in activities, and inability to remember aspects of the incident. Finally, arousal symptoms experienced by the individual can include irritability or anger, difficulty falling or staying asleep, hypervigilance, lack of concentration, and/or being easily startled. Diagnostic criteria also includes stipulations in the duration of symptoms as well as the symptoms not being attributable to a substance or co-occurring medical condition. Aside from the symptoms previously mentioned, individuals experiencing PTSD can also exhibit feelings of hopelessness, shame, or despair. They may be more likely to develop co-occurring disorders such as depression, anxiety, alcohol, or drug use.

There are an estimated 110,618 PTSD diagnoses resulting from conflicts in Iraq and Afghanistan between April 2003 and December 2013 (Brundage et al., 2015). Studies of service members and veterans from the Iraq and Afghanistan wars estimate prevalence rates of PTSD between 4-17% (Richardson, Frueh, & Acierno, 2010). In another comprehensive analysis, prevalence rates of PTSD immediately post-deployment were 9% while rates of PTSD increased to 31% prevalence one year post-deployment (Ralevski, Olivera-Figueroa, & Petrakis, 2014). In response to the high rate of PTSD, there has been an outpouring of research and federal programs dedicated to addressing

the psychological health needs of service members returning from Iraq and Afghanistan over the past decade (Nash & Litz, 2013). In contrast, research and funding for the psychological needs of military spouses and children has remained stagnant, both in research and the development of Federal programs (Nash & Litz, 2013). Emphasizing the need for increased research in these areas, in 2007, both the President's Commission on Care for America's Returning Wounded Warriors and the Defense Health Board Task Force on Mental Health recommended increased Federal funding to support military families, but in both cases the goal focused primarily on supporting the health of the active-duty family member, with secondary concern placed on the health of the civilian spouse and their children. These recommendations are consistent with the general aims of the present dissertation study. The next sections will focus on how PTSD impacts military marital relationships, followed by a discussion of combat-related depression and its effects on relationships.

Posttraumatic Stress Disorder and Effects on Marital Relationships

A growing body of research suggests that the impact of PTSD stretches beyond the service member and can severely disrupt interpersonal relationships, causing a multitude of problems (Klarić et al., 2008; Monson, Schnurr, Stevens, & Guthrie, 2004; Renshaw, Rodrigues, & Jones, 2009; Riggs, Byrne, Weathers, & Litz, 1998). PTSD experienced by the service member tends to decrease marriage stability, which can also lead to an increase in poor health and further psychological issues for both the service member and their spouse (O'Donnell, Cook, Thompson, Riley, & Neria, 2006). Some problems experienced by couples in which one person has PTSD include intimacy difficulties, communication problems, intimate partner violence, reduced emotional and physical well-being, divorce, and relationship distress (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004; Monson et al., 2004; Taft, Watkins, Stafford, Street, & Monson, 2011). It is estimated that approximately two-thirds of spouses are unaware of the symptoms of

PTSD, thus are not able to grasp the reasoning for their marital instability (Buchanan, Kemppainen, Smith, MacKain, & Cox, 2011).

It is important to consider the symptoms of PTSD in order to better understand how it may impact relationships. As previously noted, the DSM-V criteria for PTSD has different clusters, including intrusion (i.e., re-experiencing), avoidance, negative alterations in cognitions and mood, and alterations in arousal and reactivity. Cluster symptoms of avoidance appear to have a greater impact on marital dissatisfaction than other clusters due to the underlying factor of communication and self-disclosure (Cook et al., 2004; Koenen, Stellman, Sommer Jr, & Stellman, 2008; Solomon, Dekel, & Mikulincer, 2008). Service members who have experienced trauma may have difficulty trusting, sharing, and feeling close to their spouses (Mills, Teesson, Ross, & Peters, 2006). The PTSD symptoms of negative alterations in cognition and mood may particularly hinder intimacy because it includes feelings of numbing, detachment from others, and a restricted range of emotions. Riggs et al. (1998) found that emotional numbing symptoms significantly predicted fear of intimacy among Vietnam veterans. In a study examining veterans of OEF/OIF, emotional numbing was the only PTSD symptom to significantly predict sexual functioning problems, which may translate to intimacy difficulties (Nunnink, Goldwaser, Afari, Nievergelt, & Baker, 2010). Factors related to PTSD arousal symptoms may be related to increased symptoms of anger and partner violence (Taft, Street, Marshall, Dowdall, & Riggs, 2007).

The term “secondary traumatization” has been developed to grasp the concept of the negative impact of PTSD on the psychological well-being of spouses (Figley, 1995). Spouses of service members with PTSD can experience levels of psychological distress and similar symptoms of PTSD (Dekel, Solomon, & Bleich, 2005; Gallagher, Riggs, Byrne, & Weathers, 1998; Renshaw et al., 2008; Riggs et al., 1998), symptoms of anxiety and depression (Evans, McHugh, Hopwood, & Watt, 2003), and lower marital quality (Beckham, Lytle, & Feldman, 1996). Rates of PTSD for spouses of service members

have ranged from approximately 10-24%, which has largely depended on the severity of the service members' PTSD (Dekel, Levinstein, Siegel, Fridkin, & Svetlitzky, 2016; Renshaw et al., 2008; Renshaw et al., 2011). Research has yielded mixed results regarding whether spouses' PTSD symptoms are a direct result of service members' PTSD severity or whether the symptoms are independent of each other (Renshaw & Campbell, 2011). Some research suggests that trauma symptoms experienced by both the service member and spouse are independently related to relationship distress (Renshaw, Rodebaugh, & Rodrigues, 2010; Riggs, 2014). Another study found an association between the service members' PTSD severity and the degree of secondary trauma posttraumatic stress symptoms experienced by the spouse (Ahmadi, Azampoor-Afshar, Karami, & Mokhtari, 2011; Dekel, Levinstein, Siegel, Fridkin, & Svetlitzky, 2016; Gallagher et al., 1998), which may indicate that the posttraumatic stress symptoms experienced by spouses were not independent of service members' posttraumatic stress symptoms.

Service members with PTSD are more likely to experience long-term relationship problems. For example, service members with PTSD and their spouses have had higher rates of marital distress than their counterparts, although the manner in which PTSD affects the relationship appears to differ by veteran group, which may just be a product of the different instruments used in each study (Ahmady et al., 2009; Evans, Cowlishaw, & Hopwood, 2009; Renshaw et al., 2008). Veterans of Operation Desert Storm also exhibited a significant relation between PTSD and poorer family adjustment (Taft, Schumm, Panuzio, & Proctor, 2008). Australian Vietnam veterans with PTSD reported poorer family functioning, problem-solving skills, affective relatedness, communication and mutual interest and involvement (Davidson & Mellor, 2001). Spouses of Australian Vietnam veterans with PTSD reported higher levels of somatic complaints, depression, anxiety, insomnia, social difficulties, and family conflict (Westerink & Giarratano, 1999). New Zealand Vietnam veterans experiencing greater levels of PTSD symptoms were

associated with impaired interpersonal relationships, family functioning, and marital/dyadic adjustment (MacDonald, Chamberlain, Long, & Flett, 1999).

Multiple studies have investigated pathways between service members with PTSD and family dysfunction. Link and Palinkas (2013) suggested PTSD impacts interpersonal dynamics (e.g., intimacy), which can lead to increased family and marital difficulties. MacDonald et al. (1999) found that the association between PTSD and impaired family and interpersonal relationships for New Zealand Vietnam Veterans was mediated by the veteran's interpersonal difficulties. These interpersonal difficulties are characterized as problems with intimacy, aggression/assertiveness, compliance, independence, and sociability. Caregiver burden is another pathway from PTSD to family dysfunction. Severity of PTSD symptoms in veterans is associated with higher caregiver burden for spouses (Manguno-Mire et al., 2007), even compared to spouses of veterans seeking help for non-PTSD psychological problems (Calhoun, Beckham, & Bosworth, 2002). Furthermore, a caregiver's perspective of the veteran having severe PTSD symptoms, even when the veteran reported having few symptoms, accounted for higher levels of spousal distress (Renshaw et al., 2010). For example, the negative relation between service members' PTSD and spouses' marital satisfaction was significantly moderated by spouses' perception. Specifically, the relation became non-significant when wives perceived that the service member had experienced higher levels of combat exposure (Renshaw et al., 2008). Spouses' perception of the combat experiences appears to be just as important as the actual combat experiences and levels of exposure. Furthermore, PTSD should be considered when discussing combat injuries as well. There are few studies focused on PTSD, combat injury, and marital relationships, however, one study assessing National Guard soldiers one year post-deployment found that PTSD mediated the association between the presence of a deployment injury and couples' adjustment (Gewirtz, Polusny, DeGarmo, Khaylis, & Erbes, 2010).

Combat-Related Depression

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (APA, 2013) diagnostic criteria for major depressive disorder (MDD) includes depressed mood or a loss of interest or pleasure in daily activities within a two week period and at least five of nine symptom criteria, including: depressed mood or irritability, decreased interest or pleasure, weight or appetite change, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, guilt or worthlessness, diminished ability to concentrate, and/or suicidality. In addition to its effects on the individual, it is important to note that depression can have a profound impact on interpersonal and social relationships. Someone experiencing major depression may become quiet, withdrawn, and isolated from others (Matthews et al., 2016; Sharabi, Delaney, & Knobloch, 2016).

As with PTSD, the prevalence of depression has also significantly increased since the beginning of OEF/OIF (Hoge et al., 2006; Smith et al., 2008). Approximately 15-25% of service members screened positive for depressive symptoms after returning from deployment (Booth-Kewley, Larson, Highfill-McRoy, Garland, & Gaskin, 2010; Hoge et al., 2004; Seal et al., 2009). In addition to depression precipitated by combat exposure, service members may also experience non-combat related stressors during deployment that may lead to symptoms of depression (Engelhard & van den Hout, 2007). This can include family difficulties back home, extreme temperatures, difficulties with superiors or subordinates, inadequate information or equipment, and lack of privacy. Deployment related stressors that led to symptoms of depression included difficulty communicating back home and concerns or problems back home (Booth-Kewley, Highfill-McRoy, Larson, Garland, & Gaskin, 2012). Other factors predictive of depression include: combat exposure, deployment-related stressors, attitudes towards leadership, mild TBI, or marital status (Booth-Kewley et al., 2012).

In research focused on injured veterans, 36.4% of injured veterans had a mood disorder compared to only 3.4% of controls (Koren, Norman, Cohen, Berman, & Klein,

2005). The Trauma Recovery Project (Holbrook, Anderson, Sieber, Browner, & Hoyt, 1999), one of the largest epidemiological studies assessing psychological and functional outcomes of service members after physical injury, found that physical injury, depression, and PTSD were significantly associated with poorer functional status six months post-injury and persisted 12 and 18 months later. In terms of the relation of depression with TBI, it has been estimated that 25-50% of individuals with a TBI met diagnostic criteria for major depression (Jorge et al., 2004; Kennedy et al., 2005).

Depression is common following an amputation within civilian populations (Atherton & Robertson, 2006; Desmond & MacLachlan, 2004; Horgan & MacLachlan, 2004). As long as two years after amputation, approximately 30-58% of civilian individuals had a depression symptoms (Horgan & MacLachlan, 2004). Ten to 20 years post-amputation, approximately 20-28% of civilian individuals had symptoms of depression. Depression may cause significant functional impairment (Hoffman, Dukes, & Wittchen, 2008).

Depression and Effects on Marital Relationships

There is an established connection between depression and marital dissatisfaction in civilian populations (Proulx, Helms, & Buehler, 2007; Smith, Breiding, & Papp, 2012). This relationship may be bi-directional, with depression resulting in marital conflict and poorer marital adjustment, and poorer marital adjustment and marital conflict fostering depression (Du Rocher Schudlich et al., 2011). Depression impacts all aspects of communication including how one thinks, views themselves and others, utilizes effective problem-solving techniques, and shares responsibilities (O'Leary, Christian, & Mendell, 1994).

Marital conflict and negative behaviors (e.g., hostility, insults, withdrawal) predict increased symptoms of depression, both cross-sectionally and longitudinally (Choi & Marks, 2008; Du Rocher Schudlich et al., 2011; Ellison, Kouros, Papp, & Cummings, 2016; Proulx, Buehler, & Helms, 2009; Whitton, Stanley, Markman, & Baucom, 2008). Symptoms of depression in one spouse often impact the psychological well-being of the

other spouse. For example, in one study, husbands' symptoms of depression predicted an increase in their wife's depression symptoms one year later (Revenson, Marín-Chollom, Rundle, Wisnivesky, & Neugut, 2016). The reverse effect of wife's depression predicting husband's depression one year later was not significant in this specific study.

Military families are at an increased risk for depression and relationship distress following deployment (Bowling & Sherman, 2008). This may be in part due to the difficulties in reintegration after deployment (Milliken et al., 2007). Service members may struggle in re-adjusting to life back home as well as the difficulty of both the service member and spouse to redefine their roles in the family and build closeness (Bowling & Sherman, 2008; Faber, Willerton, Clymer, MacDermid, & Weiss, 2008). However, the period of time post-deployment is critical for the bond of service members and their spouses to rejuvenate and renew their relationship (Bowling & Sherman, 2008). Service members and spouses who exhibit symptoms of depression are more likely to have difficulty reintegrating as a couple (Knobloch & Theiss, 2011). Depression experienced by service members is negatively associated with their own relationship satisfaction and their spouse's relationship satisfaction during reintegration post-deployment (Renshaw et al., 2008).

Spouses of service members may experience symptoms of depression during and after deployment. Spouses of deployed service members were assessed to have higher levels of depression and anxiety compared to norms, with one study indicating 17.4% of spouses screened positive for generalized anxiety disorder and 12.2% screen positive for major depressive disorder (Eaton et al., 2008). In a study of spouses of National Guard Members, 22% of spouses met criteria for depression (BDI > 14) and 10% of spouses reported suicidal ideation approximately 45-90 days after service members' return from deployment (Gorman et al., 2011). Spouses experiencing symptoms of depression may lead to an exacerbation of service members' adjustment issues. Distressed married spouses were approximately three times more likely to experience depression compared

to satisfied married couples (Whisman & Beach, 2015). Both service members and spouses with symptoms of depression were significantly associated with negative marital relationships (Blow et al., 2013).

Effects of Combat Physical Injury, Posttraumatic Stress, and Depression on Marital Relationships

Few studies have examined the impact of service members' physical injury severity and service members and spouses' mental health symptoms on couples' marital functioning. One similar study conducted by Gewirtz and colleagues (2010) assessed how posttraumatic stress impacted marital functioning; however, they used a yes/no question to measure presence of combat physical injury rather than assess injury severity, so the effect of injury severity was not determined. The researchers found that presence of a physical injury was associated with more severe PTSD symptoms. Furthermore, the presence of physical injury had a significant indirect effect of PTSD on marital adjustment. Although no studies have specifically examined injury severity, mental health symptoms, and couples' adjustment in the same study, researchers have provided evidence for the association among these variables. For example, there is strong evidence to support the notion that combat physical injuries lead to mental health difficulties, including posttraumatic stress and depression (Lew et al., 2009; Palmer, Happe, Paxson, Jurek, & Olson, 2016; Ullrich, Askay, & Patterson, 2009). There is also evidence that combat physical injuries have acute and long-term affects on marital relationships and that spouses of service members undergoing care for injuries experience mood disturbances and other mental health symptoms (Badr, Acitelli, & Taylor, 2007; Braithwaite & Harter, 2000; Dreyer & Nortvedt, 2008; Phillips, Fussell, & Rumsey, 2007; Ponsford & Schönberger, 2010; Schonberger, Ponsford, Olver, & Ponsford, 2010). Furthermore, service members oftentimes experience mood disturbances, including posttraumatic stress and depression upon return from deployment. A multitude of research studies assessing service members' posttraumatic stress and depression

symptoms has also shown to impact spouses and marital relationships (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004; Klarić et al., 2008; Monson, Schnurr, Stevens, & Guthrie, 2004; O'Donnell, Cook, Thompson, Riley, & Neria, 2006; Renshaw, Rodrigues, & Jones, 2009; Riggs, Byrne, Weathers, & Litz, 1998; Taft, Watkins, Stafford, Street, & Monson, 2011). Moreover, spouses of service members can experience high levels of distress as well as symptoms of PTSD, which also affects marital functioning (Dekel, Solomon, & Bleich, 2005; Gallagher, Riggs, Byrne, & Weathers, 1998; Renshaw et al., 2008; Riggs et al., 1998). The strong evidence for the relation between injury severity and marital functioning as well as mental health symptoms and marital functioning among service members and their spouses provides a strong rationale for the present study.

SUMMARY AND RATIONALE

In sum, injury and trauma can have profound effects not only on the service member, but also on the spouse and the marital relationship. However, the effects of combat injury and trauma-related disorders altogether on the marital relationship of service members are poorly understood. Therefore, the present study assessed how combat injury and trauma affected the injured service member and spouse, as well as their marital relationship. We will examine how combat physical injury severity impacts several marital relationship outcomes, including marital adjustment and intimate safety. Furthermore, service members and spouses' symptoms of posttraumatic stress and depression were examined among this injured population to better understand how their mood disturbances impact the couples' dyadic adjustment.

CHAPTER 2: Aims and Hypotheses

The present study specific aims and hypotheses are as follows:

SPECIFIC AIM 1

To evaluate the contribution of service members' physical injury and mental health symptoms and spouses' mental health symptoms on intimate safety and marital adjustment.

Hypothesis 1a. The service members' physical combat injury severity and mental health (depression and posttraumatic stress) symptom severity will be negatively associated with intimate safety and marital adjustment.

Hypothesis 1b. The spouses' mental health (depression and posttraumatic stress) symptom severity will be negatively associated with intimate safety and marital adjustment.

Hypothesis 1c. Including all variables, service members' and spouses' mental health (depression and posttraumatic stress) symptom severity and service members' physical injury severity will be associated with intimate safety and marital adjustment.

SPECIFIC AIM 2

To examine the effects of mental health symptoms (depression and posttraumatic stress) with physical injury on marital adjustment.

Hypothesis 2a. The relation between service members' combat physical injury and marital adjustment will be mediated by service members' mental health (depression and posttraumatic stress) symptom severity.

Hypothesis 2b. The relation between service members' combat physical injury and marital adjustment will be mediated by spouses' mental health (depression and posttraumatic stress) symptom severity.

SPECIFIC AIM 3

To determine the effect of service members' and spouses' intimate safety on the relation between mental health (depression and posttraumatic stress) and marital adjustment.

Hypothesis 3a. Service members' level of intimate safety will moderate the relation between service members' mental health (depression and posttraumatic stress) symptom severity and marital adjustment.

Hypothesis 3b. Spouses' level of intimate safety will moderate the relation between spouses' mental health (depression and posttraumatic stress) symptom severity and marital adjustment.

EXPLORATORY AIM 4

To assess symptoms of physical injury severity, depression, and posttraumatic stress symptoms in predicting subscales of intimate safety and dyadic adjustment.

CHAPTER 3: Methods

STUDY DESIGN

The present study was a secondary data analysis of a larger clinical intervention study entitled, *Families Overcoming Under Stress – Combat Injured (FOCUS-CI, Dr. Stephen Cozza, MD, Principal Investigator)*. The purpose of FOCUS-CI was to implement and evaluate a unique evidence-based intervention program to help military families deal with the critical issue of combat injury and its impact on current and future family health and functioning. The present study utilized baseline data (i.e. prior to the clinical intervention) to better understand how the severity of combat physical injury and mental health symptoms impact marital relationships.

PARTICIPANTS

The current study examined baseline data from 38 families who were recruited and randomized to participate in the clinical intervention trial entitled, *Families Overcoming Under Stress – Combat Injured (FOCUS-CI, Dr. Stephen Cozza, MD, Principal Investigator)*. Participants were recruited from two military installations: Walter Reed National Military Medical Center (WRNMMC) and San Antonio Military Medical Center (SAMMC). For a family to be eligible for the study, they must have had at least one child under the age of 18 and be fluent in English. The injured service member must have sustained an injury during a combat deployment since 2001 and currently be transitioning to or participating in outpatient rehabilitation for the same combat injury. In addition, service members' injuries had to be severe enough to receive at least one severe injury score rating (i.e. 3, 4, or 5) on the Injury Severity Score. Injuries in the present study included amputations, traumatic brain injury, burns, and blindness. with approximately 92% of the service members reporting polytraumatic injuries. Overall, the service members within the present study sustained moderate to severe injuries that resulted in the need for rehabilitation. Families were excluded if a member of the

immediate family was actively psychotic. After consent and enrollment into the program, families were randomized into the treatment group (19 families) or standard of care group (19 families). All families completed baseline data measures which assessed constructs of parent and child distress, parent, child, and family functioning, and injury communication using interviews, clinician-rating scales, and self-report measures. Families provided consent to release records of routine medical care they received at each site prior to enrollment. Service members were additionally asked to consent to have their medical records reviewed in order to verify injuries they previously received. The present study focused on the severity of service members' physical injuries as well as posttraumatic stress and depression symptoms experienced by both service members and their spouses.

STUDY MEASURES

Service Members, spouses, and children completed a set of questionnaires, including measures of injury, present symptoms, and marital functioning. Clinicians also completed questionnaires, including a measure of combat injury severity for each service member: Injury Severity Score (ISS). The measures specifically used in the present secondary data analysis study include:

Measures of Physical Injury

- *Injury Severity Score*

Measures of Mental Health Symptoms

- *PTSD Checklist – Civilian Version*
- *Brief Symptoms Inventory*

Measures of Relationship Functioning

- *Revised Dyadic Adjustment Scale*
- *Intimate Safety Questionnaire*

Description of Predictor Measures

Injury Severity Score (ISS)

The Injury Severity Score (ISS; Appendix 1) was used by clinicians in the present study to assess the extent and severity of combat injuries sustained. The ISS was initially developed by Baker and colleagues (1974) to evaluate injury severity incurred by individuals involved in car accidents. The ISS stemmed from the *Abbreviated Injury Scale (AIS)* which was originally published in 1971 as a systematic way for rating tissue damage and adapted in 1974 to evaluate injury severity of motor-vehicle victims with multiple injuries (Baker, O'Neill, Haddon, & Long, 1974). Rather than compare similar sustained injuries, the ISS was developed to compare injuries of similar severity as a predictor of morbidity and mortality. For scoring purposes, the body is divided into seven regions: 1) External (contusions, abrasions, burns, lacerations); 2) Head (skull, brain, ears) and face (mouth, eye, nose, facial bone injuries); 3) Neck (throat, pharynx, tracheal, esophagus, larynx, thyroid gland); 4) Thorax (ribs, sternum, chest wall, lungs, bronchus, myocardium contusion); 5) Abdomen/Pelvic contents (internal abdominal cavity organs and lumbar spine); 6) Spine (strain, fracture, dislocation, compression, cervical cord, disc herniation); and 7) Extremities (sprains, fractures, amputations, dislocations). For each of the regions, the injury is assigned a severity code: 0- no injury; 1- minor; 2- moderate; 3- serious; 4- severe; and 5- critical. The ISS score was calculated as “the sum of squares of the highest AIS grade in each of the three most severely injured areas.” The scoring system was based on prior findings that mortality was associated with the ISS grades solely in the three most severe injury regions (Baker et al, 1974). Based on this scoring system as well as the present study’s criteria of at least a score of 3, total scores on the ISS could potentially range from nine to 75. The LD50 is an index for predicting morbidity and mortality such that injury severity meeting the LD50 criteria is considered to be a lethal dose for 50%. The LD50 can be considered a cutoff score that varies based on both the severity score as well as the age of the injured person. Research regarding the

psychometric properties indicated that the interrater agreement ranged from 0.66 to 0.81, which represents substantial agreement (MacKenzie, Shapiro, Eastham, 1985). The intraclass correlation coefficient as assessed for by physicians indicated a score of 0.83 (MacKenzie, Shapiro, Eastham, 1985). Furthermore, the Injury Severity Score performed as well as the ICD-derived Injury Severity Score with no statistical differences (Wong & Leung, 2008).

PTSD Checklist – Civilian Version (PCL-C)

The *PTSD Checklist – Civilian Version (PCL-C*; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report measure of PTSD symptoms as defined by the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV). The questions include certain problems and complaints that sometimes happen in response to stressful life experiences. Both service members and spouses were administered the civilian version of the measure with the prompt asking participants to rate symptoms that related to stressful life experiences in the prior month with no particular event being assessed. The items on the civilian version can apply to any traumatic event experienced, as opposed to the military version that is specific to military experiences that had occurred in the prior month. Participants answered items based on how much each problem bothered them in the past month, to include: not at all, a little bit, moderately, quite a bit, or extremely. Items on the PCL-C include disturbing memories, thoughts, or experiences, becoming upset when reminded of the event, having physical reactions when thinking of the stressful event, loss of interest in activities, and feeling emotionally numb. See Appendix 2 for the complete list of questionnaire items. The total symptom severity scores ranges from 17 to 85 and can be obtained by summing the scores from each of the 17 items. Posttraumatic stress symptoms were analyzed in the present study as a continuous variable. In order to provide a better understanding of the severity of posttraumatic stress symptoms within the present sample, the demographic information provided in the present study includes percentages of service members and spouses who

met criteria for PTSD based on cut off scores of 50 and 30. As a reference, the U.S. Department of Veterans Affairs' National Center for PTSD recommends a cut off score of 50 for diagnosis of PTSD within a military population returning from combat (Bliese et al., 2008). A cut off score of 30 for diagnosis of PTSD is oftentimes used within civilian primary care, Department of Defense screenings, and general population samples (Bliese et al., 2008). Using a cutoff score of 50 helps the reader better understand the severity of posttraumatic stress experienced by service members while a cutoff score of 30 provides a more accurate representation of the severity of posttraumatic stress experienced by civilian spouses. Provisional diagnoses based on the DSM-IV can also be obtained through the use of the PCL-C by totaling items within each of the PTSD diagnostic categories; however, PTSD diagnosis is beyond the scope of the present study.

Research has demonstrated that the PCL is a reliable and valid measure of PTSD, especially among the military population. The original investigation found test-retest reliability was above the recommended level of 0.70 after a two to three day period with Vietnam Veterans and an internal consistency above 0.80 for both Vietnam and Persian Gulf Veterans (Weathers et al., 1993). In terms of convergent and discriminant validity, correlations with the PCL were 0.79 with the CAPS and 0.90 with the Mississippi PTSD Scale within a sample of male veterans in PTSD treatment (Keen, Kutter, Niles, Krinsley, 2008).

Brief Symptom Inventory (BSI)

The *Brief Symptom Inventory (BSI)* (Derogatis, 2000) is an 18-item self-report measure that asks participants to rate current psychological distress during the past week on a 5-point likert-scale of “not at all” to “extremely” (Appendix 3). The BSI includes three subscales: Depression, Anxiety, and Somatization, each comprised of six items with a score range of 0-24. A total symptom score (GSI) can also be calculated by summing all 18 items for a range of 0-72. The scores were standardized in a combined normative sample (i.e. both male and female *T* scores) for service members and spouses since both

groups included both genders with no significant outliers. Standardized scores have a mean of 50 with a standard deviation of 10 for both the total GSI as well as each of the subscales. Any scores of 63 or higher on the BSI or subscales are considered clinically significant. Internal consistency estimates were 0.91 for the GSI, 0.84 for the Depression subscale, 0.83 for the Anxiety subscale, and 0.75 for the Somatization subscale among a sample of TBI patients in an outpatient rehabilitation program. The BSI is a more appropriate measure of psychological distress with a TBI population than other more popular measures (such as the Beck Depression Inventory –II, Minnesota Multiphasic Personality Inventory – 2, and Symptom Checklist – 90 – Revised due to the overlap of item questions and similar TBI symptoms (i.e. sleep difficulties, appetite disturbances, and deficits in attention/concentration; Babin, 2003). In a study of TBI patients, the Beck Depression Inventory actually showed stronger correlations with non-depression-related problems than with a diagnosis of depression (Sliwinski, Gordon, & Bogdany, 1998). The depression subscale on the Brief Symptom Inventory was used in the present study as a measure of depression severity in both service members and spouses to determine the impact on relationship adjustment.

Description of Relationship Functioning Measures

Intimate Safety Questionnaire (ISQ)

Cordova and colleagues (Cordova & Scott, 2001; Cordova, Gee, & Warren, 2005; Mirgain & Cordova, 2007) suggest that the process of experiencing intimacy can only occur after an expression of vulnerability. When a spouse responds to vulnerability in a positive and supportive way, then feelings of intimate safety, or “the feeling that one is safe being vulnerable with this particular spouse” is created (Cordova, Blair, Meade, 2010). Intimate safety is an important measure within relationship functioning because the construct involves spouses’ abilities to communicate with one another in vulnerable ways. The *Intimate Safety Questionnaire (ISQ; Appendix 5)* was developed in order to assess physical and emotional intimate safety and includes four subscales: Safety being

Vulnerable, Sexual Intimacy, Social Empathy, and Safety Disagreeing. Items on the Safety being Vulnerable subscale assess one's comfort with approaching an intimate spouse when feeling vulnerable and seeking comfort from the intimate spouse. The Sexual Intimacy subscale includes items to assess the safety and comfort with sexual intimacy with an intimate spouse. The Social Empathy subscale involves one's feelings of safety and comfort in social situations as well as discomfort with an intimate spouse saying hurtful or discomfoting things. The Safety Disagreeing subscale involves items including one's comfort in openly communicating negative feelings to an intimate spouse. The ISQ consists of 28 items, each rated on a five point scale. All items are summed and divided by the number of items (i.e., 28) for a total score with higher scores reflecting better intimate safety. Total and subscale scores can range from zero to four. There is no validated cut off scores with this measure. Between factor correlations for the ISQ total and subscales ranged from 0.22 to 0.91 (Cordova, Blair, Meade, 2008). Construct validity was examined by looking at the correlations between the ISQ and other similar measures. Correlations between the ISQ and Personal Assessment of Intimacy in Relationships revealed high correlations; men: $r = 0.77$, and women: $r = 0.86$, $p < 0.001$. There was also high correlation between the ISQ and DAS, 0.74 for men and 0.78 for women (Cordova, Blair, & Meade, 2008). Couples' intimate safety in the present study was a joint estimate of the overall level of intimate safety in the relationship by computing an average intimate safety score for each couple.

Revised Dyadic Adjustment Scale (RDAS)

The *Revised Dyadic Adjustment Scale (RDAS*; Busby, Christensen, Crane, and Larson, 1995) consists of 14 items grouped into three subscales: Consensus, Satisfaction, and Cohesion (Appendix 4). The RDAS total scores range from zero to 69 with a cut off score of 48. The Consensus subscale scores range from zero to 30 with a cutoff score of 22. The Satisfaction subscale scores range from zero to 20 with a cutoff score of 14. The Cohesion subscale scores range from zero to 19 with a cutoff score of 11. Higher scores

represent less distress, or better adjustment. The *Dyadic Adjustment Scale (DAS)* was developed in 1976 by Spanier to evaluate components of marital adjustment (Spanier, 1976). Spanier intentionally named the scale ‘dyadic adjustment’ as a way to be inclusive to all forms of “committed couple relationships” (Spanier, 1986). The items of the RDAS were created by selecting out homogenous construct items, creating seven first-order scales, and combining those scales to create the three second-order constructs of consensus, satisfaction, and cohesion. In terms of construct validity, the RDAS had a significant correlation with the Marital Adjustment Test at 0.68 (MAT: Crane et al., 1990). The cronbach’s alpha split-half reliability coefficient for the RDAS was 0.94. The RDAS had an 86% accuracy rate of correctly classifying non-distressed couples and 74% accuracy rate of classifying distressed couples. The present study assessed how service members’ physical injury severity as well as service members and spouses’ posttraumatic stress symptoms predicted couples’ dyadic adjustment. Couples’ dyadic adjustment is a joint estimate of the average between the service member and spouse’s scores on the dyadic adjustment. Other research studies assessing the RDAS as a measure have utilized similar methods for measuring dyadic functioning (Byrne & Carr, 2000; Crane, Middleton, & Bean, 2000, Riggs, 2014).

RDAS: Continuous and Categorical Measurement

Throughout the current study, the Revised Dyadic Adjustment Scale was assessed as both a continuous and categorical variable. Both types of analyses provide useful information when interpreting results, which are discussed in the following section.

Multiple regressions are used to predict a continuous outcome variable based on multiple predictor variables. This method has two primary objectives: 1. Predict new values for the outcome variable given the independent variables, and 2. Determine how much of the variation in the outcome variables is explained by the independent variables. This method can assess trends and the rate of change in between data points, which is incredibly important information to gather. Furthermore, using a linear method, as

opposed to a categorical method, helps maintain the statistical power, which is important when determining significance.

Logistic regressions utilize a dichotomous outcome variable in order to predict the classification of the data into groups. It can answer such questions as, “how do symptoms influence group classification,” or “how does the probability of being placed in a particular group change as symptoms worsen?” Logistic regressions help provide additional context about the results in order to provide more practical and meaningful information. It is important to note that it is not ideal to create arbitrary categories. Rather, a rigorous statistical process for determining which group categorization should be utilized. For example, in the present study, the Revised Dyadic Adjustment Scale has validated cut off scores for categorizing couples into distressed and non-distressed relationship groups. Categorizing data allows for more practical inferences of the results. For example, in the present study, categorization in the distressed couples’ group may indicate that a therapy intervention is needed.

Hayes’ Process Modeling

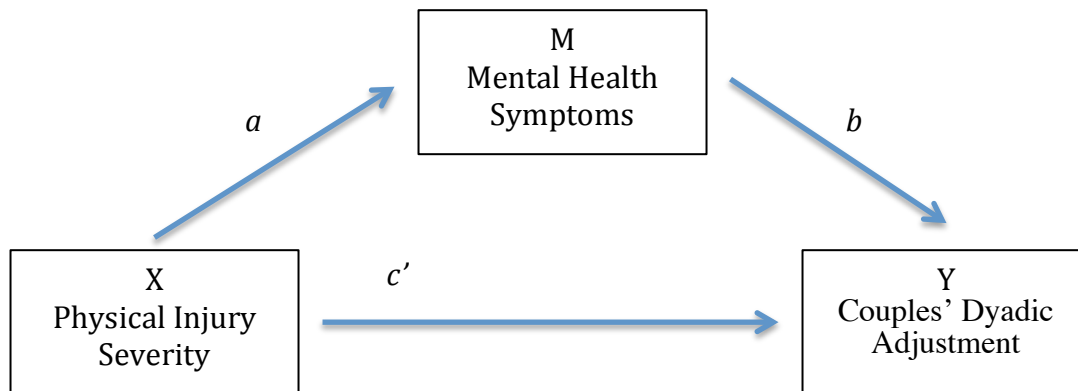
Prior to providing a detailed description for each aim, it is first important to describe Hayes’ Process modeling (Hayes, 2013), which will be used in Aim 2 for mediation models and Aim 3 for moderation models. Process modeling is a regression-based path analytic framework using ordinary least squares or logistic regression pathways. Process estimates the direct or indirect effects in single or multiple mediator models, interactions in moderation models, as well as a multitude of other path models, such as mediated moderating pathways and moderated mediated pathways (Hayes, 2013).

Process Mediation Analyses

Mediation analyses help us answer questions of *how* some variable (X) transmits its effect on another variable (Y; Hayes, 2013). The pathways leading from X to Y without passing through M (i.e., the mediation variable) is called the direct effect of X on

Y. The second pathway from X to Y through M is the indirect effect. Figure 1 demonstrates a conceptual model of the mediation analysis. An association between X and Y is no longer needed as a precondition to attempt to explain the underlying effect of X on Y.

Figure 1. Conceptual Model of the Mediation of Physical Injury Severity on Dyadic Adjustment through Mental Health Symptoms



Process Moderation Analyses

Moderation analyses help us better understand the *where* or *from whom* with the relation between variables (Hayes, 2013). For this type of analysis, the effect of X on some variable Y is moderated, or predicted by M. A moderator of an effect helps to establish boundary conditions of an effect or the circumstances for which the effect is large versus small, present versus absent, and so forth.

Furthermore, there are differences between the conceptual model and the statistical model utilized within Process moderation analyses. Figure 2 illustrates the conceptual model for the first analysis of hypothesis 3b with intimate safety as the moderator for the relation between spouses' depression and marital adjustment. Figure 3 depicts the statistical model for the first analysis of hypothesis 3b. Moderation is assessed utilizing a form of path analysis as well as reparameterizing the model by mean centering X and M so that b_1 and b_2 will estimate the effects that are meaningful and interpretable.

Figure 2. Conceptual Model of the Moderation of Depression on Dyadic Adjustment by Intimate Safety

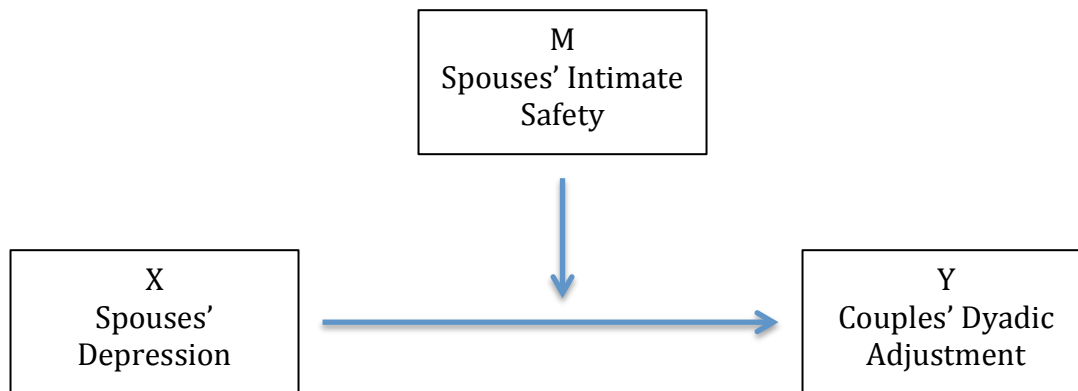
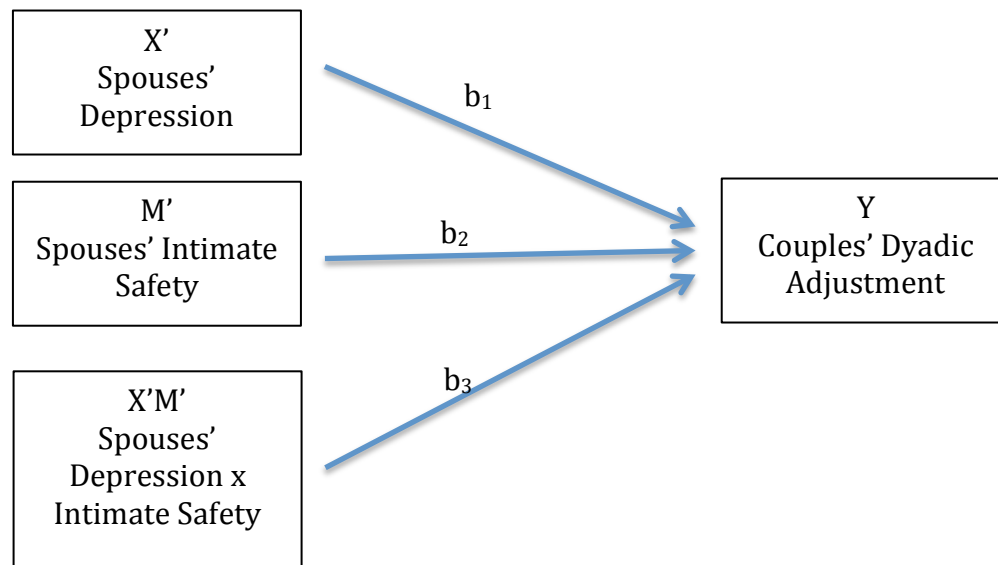


Figure 3. Statistical Model of the Moderation of Depression on Dyadic Adjustment by Intimate Safety



Note. $X' = X - \bar{X}$; $M' = M - \bar{M}$

DATA ANALYTIC PLAN

The analyses used in the present study were primarily multivariate and logistic regressions as well as mediation and moderation analyses. The independent variables used measures of physical injury severity and mental health symptoms. For service

members, constructs of physical injury severity, posttraumatic stress, and depression were used to assess marital adjustment and intimate safety. For spouses, constructs of posttraumatic stress and depression were used to assess marital adjustment and intimate safety. Physical injury severity was considered a family variable since severity of the injury provides a good indication of the length of time the service member and spouse spent in hospitalization and rehabilitation as well as the impact of the injury on the family as a whole. Data concerning the marital relationship was collected separately from both the service member and spouse. Measures of marital adjustment and intimate safety were computed as a composite score of the average between the service members and spouses' responses. IBM SPSS Statistics Version 22 was used to address all aims.

Aim 1

Aim 1 focused on how service members' physical injury severity and mental health symptoms, spouses' mental health symptoms, and the interaction between service members and spouses' mental health symptoms impacted the marital relationship. To investigate hypothesis 1a, service members' physical injury severity (as assessed by a clinician rating scale – Injury Severity Scale), posttraumatic stress symptom severity (as assessed by the PCL-C), and depression symptom severity (as assessed by the BSI) were used in a multivariate regression to understand the effect on marital adjustment (RDAS) and intimate safety (ISQ). Marital adjustment and intimate safety scores were computed as a composite score of the average between the service members and spouses' responses. Hypothesis 1b focused on the spouses' mental health symptoms in relation to marital functioning utilizing a multivariate regression. It specifically assessed spouses' mental health symptom severity of posttraumatic stress (PCL-C) and depression (BSI) on the marital relationship, including couples' marital adjustment (RDAS) and intimate safety (ISQ). Hypothesis 1c assessed all symptoms experienced by service members and spouses, including physical injury severity, posttraumatic stress, and depression on marital adjustment and intimate safety.

Aim 2

The overall concept of Aim 2 was to assess how posttraumatic stress and depression mediated the relation between service members' physical injury severity and couples' marital relationships using the Hayes' Process method (Hayes, 2013).

Hypothesis 2a specifically assessed how service members' severity of posttraumatic stress (PCL-C) and depression symptoms (BSI) mediated the relation between the service members' physical injury severity (ISS) and the couples' dyadic adjustment (RDAS).

Hypothesis 2b focused on how spouses' severity of posttraumatic stress (PCL-C) and depression symptoms (BSI) mediated the relation between the service members' physical injury severity (ISS) and dyadic adjustment (RDAS). Marital adjustment and intimate safety was a composite score of the average between the service members and spouses' responses.

Aim 3

Aim 3 assessed the concept of intimate safety (feeling comfortable and vulnerable with their significant other) to better understand how it moderated the relation between mental health symptoms and couples' marital adjustment using the Hayes' Process method. Hypotheses 3a utilized service members' mental health symptoms as the independent variable and service members' level of intimate safety as the moderator variable while hypothesis 3b focused on spouses' mental health symptoms and intimate safety as the independent and moderation variable, prospectively. Hypothesis 3a assessed how service members' level of intimate safety (ISQ) moderated the relation between service members' depression symptom severity (BSI) and couples' marital adjustment (RDAS). A second analysis of hypothesis 3a assessed how service members' level of intimate safety (ISQ) moderated the relation between service members' posttraumatic stress severity and couples' marital adjustment (RDAS). To investigate hypothesis 3b, the Hayes' Process method was used to assess how spouses' level of intimate safety (ISQ) moderated the relation between spouses' depression severity and marital dyadic

adjustment (RDAS). A second analysis for hypothesis 3b was similar in that it utilized the Hayes' Process method to understand how spouses' intimate safety (ISQ) moderated the relation between spouses' symptoms of posttraumatic stress (PCL-C) and couples' dyadic adjustment (RDAS). It was hypothesized that both service members and spouses' intimate safety moderated the relation between mental health symptoms and marital adjustment.

Exploratory Aim 4

The overall concept of Exploratory Aim 4 was to understand how physical injury severity, posttraumatic stress, and depression predicted subscales of the relationship outcome measures, RDAS and ISQ. To explore this Aim, multivariate analyses including all predictor variables were utilized. The RDAS has three subscales that were each assessed as outcome variables: Consensus, Satisfaction, and Cohesion. The ISQ has a total of four separate subscales: Safety Being Vulnerable, Social Empathy, Sexual Intimacy, and Safety Disagreeing.

Power Analysis

A power analysis was computed using G*Power Version 3.1. The data for the study has already been collected, thus the following power analyses assessed the expected effect size for 38 couples in the sample. The power analyses were based on multiple regression models, Fixed model, R^2 increase, 80% powers, and a 5% alpha level. Predictor variables included service members' physical injury severity, PTSD, and depression; spouses' PTSD and depression; interaction effects of both service members and spouses' PTSD and depression; and level of agreement. Dependent variables were marital adjustment and intimate safety. No control variables were used in the analyses.

- For Aim 1, the multiple regression analyses with three to five total predictors being tested, the minimum detectible effect size (f^2) ranged from 0.51 to 0.62, which was a large effect. Logistics regression analyses with three to five total

predictors being tested had an effect size (Cohen's d) of 0.55, which was a medium effect.

- For Aim 2, with two total predictors being tested, the minimum detectible effect size (f^2) was 0.44, which was a large effect.
- For Aim 3, with five total predictors (independent variable, interaction, and moderation variable), the minimum detectible effect size (f^2) was 0.51, which was a large effect.
- For Aim 4, with five total predictors being tested, the minimum detectible effect size (f^2) was 0.62, which was a large effect. Logistics regression analyses with five total predictors being tested had an effect size (Cohen's d) of 0.55, which was a medium effect.

Statistical Concerns

Given the large number of analyses in the current study and small sample size, it is necessary to address the possibilities of Type I and Type II error as well as ways to address this issue. To address the large number of analyses in the current study and attempts to lessen the possible effects of Type II error, it is important to note that the specific hypotheses are predicted in advance and guided by theory derived from prior research. Furthermore in the present analyses, after the formal hypotheses are tested, overall patterns within the results were observed and compared to previous literature as a way to assess and mitigate Type I error. Even taking this into account, there is still the possibility of Type I error, and the results of this study were interpreted accordingly. Making adjustments to reduce Type I error, such as by utilizing the Bonferroni correction method, would increase the chance of Type II error. Type II error is already a concern due to the small sample size, so including additional methods that may further increase Type II error may not be appropriate.

In order to provide more meaningful results, effect sizes and confidence intervals were calculated, reported, and interpreted for each statistical analysis. This expands upon the current null hypothesis significance testing that utilizes a dichotomous style in determining statistical significance. Reporting effect size and confidence intervals provides more informative information, such as the size of the effect and the strength of the relation between variables. The confidence interval provided an estimate of plausible values for the population mean as well as information about the precision of the parameter of interest.

CHAPTER 4: Results

Chapter Four summarizes the demographic characteristics for military couples, service members, and spouses in the current sample. Next, information regarding self-reported mental health symptoms for service members and their spouses were reported in conjunction with clinician-rated combat physical injury severity for service members—which were a primary predictor variable in this study. Correlations between injury severity and mental health symptoms were also reported. Attention then shifts to the characteristics of service members and spouses' self-reports of marital adjustment and intimate safety, the two primary outcome variables examined in the current study. Additionally, the use of a composite score for service members' and spouses' self-reported marital adjustment and intimate safety was presented. Lastly, findings for each of the hypotheses described in Chapter Two were addressed.

SAMPLE CHARACTERISTICS

The sample used for analyses in the current study included 38 married couples, each consisting of a service member and spouse. Demographic characteristics are displayed for couples (Table 1), service members (Table 2), and spouses (Table 3). Couples were married an average of eight years and ranged from being married only a few months up to 19 years. All couples in the sample study had at least one child. Of the 38 service members, 36 identified as male and 2 as female, whereas 37 of the 38 spouses reported being female. Both service members and spouses were 35 years of age, on average, which is older than many samples used in other military research studies. The majority of service members held a rank of E5-E6 at the time of the study and had a mean of 13 years of military service. All service members had at least one combat deployment with an average of 4 deployments to date. Ninety-two percent of service members incurred polytraumatic physical injuries during combat deployment that led to rehabilitation and participation in the present study.

Table 1. Demographic Characteristics of Couples

Variable	N	Mean (<i>SD</i>)	Range
Number of Years Married	36	7.65 (5.10)	0.30-19
Children in Family	38	2.82 (1.39)	1-6
Variable	N	Percentage	
Household Income			
\$0- \$15,000	0		0.00%
\$15,001-\$40,000	7		18.42%
\$40,001-\$65,000	11		28.95%
\$65,001-\$90,000	8		21.05%
Over \$90,000	9		23.68%
Missing/Don't Know	3		7.89%

Table 2. Demographic Characteristics of Service Members

Variable	N	Mean (<i>SD</i>)	Range
Age	38	34.95 (5.19)	25-47
Years of Military Service	38	12.74 (5.80)	2.50-33
Deployments lasting >30 days	38	3.79 (2.78)	1-11
Total Months Deployed	38	24.70 (15.84)	0.10-60
Variable	N	Percentage	
Gender			
Male	36		94.74%
Female	2		5.26%
Race			
White	29		76.31%
Other/Mixed	9		23.68%
Education Level			
High School/GED	8		21.05%
Some College or Technical School	24		63.16%
Bachelor's or Advanced Degree	6		15.79%
Military Status			
Active Duty	26		68.42%
Guard/Reserve	3		7.89%
Medically Retired	8		21.05%
Separated	1		2.63%
Military Branch			
Army	26		68.42%
Air Force	2		5.26%
Marines	7		18.42%
Navy	3		7.89%
Military Rank			
E1-E4	6		15.79%
E5-E6	16		42.11%
E7-E9	10		26.32%
Warrant Officer & Officer	6		15.79%
Type of Injury			
Amputation	10		26.32%
TBI	24		63.16%
Burns	4		10.53%
Blindness	6		15.79%
Polytrauma/Additional Injuries	35		92.11%

Note. Type of Injury count is greater than 38 due to multiple injuries sustained by service members.

Table 3. Demographic Characteristics of Spouses

Variable	N	Mean (<i>SD</i>)	Range
Age	38	34.68 (5.67)	25-47
Variable	N	Percentage	
Gender			
Male	1		2.63%
Female	37		97.37%
Race			
White	34		89.47%
Other/Mixed	4		10.53%
Education Level			
High School/GED	5		13.16%
Some College or Technical School	18		47.37%
Bachelor's or Advanced Degree	15		39.47%
Employment Status			
Works full-time outside of home	10		26.32%
Works part-time outside of home	4		10.53%
Not employed outside of home	14		36.84%
Missing	10		26.32%
Military History			
Military Service	12		31.58%
No Military Service	26		68.42%
Deployment History			
# SPs w/Deployments > 30 days	8		21.05%
# SPs w/Combat Deployments	3		7.89%
Missing	27		71.05%

Note. Military service includes active duty, reserve, or National Guard.

In Table 4, the mental health symptom severity of posttraumatic stress and depression for service members and spouses was presented. As demonstrated below, the PCL-C indicated approximately 37% of service members and 13% of spouses reported severe symptoms of posttraumatic stress. Depression symptoms were variable, with only two service members and one spouse surpassing the threshold of one standard deviation above the mean, placing them in the 84th percentile or higher. Physical combat injury severity for service members based on a clinician-rated assessment, Injury Severity Score, was also displayed in Table 4. Three service members sustained combat physical

injuries that were severe (i.e. one standard deviation above the mean) compared to an injured population.

The correlations between physical combat injury severity scores and service members and spouses' mental health symptoms were reported in Table 5. Of note, only the first five variables in the matrix (injury severity, service members' and spouses' posttraumatic stress, and service members' and spouses' depression) were utilized as predictors in the current study. The larger study from which the data were taken included additional similar mental health variables (e.g., anxiety and somatization symptoms), and these are included in the table to get a better overall picture of the subject population.

Table 4. Results for Key Predictor Variables for Service Members and Spouses

	Service Members				Spouses			
	N	Mean (<i>SD</i>)	Range	Percentage	N	Mean (<i>SD</i>)	Range	Percentage
Injury Severity Score	38	18.89 (9.93)	9-48		--			
ISS $\geq$ LD50*	3			7.89%	--			
Posttraumatic Stress (PCL-C)	38	45.39 (16.16)	20-78		38	33.97 (13.23)	17-67	
PCL-C $\geq$ 30**	31			81.58%	20			52.63%
PCL-C $\geq$ 50*	14			36.80%	5			13.16%
Brief Symptom Inventory Total (GSI)	38	42.11 (8.18)	35-65		38	38.92 (7.01)	35-61	
GSI <i>T</i> Score $\geq$ 63*	1			2.63%	0			0.00%
Depression (<i>T</i> Score)	38	44.74 (6.00)	41-63		38	43.21 (4.92)	41-64	
Depression <i>T</i> Score $\geq$ 63*	2			5.26%	1			2.63%
Anxiety (<i>T</i> Score)	38	42.55 (6.42)	39-65		38	41.42 (5.33)	39-60	
Somatization (<i>T</i> Score)	38	45.39 (6.99)	41-68		38	42.92 (4.96)	41-63	

Note. *Indicates cutoff scores for severe symptoms; ** Indicates cutoff scores for moderate severity

Table 5. Intercorrelations for Physical Injury Severity and Mental Health Symptoms

Variables	1	2	3	4	5	6	7	8	9
1. Injury Severity	1	-0.27	-0.18	-0.16	-0.003	-0.14	-0.04	-0.14	-0.05
2. Posttraumatic Stress (SM)		1	0.18	0.65**	0.05	0.62**	0.12	0.71**	0.07
3. Posttraumatic Stress (SP)			1	0.13	0.65**	0.07	0.60**	-0.05	0.71**
4. Depression (SM)				1	0.25	0.59**	0.20	0.76**	0.20
5. Depression (SP)					1	0.22	0.66**	0.15	0.87**
6. Anxiety (SM)						1	0.15	0.84**	0.13
7. Anxiety (SP)							1	0.10	0.84**
8. MH Symptoms (SM)								1	0.06
9. MH Symptoms (SP)									1

Note. * $p < .05$. ** $p < .01$. SM = Service Members; SP = Spouses

Self-reported scores for the outcome relationship functioning variables, which were the Revised Dyadic Adjustment Scale (Table 6) and the Intimate Safety Questionnaire (Table 7), were inspected and presented in Tables 6 and 7. Recall, each of these measures were administered to both service members and their spouses. The last two columns represent a composite score, or an average for a given dyad (i.e., service member and spouse), of reported functioning for each variable. The rationale for the composite score is further explained in the next section that follows Table 7. For dyadic adjustment (Table 6), the results indicated approximately 52% of service members and 47% of spouses characterized their relationships as distressed. Service members, spouses, and composite reports of intimate safety (Table 7) indicated both groups had the greatest difficulty with communicating negative feelings or disagreements with their spouse and least difficulty with sexual intimacy.

Table 6. Dyadic Adjustment Scores for Service Members, Spouses, and Composite

	Service Member				Spouse				Composite			
	N	Mean (<i>SD</i>)	%	Range	N	Mean (<i>SD</i>)	%	Range	N	Mean (<i>SD</i>)	%	Range
RDAS Total	38	47.23 (7.82)		28-62	38	46.47 (11.48)		17-67	38	46.85 (8.18)		25.5-63.5
Distressed	20		52.6%		18		47.4%		18		47.4%	
<i>Consensus</i>	38	21.29 (4.38)		12-30	38	21.05 (5.63)		4-30	38	21.17 (3.98)		9.5-28.5
Distressed	21		55.3%		24		63.2%		25		65.8%	
<i>Satisfaction</i>	38	14.76 (2.49)		8-20	38	13.92 (3.15)		5-19	38	14.34 (2.44)		6.5-17.5
Distressed	15		39.5%		20		52.6%		20		52.6%	
<i>Cohesion</i>	38	11.18 (2.93)		4-17	38	11.50 (4.24)		2-19	38	11.34 (3.09)		3-17.50
Distressed	22		57.9%		18		47.4%		16		55.3%	

Note. Distressed refers to the percentage of service members, spouses, and composite that were categorized in the distressed relationship groups for dyadic adjustment. Italics refer to subscales of the RDAS.

Table 7. Intimate Safety Scores for Service Members, Spouses, and Composite

	Service Member		Spouse		Composite	
	Mean (<i>SD</i>)	Range	Mean (<i>SD</i>)	Range	Mean (<i>SD</i>)	Range
Total ISQ	3.04(0.49)	2.11-3.93	3.08(0.64)	1.56-4.00	3.06(0.48)	2.11-3.96
<i>Safety Being Vulnerable</i>	2.84(0.65)	1.30-4.00	2.95(0.77)	0.90-4.00	2.89(0.60)	1.75-3.95
<i>Sexual Intimacy</i>	3.51(0.52)	2.29-4.00	3.44(0.93)	0.14-4.00	3.48(0.60)	1.43-4.00
<i>Social Empathy</i>	3.01(0.63)	1.71-4.00	2.97(0.67)	1.29-4.00	2.99(0.53)	1.79-4.00
<i>Safety Disagreeing</i>	2.65(0.83)	1.33-4.00	2.90(0.99)	0.67-4.00	2.78(0.76)	1.17-4.00

Note. Italics refer to subscales of the ISQ.

COMPOSITE OUTCOME VARIABLES AS A MEASURE OF RELATIONSHIP FUNCTIONING

In the present study, composite scores, or the average between the service members and spouses' responses, were deemed to be the most appropriate outcome variables for assessing couples' dyadic adjustment and intimate safety. Other studies have used this method to create a joint estimate of the dyad (Byrne & Carr, 2000; Crane, Middleton, & Bean, 2000; Riggs, 2014). Another method considered was analyzing each person in the dyad separately, however, that would double the number of analyses. Instead, scores for service members and spouses on the ISQ and RDAS were examined in order to determine if a composite score would be appropriate. This consisted of assessing both the mean differences and correlations between service members and spouses' scores on the ISQ and RDAS. Paired *t*-test and correlation analyses between service members and spouses' total scores on the RDAS, ISQ, as well as all subscales were conducted (Table 8). Results of the paired *t*-test analyses indicated there were no statistically significant mean differences between service members and spouses' dyadic adjustment and intimate safety total scores as well as all subscales. Furthermore, there were statistically significant correlations between service members and spouses' responses on total relationship outcomes of dyadic adjustment and intimate safety. All subscales for the ISQ had statistically significant correlations between service members and spouses as well. Scores on the Satisfaction and Cohesion subscales of the RDAS were both statistically significantly correlated between service members and spouses, but were not for the Consensus subscale. A complete breakdown of the results from paired *t*-test and correlation analyses are presented in Table 8. The similarity between service members and spouses' outcome scores supported the use of a composite score, or average score between service members and spouses' responses for dyadic adjustment and intimate safety.

Table 8. Paired *T*-test Differences for RDAS and ISQ Outcomes

Pairs	Mean Difference	Correlation
ISQ Total	0.39	0.41**
<i>Safety Being Vulnerable</i>	0.80	0.42**
<i>Sexual Intimacy</i>	0.46	0.31*
<i>Social Empathy</i>	0.28	0.34*
<i>Safety Disagreeing</i>	1.56	0.40*
RDAS Total	0.43	0.41**
<i>Consensus</i>	0.24	0.25
<i>Satisfaction</i>	1.79	0.49**
<i>Cohesion</i>	0.50	0.47**

Note. * $p < .05$. ** $p < .01$. The pairs are service members and spouses' scores for each variable. Mean difference is the difference between service members and spouses' scores for each paired variable. Correlation represents the correlation between service members and spouses' scores for each paired variable. Italics refer to subscales of the ISQ and RDAS.

In summary, results of the composite score in this sample revealed that little difference existed in the means and percentages for service members and spouses' scores on dyadic adjustment and intimate safety (refer to Table 6 and 7). Using the new composite scores, 47% of couples reported their marital relationship was distressed with an average mean score of 46.85, which would be classified as distressed. The intimate safety total composite score was 3.06, which indicated a relatively high score with couples reporting "almost always" experiencing intimate safety.

EFFECTS OF PHYSICAL AND MENTAL HEALTH SYMPTOMS ON RELATIONSHIP OUTCOMES: UNIVARIATE RESULTS

Prior to discussing results for each of the hypotheses, the unique contribution of each predictor variable was examined using univariate regression analysis. The following analyses were used to assess the association between service members' physical injury severity, posttraumatic stress, and depression on relationship outcomes of dyadic adjustment and intimate safety. The association between spouses' posttraumatic stress and depression on relationship outcomes, including dyadic adjustment and intimate safety, are presented afterwards.

Service Members' Physical Injury Severity and Mental Health Symptoms in Relation to Couples' Relationship Functioning: Univariate Results

Service Members' Physical Injury Severity

All service members in the study incurred some form of physical injury, including amputations, TBI, burns, and blindness. Most service members in the present study incurred polytraumas, or multiple physical injuries. Severity of physical injuries sustained by service members was measured utilizing the Injury Severity Scale. Service members' physical injury severity did not statistically significantly predict couples' intimate safety, $F(1, 36) = 1.39, p = 0.25$. Furthermore, a linear regression analysis established that physical injury severity did not statistically significantly predict couples' dyadic adjustment, $F(1, 36) = 1.75, p = 0.19$. A binomial logistic regression was conducted to ascertain the effects of physical injury severity on the likelihood that couples were classified into a maladjusted relationship category. Results indicated the one-predictor model fit statistically significantly better than a model with no predictors at all, $\chi^2(1) = 4.79, p = 0.03$. Thus, injury severity was found to be a statistically significant predictor of couples' dyadic adjustment group, $\beta = 0.08$, Wald $\chi^2(1) = 3.91, p = 0.05$. Specifically, for each point increase in injury severity score, the odds of being in the adjusted (or non-distressed) relationship group increased by a factor of 1.08 (95% CI: 1.001, 1.174), or by 8%. The one-predictor model explained 15.79% (Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 65.79% of cases, which is a medium effect according to the guidelines of Cohen's f .

Service Members' Posttraumatic Stress Symptoms

The average score of posttraumatic stress for service members on the PTSD Checklist was 45.39 ($SD = 16.16$). Over 80% of service members had at least moderate symptoms of posttraumatic stress and 36.8% had severe symptoms. A linear regression analysis indicated service members' posttraumatic stress symptoms were not a statistically significant predictor of couples' intimate safety, $F(1, 36) = 1.74, p = 0.20$.

Posttraumatic stress symptoms only accounted for 4.6% of the variance of couples level of intimate safety. Additionally, a second linear regression analysis indicated service members' posttraumatic stress symptoms did not statistically significantly predict couples' dyadic adjustment, $F(1, 36) = 0.16, p = 0.69$. A binomial logistic regression was also conducted to evaluate the effects of service members' posttraumatic stress on the likelihood that couples were classified into a maladjusted relationship category. Results indicated a model including only service members' posttraumatic stress symptoms was not a statistically significant predictor of marital relationship category, $\beta = -0.001$, Wald $\chi^2(1) = 0.002, p = 0.97$.

Service Members' Depression Symptoms

Service members' depression was evaluated using the BSI Depression subscale with a mean *T*-score of 44.74 ($SD = 6.00$). As a reminder, *T*-scores are characterized by a distribution with a mean of 50 and a standard deviation of 10. Two service members had severe symptoms of depression that were one standard deviation above the mean, placing them in the 84th percentile or higher. A linear regression analysis indicated service members' depression was a statistically significant predictor of intimate safety, $F(1, 36) = 4.77, p = 0.04$. Service members' depression accounted for 11.69% of the variability in intimate safety scores, which is a medium effect suggested by Cohen's *f*.

A linear regression analysis indicated service members' depression scores marginally predicted dyadic adjustment, $F(1, 36) = 3.38, p = 0.07$. Service members' levels of depression accounted for 8.57% of the explained variability in dyadic adjustment, which was a small effect suggested by Cohen's *f*. A binomial logistic regression was conducted to examine the effects of service members' depression symptoms on the likelihood that couples will be classified into a maladjusted marital relationship category. Results indicated a model including only service members'

depression symptoms was not a statistically significant predictor of marital relationship category, $\beta = -0.09$ [95% CI: -0.21, 0.04], Wald $\chi^2(1) = 2.20$, $p = 0.14$.

Spouses' Mental Health Symptoms and Couples' Relationship Functioning: Univariate Results

Spouses' Posttraumatic Stress Symptoms

The average score on the PTSD checklist for spouses was 33.97 ($SD = 13.23$), which was in the moderate severity range. More than 50% of spouses had at least moderate symptoms of posttraumatic stress and 13.16% had severe symptoms of posttraumatic stress. The results of a linear regression analysis revealed spouses' posttraumatic stress symptoms statistically significantly predicted intimate safety, $F(1, 36) = 13.04$, $p = 0.001$. Spouses' posttraumatic stress symptoms accounted for 26.59% of the variability in intimate safety scores, a large effect based on the guidelines suggested by Cohen's f .

A linear regression analysis indicated the number of posttraumatic stress symptoms reported by spouses of service members statistically significantly predicted dyadic adjustment among military couples, $F(1, 36) = 8.69$, $p = 0.01$. Spouses' posttraumatic stress symptoms explained 19.44% of the variance in couples' dyadic adjustment, which was a medium effect based on the guidelines suggested by Cohen's f . A binomial logistic regression was conducted to ascertain the effects of spouses' posttraumatic stress symptoms on the likelihood that couples will be classified into a maladjusted marital relationship category. Results indicated the one-predictor model fit statistically significantly better than a model with no predictors at all, $\chi^2(1) = 4.14$, $p = 0.04$. However, spouses' posttraumatic stress was marginally significant $\beta = -0.06$, Wald $\chi^2(1) = 3.57$, $p = 0.06$. Specifically, each point increased in spouses' posttraumatic stress, the odds of being in the maladjusted (distressed) relationship group increased by a factor of 1.06 (95% CI: 0.89, 1.002), or by 6%. The one-predictor model explained 13.77%

(Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 63.2% of cases, which is a medium effect according to the guidelines of Cohen's f .

Spouses' Depression Symptoms

Spouses' had a mean T -score of 43.21 ($SD = 4.92$) on the BSI, a measure of depression symptoms. Again, T -scores are characterized by a distribution with a mean of 50 and a standard deviation of 10. One spouse had severe depression symptom scores (i.e., one standard deviation above the mean). For intimate safety, spouses' symptom severity of depression statistically significantly predicted couples' intimate safety, $F(1, 36) = 5.68, p = 0.02$. Spouses' depression levels explained 13.62% of the variance in couples' intimate safety, which was a medium effect size.

Conversely, a linear regression analysis indicated spouses' symptoms of depression was not a statistically significant predictor of couples' dyadic adjustment, $F(1, 36) = 3.36, p = 0.08$. Spouses' depression accounted for 8.55% of the variance in couples' dyadic adjustment, which was a small effect size according to the guidelines of Cohen's f . A binomial logistic regression was conducted to analyze the effects of spouses' depression symptoms on the likelihood that couples will be classified into a maladjusted marital relationship category. Results indicated the one-predictor model was not statistically significant, $\chi^2(1) = 1.04, p = 0.31$. Thus, spouses' depression symptoms was also not statistically significantly predictive of couples' dyadic adjustment group, $\beta = -0.07$, Wald $\chi^2(1) = 0.90, p = 0.34$. The one-predictor model only explained 3.61% (Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 52.63% of cases, which was a small effect.

STUDY AIM 1

Hypothesis 1a: Service Members' Symptoms as Predictors for Couples' Intimate Safety and Dyadic Adjustment

Hypothesis 1a proposed that service members' symptoms of physical injury severity, posttraumatic stress, and depression symptoms predicted couples' dyadic adjustment and intimate safety. For this hypothesis, dyadic adjustment was analyzed using multivariate regressions, including both continuous (i.e., multiple regression) and categorical (i.e., logistic regression) methods. Intimate safety was analyzed using only multiple regression analyses due to its lack of validated cut scores.

Intimate Safety as the Outcome Variable for Hypothesis 1a

A multiple regression analysis was conducted to predict couples' intimate safety from service members' physical injury severity, posttraumatic stress, and depression symptoms. All three predictors were entered into the model in a single step. The multiple regression model did not statistically significantly predict couples' intimate safety, $F(3, 34) = 1.83, p = 0.16$. R^2 for the overall model was 13.88% with an adjusted R^2 of 6.28%, a medium effect based on the guidelines suggested by Cohen's f . Of the three predictor variables, none were statistically significant predictors of couples' intimate safety (see Table 9).

Table 9. Multiple Regression Analysis Predicting Couples' Intimate Safety using Service Members' Physical and Mental Health Symptoms

	B	SE _B	β	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.01	0.01	0.15	0.36	-0.01	0.02
Posttraumatic Stress (SM)	0.002	0.01	0.06	0.78	-0.01	0.02
Depression (SM)	-0.03	0.02	-0.36	0.10	-0.06	0.01

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% confidence interval for beta; SM = service members

Dyadic Adjustment as the Outcome Variable for Hypothesis 1a

An additional multiple regression was conducted for service members' physical injury severity, posttraumatic stress, and depression symptoms to predict couples' dyadic adjustment. All three predictors were entered into the model in a single step. The multiple regression model did not statistically significantly predict couples' dyadic adjustment, $F(3, 34) = 2.15, p = 0.11$. R^2 for the overall model was 15.92% with an adjusted R^2 of 8.50%, a medium size effect according to the guidelines of Cohen's f . Of the three predictor variables included in the model, only service members' depression symptoms statistically significantly predicted couples' dyadic adjustment (Table 10).

Table 10. Multiple Regression Analysis Predicting Couples' Dyadic Adjustment using Service Members' Physical and Mental Health Symptoms

	B	SE _B	β	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.18	0.14	0.22	0.18	-0.09	0.46
Posttraumatic Stress (SM)	0.14	0.11	0.28	0.19	-0.08	0.36
Depression (SM)	-0.61	0.28	-0.44*	0.04	-1.18	-0.03

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% confidence interval for beta; SM = service members

A binomial logistic regression was conducted to determine the effects of service members' symptoms (i.e., injury severity, posttraumatic stress, and depression) on the likelihood couples would be classified into a maladjusted couples' relationship category using the valid cut scores provided by the authors of the RDAS measure (see Table 6 for the demographics and percentage of couples that are classified into the distressed group). Results indicated the model was statistically significant, $\chi^2(3) = 9.88, p = 0.02$. The model explained 30.55% (Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 76.32% of cases, which was a large effect according to the guidelines of Cohen's f . Of the three predictor variables, only service members' physical injury severity was statistically significant, $\beta = 0.10$, Wald $\chi^2(1) = 4.60, p = 0.03$ (Table 11). Specifically, for each point increase in physical injury score, the odds of being in the

adjusted (or non-distressed) relationship group increased by a factor of 1.11 (95% CI: 1.01, 1.21) or by 11%. The effects of service members' depression on classification of couples' dyadic adjustment was marginally significant, $\beta = -0.20$, Wald $\chi^2(1) = 3.58$, $p = 0.06$. Specifically, for each point decrease in service members' depression symptoms, the odds of being in the adjusted (non-distressed) relationship group increased by a factor of 1.22, or 22%. Service members posttraumatic stress was not statistically significant, $\beta = 0.06$, Wald $\chi^2(1) = 3.15$, $p = 0.08$.

Table 11. Logistic Regression Analysis Predicting Couples' Dyadic Adjustment Groups using Service Members' Physical and Mental Health Symptoms

	B	SE	Wald χ^2	df	p	OR	95% CI for OR	
							Lower	Upper
Physical Injury Severity	0.10	0.05	4.60	1	0.03*	1.11	1.01	1.21
Posttraumatic Stress (SM)	0.06	0.03	3.15	1	0.08	1.06	0.99	1.13
Depression (SM)	-0.20	0.11	3.58	1	0.06	0.82	0.66	1.01

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE = standard error; df = degrees of freedom; OR = odds ratio; CI = 95% confidence interval around odds ratio; SM = service members

Hypothesis 1b: Spouses' Symptoms and Injury Severity as Predictors for Couples' Intimate Safety and Dyadic Adjustment

Hypothesis 1b proposed that spouses' symptoms of posttraumatic stress and depression, along with service member injury severity, predicted couples' dyadic adjustment and intimate safety. For this hypothesis, dyadic adjustment was analyzed using multivariate regressions, including both continuous (i.e., multiple regression) and categorical (i.e., logistic regression) methods. Intimate safety was analyzed using only multiple regression analyses due to its lack of validated clinical criterion cut scores.

Intimate Safety as the Outcome Variable for Hypothesis 1b

A multiple regression was conducted to predict couples' intimate safety using spouses' posttraumatic stress and depression symptoms as well as service members' physical injury severity. The multiple regression model statistically significantly predicted couples' intimate safety, $F(3, 34) = 4.40$, $p = 0.01$. R^2 for the overall model was

27.98% with an adjusted R^2 of 21.63%, a large effect size. Of the three predictors included in the model, only spouses' posttraumatic stress symptoms statistically significantly predicted couples' intimate safety (Table 12).

Table 12. Multiple Regression Analysis Predicting Couples' Intimate Safety using Spouses' Mental Health Symptoms and Injury Severity

	B	SE _B	β	Sig.	95% CI	
					Lower	Upper
Physical Injury Severity	0.01	0.01	0.11	0.46	-0.01	0.02
Posttraumatic Stress (SP)	-0.02	0.01	-0.44*	0.03	-0.03	-0.002
Depression (SP)	-0.01	0.02	-0.08	0.69	-0.05	0.03

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta; SP = spouse

Dyadic Adjustment as the Outcome Variable for Hypothesis 1b

A multiple regression was conducted to predict couples' dyadic adjustment from spouses' posttraumatic stress and depression symptoms as well as service members' physical injury severity. The multiple regression model statistically significantly predicted couples' dyadic adjustment, $F(3, 34) = 3.09$, $p = 0.04$. R^2 for the overall model was 21.45% with an adjusted R^2 of 14.52%, a large effect size. Of the three predictors included in the model, spouses' posttraumatic stress symptoms were marginally significant and may be considered clinically relevant (Table 13).

Table 13. Multiple Regression Analysis Predicting Couples' Dyadic Adjustment using Spouses' Mental Health Symptoms and Injury Severity

	B	SE _B	β	Sig.	95% CI	
					Lower	Upper
Physical Injury Severity	0.12	0.13	0.15	0.36	-0.14	0.38
Posttraumatic Stress (SP)	-0.24	0.13	-0.39	0.07	-0.50	0.02
Depression (SP)	-0.06	0.34	-0.04	0.86	-0.75	0.62

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta; SP = spouse

A binomial logistic regression was conducted to ascertain the effects of spouses' posttraumatic stress, depression, and injury severity on the likelihood that couples were classified into a maladjusted marital relationship category. Results indicated the overall

model was marginally statistically significant, $\chi^2(3) = 7.79, p = 0.051$. The model explained 24.73% (Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 63.16% of cases, a large effect. Of the three predictors, none were statistically significant (Table 14).

Table 14. Logistic Regression Analysis Predicting Couples' Dyadic Adjustment Groups using Spouses' Mental Health Symptoms and Injury Severity

	B	SE	Wald χ^2	df	p	OR	95% CI for OR	
							Lower	Upper
Physical Injury Severity	0.07	0.04	2.93	1	0.09	1.08	0.99	1.17
Posttraumatic Stress (SP)	-0.05	0.04	1.69	1	0.19	0.95	0.88	1.03
Depression (SP)	0.02	0.11	0.03	1	0.87	1.02	0.83	1.25

Note. B = unstandardized regression coefficient; SE = standard error; df = degrees of freedom; OR = odds ratio; 95% CI = 95% confidence interval around odds ratio; SP = spouse

Hypothesis 1c: The Inclusion of all Service Members and Spouses' Mental Health Symptoms and Injury Severity on Couples' Intimate Safety and Dyadic Adjustment

Hypothesis 1c proposed service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms predicted couples' intimate safety and dyadic adjustment. For this hypothesis, dyadic adjustment was analyzed using multivariate regressions, both in continuous and categorical methods and intimate safety was only analyzed using multiple regressions with continuous scores due to its lack of validated cut scores.

Intimate Safety as the Outcome Variable for Hypothesis 1c

A multiple regression was conducted to predict couples' intimate safety from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model statistically significantly predicted couples' intimate safety, $F(5, 32) = 3.52, p = 0.01$. R^2 for the overall model was 35.45% with an adjusted R^2 of 25.36%, a large effect size. Of the five predictors included in the model, spouses' posttraumatic

stress symptoms statistically significantly predicted couples' intimate safety and service members' depression symptoms were marginally significant (Table 15).

Table 15. Multiple Regression Analysis Predicting Couples' Intimate Safety using Service Members and Spouses' Mental Health Symptoms and Injury Severity

	B	SE _B	β	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.004	0.01	0.08	0.59	-0.01	0.02
Posttraumatic Stress(SM)	0.004	0.01	0.13	0.53	-0.01	0.02
Depression (SM)	-0.03	0.02	-0.36	0.09	-0.06	0.004
Posttraumatic Stress (SP)	-0.02	0.01	-0.51*	0.02	-0.03	-0.004
Depression (SP)	0.004	0.02	0.04	0.83	-0.04	0.04

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta; SM = service members; SP = spouses

Dyadic Adjustment as the Outcome Variable for Hypothesis 1c

A multiple regression was conducted to predict couples' dyadic adjustment from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model statistically significantly predicted couples' dyadic adjustment, $F(5, 32) = 3.17, p = 0.02$. R^2 for the overall model was 33.09% with an adjusted R^2 of 22.64%, a large effect size. Of the five predictors included in the model, spouses' posttraumatic stress symptoms and service members' depression symptoms significantly predicted couples' dyadic adjustment (Table 16).

Table 16. Multiple Regression Analysis Predicting Couples' Dyadic Adjustment using Service Members and Spouses' Mental Health Symptoms and Injury Severity

	B	SE _B	β	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.12	0.13	0.15	0.33	-0.13	0.38
Posttraumatic Stress (SM)	0.19	0.10	0.37	0.08	-0.02	0.40
Depression (SM)	-0.65	0.28	-0.48*	0.03	-1.22	-0.08
Posttraumatic Stress (SP)	-0.31	0.13	-0.51*	0.02	-0.57	-0.06
Depression (SP)	0.24	0.35	0.14	0.50	-0.47	0.94

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta; SM = service members; SP = spouses

Next, analyses were conducted to determine the effects of service members' symptoms (injury severity, posttraumatic stress, and depression) and spouses' symptoms (posttraumatic stress and depression) on the likelihood that couples' were classified into a maladjusted couples' relationship category. A logistic regression indicated the overall model was statistically significant, $\chi^2(5) = 15.64, p = 0.01$. The model explained 45.02% (Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 68.42% of cases, a large effect. Specifically, for each point increase in physical injury severity, the odds of being in the adjusted (non-distressed) group increased by a factor of 1.11 [95% CI: 1.00, 1.24], or by 11% (Table 17). Furthermore, for each point increase in service members' posttraumatic stress, the odds of being in the adjusted (non-distressed) group increased by a factor of 1.11 [95% CI: 1.01, 1.22], or by 11%. Conversely, for each point increase in service members' depression, the odds of being in the maladjusted (distressed) group increased by a factor of 1.36, or 36%. Furthermore, for each point increase in spouses' posttraumatic stress, the odds of being in the maladjusted (distressed) group increased by a factor of 1.12, or 12%.

Table 17. Logistic Regression Analysis Predicting Couples' Dyadic Adjustment Groups using Service Members and Spouses' Mental Health Symptoms and Injury Severity

	B	SE	Wald χ^2	df	p	OR	95% CI for OR	
							Lower	Upper
Physical Injury Severity	0.11	0.05	4.01	1	0.05	1.11	1.00	1.24
Posttraumatic Stress (SM)	0.10	0.05	4.68	1	0.03	1.11	1.01	1.22
Depression (SM)	-0.31	0.14	4.67	1	0.03	0.73	0.55	0.97
Posttraumatic Stress (SP)	-0.12	0.06	3.92	1	0.05	0.89	0.79	1.00
Depression (SP)	0.17	0.14	1.52	1	0.22	1.19	0.90	1.56

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE = standard error; df = degrees of freedom; OR = odds ratio; CI = 95% confidence interval around odds ratio; SM = service members; SP = spouses. P values for physical injury severity and spouses' posttraumatic stress were less than 0.05.

AIM 2

Hypothesis 2a: Service Members' Mental Health Symptoms as a Mediator for the Relation between Injury Severity and Couples' Dyadic Adjustment

Hypothesis 2a predicted that service members' mental health symptoms (posttraumatic stress and depression, individually) mediated the relation between physical injury severity and marital adjustment. All mediation analyses were conducted using Hayes' Process modeling in SPSS 22. Of note, statistics throughout this section (e.g., a , b , c' , and ab) were all coefficients used to represent the relation between the variables being analyzed. For further details, refer back to Figure 1 in the Methods chapter.

Analysis of Service Members' Posttraumatic Stress as a Mediator between Injury Severity and Dyadic Adjustment

Following the Hayes' Process procedures outlined in the Methods section, mediation analyses were conducted by estimating service members' posttraumatic stress as a mediator for the relation between injury severity and couples' dyadic adjustment. Injury severity was not statistically significantly related to service members' posttraumatic stress ($a = -0.44$, $p = 0.10$). Service members' posttraumatic stress did not statistically significantly predict dyadic adjustment ($b = -0.004$, $p = 0.96$). The direct effect of injury severity on dyadic adjustment was not statistically significant ($c' = 0.18$, $p = 0.22$). Each of the results was presented in Table 18. A bootstrap confidence interval for the indirect effect of injury severity (ab) was conducted using 10,000 bootstrap samples. Results showed the range of plausible values for the ab coefficient was -0.07 to 0.09. This range of plausible values included zero, indicating there was no evidence of an indirect effect of injury severity on dyadic adjustment through the mediation of service members' posttraumatic stress symptoms.

Table 18. Mediation Analysis for the Effect of Injury Severity and Service Members' Posttraumatic Stress on Dyadic Adjustment

Antecedent		Consequent						
		M (SM Posttraumatic Stress)			Y (Dyadic Adjustment)			
		Coeff.	SE	Sig.		Coeff.	SE	Sig.
X (SM Injury Severity)	<i>a</i>	-0.44	0.26	0.10	<i>c'</i>	0.18	0.14	0.22
M (SM Posttraumatic Stress)		--	--	--	<i>b</i>	-0.004	0.09	0.96
		R ² = 0.07			R ² = 0.05			
		<i>F</i> (1,36) = 2.85, <i>p</i> = 0.10			<i>F</i> (2,35) = 0.85, <i>p</i> = 0.43			

Note. X = predictor variable; M = mediator variable; Y = outcome variable; SE = standard error; SM = service members; *a* = relation between X and M; *b* = relation between M and Y; *c'* = direct relation between X and Y.

Analysis of Service Members' Depression as a Mediator between Injury Severity and Dyadic Adjustment

A second mediation analysis was conducted to test service members' depression as a mediator for the relation between injury severity and couples' dyadic adjustment. Injury severity was not statistically significantly related to service members' depression ($a = -0.09, p = 0.35$). Service members' depression did not statistically significantly predict dyadic adjustment ($b = -0.36, p = 0.11$). The direct effect of injury severity on dyadic adjustment was not statistically significant ($c' = 0.14, p = 0.29$). Detailed results of the mediation analysis are found in Table 19. A bootstrap confidence interval for the indirect effect of injury severity (ab) was conducted using 10,000 bootstrap samples. Results showed the range of plausible values for the ab coefficient was -0.01 to 0.12, indicating there was no evidence of an indirect effect of injury severity on dyadic adjustment through the mediation of service members' depression symptoms.

Table 19. Mediation Analysis for the Effect of Injury Severity and Service Members' Depression on Dyadic Adjustment

Antecedent		Consequent						
		M (SM Depression)			Y (Dyadic Adjustment)			
		Coeff.	SE	Sig.		Coeff.	SE	Sig.
X (SM Injury Severity)	<i>a</i>	-0.09	0.1	0.35	<i>c'</i>	0.14	0.13	0.29
M (SM Depression)		--	--	--	<i>b</i>	-0.36	0.22	0.11
$R^2 = 0.02$					$R^2 = 0.12$			
$F(1, 36) = 0.89, p = 0.35$					$F(2, 35) = 2.28, p = 0.12$			

Note. X = predictor variable; M = mediator variable; Y = outcome variable; SE = standard error; SM = service members; *a* = relation between X and M; *b* = relation between M and Y; *c'* = direct relation between X and Y.

Hypothesis 2b: Spouses' Mental Health Symptoms as a Mediator of the Relation between Injury Severity and Couples' Dyadic Adjustment

Hypothesis 2b predicted spouses' mental health symptoms (posttraumatic stress and depression) mediated the relation between service members' physical injury severity and couples' marital adjustment. To test this hypothesis, posttraumatic stress and depression were individually assessed as mediators. All mediation analyses were conducted using Hayes' Process modeling in SPSS 22. Of note, statistics throughout this section (e.g., *a*, *b*, *c'*, and *ab*) were all coefficients used to represent the relation between the variables being analyzed. For further details, refer to Figure 1 in the Methods chapter.

Analysis of Spouses' Posttraumatic Stress as a Mediator between Injury Severity and Dyadic Adjustment

A mediation analysis was conducted to test whether spouses' posttraumatic stress symptoms mediated the relation between injury severity and dyadic adjustment. Injury severity was not statistically significantly related to spouses' posttraumatic stress ($a = -0.24, p = 0.28$). Spouses' posttraumatic stress symptoms did statistically significantly predict dyadic adjustment ($b = -0.26, p = 0.01$). The direct effect of injury severity on dyadic adjustment was not statistically significant ($c' = 0.12, p = 0.36$). Full results from the mediation analysis can be found in Table 20. A bootstrap confidence interval for the indirect effect of injury severity (*ab*) on couples' dyadic adjustment was conducted using

10,000 bootstrap samples. Results showed the range of plausible values for ab coefficient was -0.01 to 0.18. The confidence interval included zero, which indicated there was no evidence of an indirect effect of injury severity on dyadic adjustment through the mediation of spouses' posttraumatic stress symptoms.

Table 20. Mediation Analysis for the Effect of Injury Severity and Spouses' Posttraumatic Stress on Dyadic Adjustment

		Consequent						
		M (SP Posttraumatic Stress)			Y (Dyadic Adjustment)			
Antecedent		Coeff.	SE	Sig.		Coeff.	SE	Sig.
X (SM Injury Severity)	<i>a</i>	-0.24	0.22	0.28	<i>c'</i>	0.12	0.13	0.36
M (SP Posttraumatic Stress)		--	--	--	<i>b</i>	-0.26	0.09	0.01*
R ² = 0.03				R ² = 0.21				
<i>F</i> (1, 36) = 1.19, <i>p</i> = 0.28				<i>F</i> (2, 35) = 4.76, <i>p</i> = 0.01				

Note. * $p < 0.01$; X = predictor variable; M = mediator variable; Y = outcome variable; SE = standard error; SM = service members; a = relation between X and M; b = relation between M and Y; c' = direct relation between X and Y.

Analysis of Spouses' Depression as a Mediator between Injury Severity and Dyadic Adjustment

A mediation analysis was conducted to investigate whether spouses' depression symptoms mediated the relation between injury severity and dyadic adjustment. Injury severity was not statistically significantly related to spouses' depression ($a = -0.001, p = 0.99$). Spouses' depression symptoms did not statistically significantly predict dyadic adjustment ($b = -0.49, p = 0.07$), although there was marginal statistical significance. The direct effect of injury severity on dyadic adjustment was not statistically significant ($c' = 0.18, p = 0.18$). Refer to Table 21 for more detailed statistics. A bootstrap confidence interval for the indirect effect of injury severity (ab) was conducted using 10,000 bootstrap samples. Results showed the range of plausible values for the ab coefficient was -0.06 to 0.06, indicating there was no evidence of an indirect effect of injury severity on dyadic adjustment through the mediation of spouses' depression symptoms.

Table 21. Mediation Analysis for the Effect of Injury Severity and Spouses' Depression on Dyadic Adjustment

Antecedent		Consequent					
		M (SP Depression)			Y (Dyadic Adjustment)		
		Coeff.	SE	Sig.	Coeff.	SE	Sig.
X (SM Injury Severity)	<i>a</i>	-0.001	0.08	0.99	<i>c'</i>	0.18	0.13
M (SP Depression)		--	--	--	<i>b</i>	-0.49	0.26
		$R^2 = 0.00$			$R^2 = 0.13$		
		$F(1, 36) = 0.0003, p = 0.99$			$F(2, 35) = 2.65, p = 0.08$		

Note. * $p < 0.01$; X = predictor variable; M = mediator variable; Y = outcome variable; SE = standard error; SM = service members; *a* = relation between X and M; *b* = relation between M and Y; *c'* = direct relation between X and Y.

AIM 3

As noted in the statistical section of the Methods, the Hayes' Process model was used for moderation analyses. Specifically, the intent of Aim 3 was to individually assess intimate safety as a moderator for the relation between mental health symptoms and couples' dyadic adjustment for both constituents of the dyad (3a: service members; 3b: spouses). Figure 2 in the Methods chapter offers a visual illustration of the conceptual design for Aim 3.

Hypothesis 3a: Service Members' Intimate Safety as a Moderator of the Relation between Service Members' Mental Health Symptoms and Couples' Dyadic Adjustment

Evaluation of Hypothesis 3a utilized Hayes' Process moderation analyses to assess service members' intimate safety as a moderator of the relation between service members' mental health symptoms (i.e., depression and posttraumatic stress) and couples' dyadic adjustment. Conceptual and statistical models illustrating the design of the analyses implemented for hypothesis 3a are available in Figures 2 and 3, respectively.

First, a moderation analysis was conducted to examine the effect of service members' intimate safety on the relation between service members' depression and couples' dyadic adjustment. Results indicated there was not a statistically significant relation between service members' depression and couples' dyadic adjustment ($b_1 = -0.28, p = 0.27$). There was a statistically significant relation between service members'

intimate safety and couples' dyadic adjustment ($b_1 = 5.85, p = 0.04$). The interaction between service members' depression and intimate safety did not statistically significantly predict couples' dyadic adjustment ($b_3 = -0.16, p = 0.70$). The outcome indicated there was not a statistically significant change when the interaction product was added to the model, $R^2 = 0.003, F(1, 34) = 0.16, p = 0.70$. A complete review of the results for the hypothesis that service members' intimate safety did not moderate the relation between service members' depression symptoms and couples' dyadic adjustment are shown in Table 22.

Table 22. Service Members' Intimate Safety as a Moderator of the Relation between Service Members' Depression and Couples' Dyadic Adjustment

		Coeff.	SE	t	Sig.
Service Members' Depression (X')	b_1	-0.28	0.25	-1.12	0.27
Service Members' Intimate Safety (M')	b_2	5.85	2.72	2.15	0.04
Depression x Intimate Safety (X'M')	b_3	-0.16	0.40	-0.40	0.70
$R^2 = 0.20, MSE = 58.30$					
$F(3, 34) = 2.81, p = 0.05$					

Note. * $p < 0.01$; SE = standard error; MSE = mean squared error; X' = predictor variable (mean centered); M' = moderating variable (mean centered); X'M' = interaction between predicting and moderating variables; b_1 = coefficient estimates of the effects for the pathway between X' and the outcome variable; b_2 = coefficient estimates of the effects for the pathway between M' and the outcome variable; b_3 = coefficient estimates of the effects for the pathway between the interaction (X'M') and the outcome variable.

Evaluation of Hypothesis 3a also involved a moderation analysis to determine the effect of service members' intimate safety as a moderator of the relation between service members' posttraumatic stress and couples' dyadic adjustment. Results indicated service members' posttraumatic stress did not statistically significantly predict couples' dyadic adjustment ($b_1 = 0.02, p = 0.84$). Service members' intimate safety was statistically significantly predictive of couples' dyadic adjustment ($b_2 = 7.03, p = 0.01$). The coefficient for the interaction product was not statistically different from zero ($b_3 = 0.02, p = 0.90$). The R^2 increase when the product interaction was added to the model was not statistically significant, $R^2 = 0.0004, F(1, 34) = 0.01, p = 0.90$. These results indicated service members' intimate safety did not moderate the relation between service members'

posttraumatic stress and couples' dyadic adjustment. Complete results of the analysis are presented in Table 23.

Table 23. Service Members' Intimate Safety as a Moderator of the Relation between Service Members' Posttraumatic Stress and Couples' Dyadic Adjustment

		Coeff.	SE	<i>t</i>	Sig.
Service Members' Posttraumatic Stress (X')	b_1	0.02	0.08	0.20	0.84
Service Members' Intimate Safety (M')	b_2	7.03	2.71	2.59	0.01
Depression x Intimate Safety (X'M')	b_3	0.02	0.16	0.12	0.90
$R^2 = 0.17$, MSE = 60.39					
$F(3, 34) = 3.32$, $p = 0.09$					

Note. * $p < 0.01$; SE = standard error; MSE = mean squared error; X' = predictor variable (mean centered); M' = moderating variable (mean centered); X'M' = interaction between predicting and moderating variables; b_1 = coefficient estimates of the effects for the pathway between X' and the outcome variable; b_2 = coefficient estimates of the effects for the pathway between M' and the outcome variable; b_3 = coefficient estimates of the effects for the pathway between the interaction (X'M') and the outcome variable.

Hypothesis 3b: Spouses' Intimate Safety as a Moderator of the Relation between Spouses' Mental Health Symptoms and Couples' Dyadic Adjustment

Hypothesis 3b assessed the moderating effect of spouses' intimate safety on the relation between spouses' mental health symptoms (i.e., posttraumatic stress and depression) and couples' dyadic adjustment. Spouses' posttraumatic stress and depression symptoms were used as predictors in two separate analyses. Both moderation analyses were performed using the Hayes' Process modeling technique (Hayes, 2013) described in the Methods chapter.

Results of the first analysis indicated spouses' depression symptoms did not statistically significantly predict dyadic adjustment ($b_1 = 0.47$, $p = 0.20$). Spouses' intimate safety, however, was a statistically significant predictor of couples' dyadic adjustment ($b_2 = 8.47$, $p < 0.001$). The interaction between spouses' depression and intimate safety did not statistically significantly predict couples' dyadic adjustment ($b_3 = 0.52$, $p = 0.09$). Statistical details of the analyses conducted for hypothesis 3b are presented in Table 24. As noted in the Methods, the Process method for moderation analyses also displays the proportion of the total variance in the outcome uniquely

attributable to the interaction effect. In this case, the Process analysis provided information about the proportion of variance in dyadic adjustment that was explained by the interaction between spouses' depression and intimate safety (i.e., intimate safety scores at different levels of depression). Results of the Process method indicated there was not a statistically significant change in variance explained in couples' dyadic adjustment when the interaction between spouses' depression and intimate safety was added to the model, $R^2 = 0.05$, $F(1, 34) = 2.97$, $p = 0.09$.

Table 24. Spouses' Intimate Safety as a Moderator for the Relation Between Spouses' Depression and Couples' Dyadic Adjustment

		Coeff.	SE	t	Sig.
Spouses' Depression (X')	b_1	0.47	0.36	1.32	0.20
Spouses' Intimate Safety (M')	b_2	8.47	1.84	4.61	< 0.001*
Depression x Intimate Safety (X'M')	b_3	0.52	0.30	1.72	0.09
$R^2 = 0.46$, MSE = 39.54					
$F(3, 34) = 9.52$, $p < 0.001$					

Note. * $p < 0.01$; SE = standard error; MSE = mean squared error; X' = predictor variable (mean centered); M' = moderating variable (mean centered); X'M' = interaction between predicting and moderating variables; b_1 = coefficient estimates of the effects for the pathway between X' and the outcome variable; b_2 = coefficient estimates of the effects for the pathway between M' and the outcome variable; b_3 = coefficient estimates of the effects for the pathway between the interaction (X'M') and the outcome variable.

Hypothesis 3b also evaluated spouses' intimate safety as a moderator of the relation between spouses' posttraumatic stress and couples' dyadic adjustment. Results indicated spouses' posttraumatic stress did not statistically significantly predict couples' dyadic adjustment ($b_1 = 0.03$, $p = 0.81$). Conversely, spouses' intimate safety did statistically significantly predict couples' dyadic adjustment ($b_2 = 7.37$, $p = 0.003$). The coefficient for the interaction product was not statistically different from zero ($b_3 = 0.19$, $p = 0.20$). The R^2 increase when the product interaction was added to the model was not statistically significant, $R^2 = 0.03$, $F(1, 34) = 1.71$, $p = 0.20$. This indicates spouses' intimate safety did not moderate the relation between posttraumatic stress and couples' dyadic adjustment. A complete review of the results for the hypothesis assessing intimate

safety as a moderator for the relation between spouses' posttraumatic stress and couples' dyadic adjustment can be found in Table 25.

Table 25. Spouses' Intimate Safety as a Moderator of the Relation Between Spouses' Posttraumatic Stress and Couples' Dyadic Adjustment

		Coeff.	SE	t	Sig.
Spouses' Posttraumatic Stress (X')	b_1	0.03	0.11	0.24	0.81
Spouses' Intimate Safety (M')	b_2	7.37	2.33	3.16	0.003*
Depression x Intimate Safety (X'M')	b_3	0.19	0.14	1.31	0.20
$R^2 = 0.44$, MSE = 40.93					
$F(3, 34) = 8.81$, $p < 0.001$					

Note. * $p < 0.01$; SE = standard error; MSE = mean squared error; X' = predictor variable (mean centered); M' = moderating variable (mean centered); X'M' = interaction between predicting and moderating variables; b_1 = coefficient estimates of the effects for the pathway between X' and the outcome variable; b_2 = coefficient estimates of the effects for the pathway between M' and the outcome variable; b_3 = coefficient estimates of the effects for the pathway between the interaction (X'M') and the outcome variable.

EXPLORATORY AIM 4

The goal of Exploratory Aim 4 was to assess how the subscales of the ISQ and RDAS related to service members' physical injury severity, posttraumatic stress symptoms, and depression as well as spouses' posttraumatic stress symptoms and depression. In prior analyses, the total scores for intimate safety and dyadic adjustment were utilized as outcome variables. For the current analyses, each subscale for intimate safety and dyadic adjustment was explored as separate outcomes. For intimate safety, the subscales of interest included: (1) Safety Being Vulnerable, (2) Sexual Intimacy, (3) Social Empathy, and (4) Safety Disagreeing. For dyadic adjustment, the subscales of interest were (1) Consensus, (2) Satisfaction, and (3) Cohesion. All predictor variables, (ie. service members' injury severity, posttraumatic stress, and depression symptoms, and spouses' posttraumatic stress and depression symptoms) were included in each of the exploratory analyses.

Exploratory Analyses of Intimate Safety Subscales

The ISQ includes four subscales: Safety Being Vulnerable, Sexual Intimacy, Social Empathy, and Safety Disagreeing. Due to the lack of validated cut scores for the

ISQ, multivariate linear regressions were conducted for each of the subscales. To review, when all five predictors were included in the model (i.e., Hypothesis 1c) to predict intimate safety, only spouses' posttraumatic stress symptoms was a statistically significant predictor. Results for analyses of each of the subscales are presented below and in Tables 26, 27, 28, and 29.

A multiple regression was conducted to predict couples' ISQ Safety Being Vulnerable from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model marginally predicted couples' Safety Being Vulnerable, $F(5, 32) = 2.44, p = 0.06$. R^2 for the overall model was 27.58% with an adjusted R^2 of 16.27%, a large effect size. Of the five predictors included in the model, service members' depression symptoms were marginally predictive of couples' Safety Being Vulnerable (Table 26).

Table 26. Multivariate Regression Analysis Predicting ISQ Safety Being Vulnerable Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.01	0.01	0.19	0.23	-0.01	0.03
Posttraumatic Stress (SM)	0.01	0.01	0.25	0.24	-0.01	0.03
Depression (SM)	-0.04	0.02	-0.43	0.051	-0.09	0.00
Posttraumatic Stress (SP)	-0.01	0.01	-0.25	0.25	-0.03	0.01
Depression (SP)	-0.01	0.03	-0.76	0.73	-0.06	0.04

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

A multiple regression was conducted to predict couples' ISQ Sexual Intimacy from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model did not significantly predicted couples' Sexual Intimacy, $F(5, 32) = 1.81, p = 0.14$. R^2 for the overall model was 22.06% with an adjusted R^2 of 9.89%, a

large effect size. Of the five predictors included in the model, spouses' posttraumatic stress symptoms statistically significantly predicted couples' Sexual Intimacy (Table 27).

Table 27. Multivariate Regression Analysis Predicting ISQ Sexual Intimacy Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	-0.01	0.01	-0.16	0.33	-0.03	0.01
Posttraumatic Stress (SM)	-0.002	0.01	-0.06	0.79	-0.02	0.01
Depression (SM)	-0.01	0.02	-0.12	0.58	-0.06	0.03
Posttraumatic Stress (SP)	-0.02	0.01	-0.47	0.04*	-0.04	-0.001
Depression (SP)	-0.01	0.03	0.07	0.76	-0.05	0.06

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

A multiple regression was conducted to predict couples' ISQ Social Empathy from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model statistically significantly predicted couples' Social Empathy, $F(5, 32) = 3.40, p = 0.01$. R^2 for the overall model was 34.66% with an adjusted R^2 of 24.45%, a large effect size. Of the five predictors included in the model, spouses' posttraumatic stress symptoms statistically significantly predicted couples' Social Empathy (Table 28).

Table 28. Multivariate Regression Analysis Predicting ISQ Social Empathy Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.01	0.01	0.16	0.30	-0.01	0.03
Posttraumatic Stress (SM)	0.003	0.01	0.09	0.67	-0.01	0.03
Depression (SM)	-0.02	0.02	-0.20	0.34	-0.05	0.02
Posttraumatic Stress (SP)	-0.02	0.01	-0.58	0.01*	-0.04	-0.01
Depression (SP)	0.01	0.02	0.12	0.57	-0.03	0.06

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

A multiple regression was conducted to predict couples' ISQ Safety Disagreeing from service members' physical injury severity, posttraumatic stress, and depression

symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model did not significantly predicted couples' Safety Disagreeing, $F(5, 32) = 1.56, p = 0.20$. R^2 for the overall model was 19.58% with an adjusted R^2 of 7.01%, a medium effect size. None of the five predictors included in the model statistically significantly predicted couples' Safety Disagreeing (Table 29).

Table 29. Multivariate Regression Analysis Predicting ISQ Safety Disagreeing Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	-0.001	0.01	-0.02	0.93	-0.03	0.03
Posttraumatic Stress (SM)	0.001	0.01	0.01	0.95	-0.02	0.02
Depression (SM)	-0.04	0.03	-0.32	0.17	-0.10	0.02
Posttraumatic Stress (SP)	-0.02	0.01	-0.38	0.10	-0.05	0.004
Depression (SP)	0.02	0.04	0.13	0.56	-0.05	0.09

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

Exploratory Analyses of Dyadic Adjustment Subscales

The RDAS includes three subscales: Consensus, Satisfaction, and Cohesion. For exploratory purposes, these three subscales were used as outcome variables in place of the dyadic adjustment total score used in Aim 1. Each of the subscales had corresponding validated cut scores provided by the author of the questionnaire. Multiple and logistic regressions were utilized. The multiple regressions were used to investigate the relation between physical and mental health predictors and each of the RDAS subscales. The multivariate logistic regressions determined how physical and mental health symptoms predicted couples' dyadic adjustment groups (distressed versus non-distressed). The model used for the current analyses included all five predictor variables: service members' physical injury severity, posttraumatic stress symptoms, and depression symptoms as well as spouses' posttraumatic stress symptoms and depression symptoms.

Multivariate Regression Analyses of Dyadic Adjustment Subscales

To review, the multivariate analysis for the dyadic adjustment *total score* utilizing all five predictor variables (hypothesis 1c) indicated only spouses' posttraumatic stress symptoms was a statistically significant predictor of couples' dyadic adjustment. No other variables were statistically significantly predictive of couples' dyadic adjustment. Complete results for the multivariate regression analyses conducted on each of the RDAS subscales is presented below and in Tables 30, 31, and 32 below.

A multiple regression was conducted to predict couples' RDAS Consensus from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model marginally predicted couples' Consensus, $F(5, 32) = 2.45, p = 0.06$. R^2 for the overall model was 27.67% with an adjusted R^2 of 16.37%, a large effect size. Of the five predictors included in the model, spouses' posttraumatic stress symptoms statistically significantly predicted couples' Consensus (Table 30).

Table 30. Multivariate Regression Analysis Predicting RDAS Consensus Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.04	0.06	0.09	0.58	-0.09	0.17
Posttraumatic Stress (SM)	0.05	0.05	0.21	0.34	-0.06	0.16
Depression (SM)	-0.17	0.14	-0.26	0.23	-0.46	0.12
Posttraumatic Stress (SP)	-0.15	0.06	-0.51	0.02*	-0.28	-0.02
Depression (SP)	0.05	0.17	0.06	0.79	-0.31	0.40

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

A multiple regression was conducted to predict couples' RDAS Satisfaction from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model statistically significantly predicted couples' Satisfaction, $F(5, 32) = 3.12, p = 0.02$. R^2 for the overall model was 32.75% with an adjusted R^2 of 22.25%, a large effect size. Of the five predictors included in the model, service members'

depression symptoms and spouses' posttraumatic stress symptoms statistically significantly predicted couples' Satisfaction (Table 31).

Table 31. Multivariate Regression Analysis Predicting RDAS Satisfaction Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.06	0.04	0.23	0.14	-0.02	0.13
Posttraumatic Stress (SM)	0.10	0.03	0.64	0.004	0.03	0.16
Depression (SM)	-0.20	0.08	-0.50	0.02*	-0.37	-0.03
Posttraumatic Stress (SP)	-0.10	0.04	-0.52	0.02*	-0.17	-0.02
Depression (SP)	0.20	0.10	0.40	0.066	-0.01	0.41

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

A multiple regression was conducted to predict couples' RDAS Cohesion from service members' physical injury severity, posttraumatic stress, and depression symptoms as well as spouses' posttraumatic stress and depression symptoms. The multiple regression model statistically significantly predicted couples' Cohesion, $F(5, 32) = 3.00$, $p = 0.03$. R^2 for the overall model was 31.92% with an adjusted R^2 of 21.28%, a large effect size. Of the five predictors included in the model, service members' depression symptoms statistically significantly predicted couples' Cohesion (Table 32).

Table 32. Multivariate Regression Analysis Predicting RDAS Cohesion Subscale

	B	SE _B	Beta	Sig.	95% CI	
					Lower	Upper
Injury Severity	0.03	0.05	0.10	0.52	-0.07	0.13
Posttraumatic Stress (SM)	0.04	0.04	0.21	0.32	-0.04	0.12
Depression (SM)	-0.28	0.11	-0.54	0.01*	-0.49	-0.06
Posttraumatic Stress (SP)	-0.07	0.05	-0.28	0.18	-0.16	0.03
Depression (SP)	-0.01	0.13	-0.01	0.95	-0.28	0.26

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; β = standardized regression coefficient; 95% CI = 95% confidence interval around beta.

Multivariate Logistic Regression Analysis of Dyadic Adjustment Subscales

Validated cut scores have been established for each subscale of the RDAS to help determine couples that can be categorized as a distressed marital relationship. The cut scores were utilized in this study to create binary variables (distressed/non-distressed) that were used as an outcome variable. To review, a logistic regression including all physical and mental health symptoms for service members and their spouses was used to predict dyadic adjustment total scores as a dichotomous variable in hypothesis 1c. Results indicated worse severity of service members' depression and spouses' posttraumatic stress symptoms statistically significantly predicted couples being categorized into distressed dyadic adjustment groups. Furthermore, results indicated worse severity of service members' physical injury severity and posttraumatic stress statistically significantly predicted couples being categorized into a non-distressed, adjusted dyadic group. Results for the logistic regression analyses conducted on each of the RDAS subscales are available below and in Tables 33, 34, and 35.

Analyses were conducted to determine the effects of service members' symptoms (injury severity, posttraumatic stress, and depression) and spouses' symptoms (posttraumatic stress and depression) on the likelihood that couples' would be classified into a distressed relationship category based on couples' Consensus. A logistic regression indicated the overall model was not statistically significant, $\chi^2(5) = 7.68, p = 0.18$ (Table 33). The model explained 25.30% (Nagelkerke R^2) of the variance in couples' Consensus and correctly classified 73.68% of cases, a large effect. Of the five predictors, none were statistically significantly predictive of couples' Consensus groups.

Table 33. Logistic Regression for Predicting RDAS Consensus Subscale Groups

	B	SE	χ^2 Wald	df	Sig.	OR	95% CI for OR	
							Lower	Upper
Physical Injury Severity	0.06	0.04	2.32	1	0.55	1.07	0.98	1.16
Posttraumatic Stress (SM)	0.02	0.04	0.35	1	0.23	1.02	0.95	1.09
Depression (SM)	-0.14	0.11	1.47	1	0.18	0.87	0.70	1.09
Posttraumatic Stress (SP)	-0.07	0.05	1.84	1	0.24	0.94	0.85	1.03
Depression (SP)	0.14	0.12	1.38	1	0.87	1.15	0.91	1.46

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE = standard error; df = degrees of freedom; OR = odds ratio; CI = 95% confidence interval around odds ratio; SM = service members; SP = spouses.

Analyses were conducted to determine the effects of service members' symptoms (injury severity, posttraumatic stress, and depression) and spouses' symptoms (posttraumatic stress and depression) on the likelihood that couples' would be classified into a distressed relationship category based on couples' Satisfaction. A logistic regression indicated the overall model was statistically significant, $\chi^2(5) = 25.12$, $p = 0.001$. The model explained 64.56% (Nagelkerke R^2) of the variance in couples' adjustment and correctly classified 81.58% of cases, a large effect. Specifically, for each point increase in physical injury severity, the odds of being in the adjusted (satisfied) group increased by a factor of 1.19 [95% CI: 1.03, 1.37], or by 19% (Table 34). Furthermore, for each point increase in service members' posttraumatic stress, the odds of being in the adjusted (Satisfied) group increased by a factor of 1.18 [95% CI: 1.02, 1.37], or by 18%. Conversely, for each point increase in service members' depression, the odds of being in the maladjusted (dissatisfied) group increased by a factor of 1.52, or 52%. Furthermore, for each point increase in spouses' posttraumatic stress, the odds of being in the maladjusted (dissatisfied) group increased by a factor of 1.30, or 30%.

Table 34. Logistic Regression for Predicting RDAS Satisfaction Subscale Groups

	B	SE	χ^2 Wald	df	Sig.	OR	95% CI for OR	
							Lower	Upper
Physical Injury Severity	0.17	0.07	5.53	1	0.02*	1.19	1.03	1.37
Posttraumatic Stress (SM)	0.17	0.08	4.94	1	0.03*	1.18	1.02	1.37
Depression (SM)	-0.41	0.20	4.27	1	0.04*	0.66	0.45	0.98
Posttraumatic Stress (SP)	-0.26	0.10	6.65	1	0.01*	0.77	0.63	0.94
Depression (SP)	0.46	0.20	5.14	1	0.02*	1.59	1.06	2.36

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE = standard error; df = degrees of freedom; OR = odds ratio; CI = 95% confidence interval around odds ratio; SM = service members; SP = spouses.

Analyses were conducted to determine the effects of service members' symptoms (injury severity, posttraumatic stress, and depression) and spouses' symptoms (posttraumatic stress and depression) on the likelihood that couples' will be classified into a distressed relationship category based on couples' Cohesion. A logistic regression indicated the overall model was not statistically significant, $\chi^2(5) = 9.83$, $p = 0.08$ (Table 35). The model explained 30.51% (Nagelkerke R^2) of the variance in couples' Consensus and correctly classified 68.42% of cases, a large effect. Of the five predictors, service members' depression was statistically significantly predictive of couples' Cohesion groups. Specifically, for each point increase in service members' depression, the odds of being in the maladjusted (non-cohesive) group increased by a factor of 1.30, or 30%.

Table 35. Logistic Regression for Predicting RDAS Cohesion Subscale Groups

	B	SE	χ^2 Wald	df	Sig.	OR	95% CI for OR	
							Lower	Upper
Physical Injury Severity	0.07	0.04	2.38	1	0.12	1.07	0.98	1.17
Posttraumatic Stress (SM)	0.05	0.04	1.83	1	0.18	1.05	0.98	1.13
Depression (SM)	-0.26	0.13	4.00	1	0.05*	0.77	0.6	1.00
Posttraumatic Stress (SP)	-0.04	0.04	0.65	1	0.42	0.97	0.89	1.05
Depression (SP)	0.05	0.12	0.18	1	0.68	1.05	0.83	1.32

Note. * $p < 0.05$. B = unstandardized regression coefficient; SE = standard error; df = degrees of freedom; OR = odds ratio; CI = 95% confidence interval around odds ratio; SM = service members; SP = spouses.

CHAPTER 5: Discussion

The current study assessed couples' relationship functioning, including intimate safety and dyadic adjustment, among couples consisting of a service member with a combat-related physical injury and their spouse. More specifically, the current study examined how the service members' physical injury severity as well as service members and spouses' symptoms of posttraumatic stress and depression impacted the couples' intimate safety and dyadic adjustment.

The most consistent finding in the study was that spouses' posttraumatic stress symptoms were predictive of couples' intimate safety and dyadic adjustment. Service members' depression was also predictive of dyadic adjustment in several analyses. Surprisingly, there was little evidence that service members' physical injury severity had much of an effect on the relationship outcomes measured in the study. When there was an observable but slight effect of physical injury, the nature of the effect was that worse injury severity predicted couples being categorized into non-distressed couples' group.

In contrast to existing literature (Gewirtz, Polusny, DeGarmo, Khaylis, & Erbes, 2010), mediation analyses did not provide evidence for posttraumatic stress and depression as mediators for the relation between service members' physical injury severity and couples' dyadic adjustment. Furthermore, findings of this study did not support the conclusion that intimate safety moderated the relation between mental health symptoms and couples' dyadic adjustment.

Exploratory analyses were also conducted of the Revised Dyadic Adjustment and Intimate Safety subscales. These results indicated that physical injury and mental health symptoms were predictive of the RDAS Satisfaction subscale, but not RDAS Consensus and Cohesion subscales. Service members' depression and spouses' posttraumatic stress demonstrated had minor predictive value on ISQ subscales.

SPOUSES' MENTAL HEALTH SYMPTOMS

Rates of posttraumatic stress among spouses were fairly high within the current sample. Approximately 53% of spouses in the present sample exhibited at least moderate symptoms of posttraumatic stress ($PCL-C \geq 30$) with approximately 13% reporting severe symptoms ($PCL-C \geq 50$). Rates of PTSD among spouses of non-injured service members ranged between 10-24% in previous studies, with one influencing factor reportedly being service members' PTSD symptom severity (Dekel, Levinstein, Siegel, Fridkin, & Svetlitzky, 2016; Renshaw et al., 2008; Renshaw et al., 2011). Riggs (2014) found a prevalence rate of 28% of spouses endorsed symptoms consistent with a posttraumatic stress disorder diagnosis. Within Renshaw and colleagues' (2008) sample, spouses had a mean PCL score of 27.98 and approximately 12.5% of spouses met criteria for PTSD based on a PCL cut off score of 44. Comparing those results to the present study, the mean PCL score was 33.97 and approximately 21% of spouses exceeded the PCL cut off score of 44. Although the spouses in the present sample exhibited higher symptoms on the PCL compared to past military studies, the present study differs in that service members were being treated for moderate to severe physical injuries. Physical injuries may lead to higher levels of distress experienced by spouses living and taking care of service members as well as other household responsibilities. It should be noted that some spouses may have had prior traumatic events that may have contributed to higher symptoms as well. Upon further assessing spouses' trauma in the present study, half of the spouses in the present study reported experiencing a past event that was extremely upsetting, with one-fourth of spouses reporting that the past event was still bothersome. Scores on the PCL, which assessed symptoms experienced by spouses in the past month, were not correlated with adverse childhood experiences or trauma history. It was difficult to assess whether posttraumatic stress symptoms were due to being in the role as a spouse or caregiver, or whether symptoms were due to other possible unknown factors. These results indicate that it may be possible that past experiences of the spouses

may have contributed to symptoms of posttraumatic stress, however, it is also likely that the distress experienced by the spouses due to their spouse being injured and having to be caregivers for the service members during rehabilitation and recovery may be a more significant contributing factor.

In the present study, spouses' posttraumatic stress symptoms were consistently predictive of intimate safety and dyadic adjustment. When intimate safety is divided into smaller constructs, spouses' posttraumatic stress symptoms were more specifically predictive of sexual intimacy and social empathy constructs, rather than safety being vulnerable and safety disagreeing constructs. In assessing specific constructs of dyadic adjustment through the subscales, spouses' posttraumatic stress symptoms were specifically predictive of couples' satisfaction and consensus. In the civilian sector, spouses' caring for their injured spouse showed increased levels of anxiety and depression (Ponsford & Schönberger, 2010), poor family functioning (Kreutzer, Serio, & Berquist, 1994), and reduced life satisfaction (Livingston et al., 2010). Stress levels experienced by spouses may be higher than injured service members' stress levels due to both the primary stressors (i.e., physical work of providing care) and secondary stressors (i.e., decrease in household income, loss of social activities) related to the effects of the injury (Badr et al., 2007). Stress levels are likely exhibited through posttraumatic stress symptoms in the present sample, similar to past research that found family members to be at risk for developing posttraumatic stress disorder due to the high levels of distress (Ceranoglu & Stern, 2006). Relevant to the posttraumatic stress findings in this study, spouses can oftentimes take on the role of caregiver in order to provide additional support for an injured spouse. Research in both military and non-military populations has shown that spouses in the role of caregiver who feel the need to overprotect the injured spouse will experience higher levels of stress, negative health symptoms, and decreased marital satisfaction for both spouses (Coyne & Smith, 1994; Joseph & Afifi, 2010; Suls, Green, Rose, Lounsbury, & Gordon, 1997).

Other studies reported rates of depression among spouses of non-injured service members returning from deployment ranged from 12-22% (Eaton et al., 2008; Gorman et al., 2011). When factoring in functional impairment as diagnostic criteria for depression rather than only using symptoms as a screener, rates of major depressive disorder among spouses lessened to approximately 6.7%. In another study assessing mental health symptoms experienced by spouse caregivers of veterans with polytraumas, depression *T* scores ranged from 45.6 to 52.8, which indicated average symptoms compared to the general U.S. population. This range was dependent upon whether or not spouses received training at the hospital to care for the veterans' injuries or not. The present sample exhibited similar depression symptoms with an average *T* score of 43.2. Furthermore, the present sample only included one spouse with depression symptoms that met criteria for diagnosis, which is equivalent to 2.6% of the present sample. Although spouses' lower rates of depression symptoms may not be consistent with other military studies assessing symptoms after deployment, the rates of depression exhibited in the present study may be similar to other studies in which spouses become caregivers of injured service members.

It was not evident that spouses' depression strongly predicted dyadic adjustment or intimate safety. These findings are not consistent with prior research and with several studies indicating that spouses experiencing distress were three times more likely to exhibit symptoms of depression (Whisman & Beach, 2015). In turn, these symptoms of depression were negatively associated with poor marital relationships (Blow et al., 2013). One possible explanation for these results is that spouses' depression could be better explained by symptoms of posttraumatic stress, which exhibited a higher variance within the multivariate models. Furthermore, another reason for the lack of findings for spouses' depression in the present study is that none of the spouses reported highly significant levels of depression and the mean *T* score within the present sample was below the standardized mean.

SERVICE MEMBERS' MENTAL HEALTH SYMPTOMS

This sample specifically targets a military population that has been exposed to combat and sustained physical injuries as a result. Their combat exposure coupled with combat physical injuries resulted in increased rates of posttraumatic stress, depression, and many other mental health difficulties (Jacobson et al., 2008; Jacobson et al., 2009; Smith et al., 2008; Wells et al., 2010). Studies have estimated rates of 35-45% of service members returning from combat deployment met criteria for at least one mental health problem (Gorman, Blow, Ames, & Reed, 2011; Milliken, Auchterlonie, & Hoge, 2007).

Within the current sample, over 80% of service members exhibited at least moderate symptoms of posttraumatic stress ($PCL-C \geq 30$) and approximately 37% exhibited severe symptoms of posttraumatic stress ($PCL-C \geq 50$). Rates of PTSD in service members returning from combat typically ranged between 4-17% (Creamer, Wade, Fletcher, & Forbes, 2011; Richardson, Frueh, & Acierno, 2010; Solomon & Horesh, 2007). Specifically within a combat injured population, Grieger and colleagues (2006) found rates of posttraumatic stress disorder ranged from 4.2% to 12.2% during the first year after injury. Posttraumatic stress symptoms in the present study are significantly higher than have been previously reported. This may be due to our current sample, which includes service members that have been directly exposed to explosive blasts and/or other highly dangerous combat conditions resulting in moderate to severe physical injuries. These high levels of exposure may be associated with higher rates of posttraumatic stress symptoms than reported by other deployment-related studies.

Military deployment studies have previously reported approximately 15-25% of service members screened positive for depressive symptoms after returning from deployment (Booth-Kewley, Larson, Highfill-McRoy, Garland, & Gaskin, 2010; Hoge et al., 2004; Seal et al., 2009). Rates of depression may be higher in prior studies due to the method used for screening as opposed to the present study which assessed for diagnosable conditions of depression. Rates of depression specifically within a combat

injured population has been estimated at 4.4% to 9.3%, depending on when depression was measured since injury (Grieger et al., 2006), which is a similar rate compared to the present study. Rates of depression were low among service members in the current study compared to other military deployment studies, but were similar to Grieger and colleagues' (2006) study specifically assessing depression among injured service members. Only two service members exhibited clinically significant depression (T score = 63), which equates to 5.3% of the current sample. Most depression scores were below the mean of the normal population (T score = 50).

A multitude of research studies assessing service members' posttraumatic stress and depression symptoms have also shown to impact spouses and marital relationships (Cook, Riggs, Thompson, Coyne, & Sheikh, 2004; Klarić et al., 2008; Monson, Schnurr, Stevens, & Guthrie, 2004; O'Donnell, Cook, Thompson, Riley, & Neria, 2006; Renshaw, Rodrigues, & Jones, 2009; Riggs, Byrne, Weathers, & Litz, 1998; Taft, Watkins, Stafford, Street, & Monson, 2011). Throughout the present study, service members' posttraumatic stress symptoms were not predictive of couples' dyadic adjustment, which was inconsistent with past research studies assessing the association between PTSD and dyadic adjustment in non-injured samples. One study of a non-injured sample, found that when spouses perceived that service members had experienced low levels of combat exposure, service members' reports of posttraumatic stress was negatively related (Renshaw, Rodrigues, & Jones, 2008). In contrast, Renshaw and colleagues (2008) reported that if spouses perceived that the service members had experienced high levels of combat, then service members' PTSD did not significantly impact marital satisfaction. This indicates that spouses' perception of service members experiencing traumatic experiences and associated symptoms may help provide a viable explanation for why the service member may be acting on or feeling symptoms of posttraumatic stress. Furthermore, spouses' perception appeared to have a strong relation to marital functioning more so than service members' reported symptoms. This may be one

hypothesis to explain why service members' posttraumatic stress symptoms did not predict dyadic adjustment and was correlated (non-significantly) such that high symptoms predicted better dyadic adjustment.

One consistent finding throughout the present study was that service members' depression was associated with couples' dyadic adjustment. This is similar to existing research in the civilian sector, which indicates that depression often results in marital conflict and poorer marital adjustment (Du Rocher Schudlich et al., 2011). More specifically, depression is thought to impact aspects of communication—internal dialogue and how one thinks and views themselves and others, as well as utilizing effective problem-solving techniques and sharing responsibilities (O'Leary, Christian, & Mendell, 1994). Research also indicates that service members who exhibit symptoms of depression are more likely to have difficulty rejuvenating their relationship and reintegrating as a couple (Knobloch & Theiss, 2011). Our findings are similar to past research: depression experienced by service members is negatively associated with both their own and their spouses' relationship satisfaction post-deployment (Renshaw et al., 2008).

INJURY SEVERITY

Physical injuries incurred by service members during combat exposure were primarily polytraumas consisting of at least two or more injuries sustained during the same combat event. To be included in the present study, service members' injuries must have included at least one score of 3, which is considered to be a severe but not life-threatening physical injury. A service member with one injury such as a TBI or amputation would have a score of 9. A score of 18, which was the mean score for the present sample, may include a moderate injury (i.e., spinal compression fracture or amputation) or a combination of one severe life-threatening injury (i.e., crushed pelvis or above knee amputation) plus a minor injury (i.e., acute strain of spine or fracture of finger). Scores in the present sample ranged between nine to 48 with a mean score of 18.89. Overall, the current study's present sample consisted of fairly severe physical

injuries with 92% of the sample reporting polytraumatic injuries. It is important to note that injury severity in the present sample is not a measure of functioning impairment, but a clinician-rated score of the injury severity.

Service members' physical injury severity produced mixed results throughout this study in regards to its predictive value on dyadic adjustment. When the relation between physical injury severity and dyadic adjustment was considered in a linear model, the results were non-significant. However, when considering how physical injury severity predicted whether couples' were grouped into distressed or non-distressed groups, results were consistent with our other findings for physical injury. Couples in which the service members had worse injury severities were again more likely to fall into the non-distressed adjustment group, and more severe physical injuries led to a higher probability of being categorized into a better adjusted couples' group. One similar study conducted by Gewirtz and colleagues (2010) assessed how physical injury and posttraumatic stress impacted marital functioning; however, they used a yes/no question to measure presence of combat physical injury rather than assess injury severity, so the effect of injury severity was not determined. These researchers found that presence of a physical injury was associated with more severe PTSD symptoms and that PTSD significantly mediated the relation between having a deployment injury and couples' adjustment. Other research studies seem to support the notion that physical injuries have acute and long-term negative affects on marital relationships, opposite of what the current study found (Badr, Acitelli, & Taylor, 2007; Kreutzer, Serio, & Berquist, 1994; Livingston et al., 2010; Ponsford & Schönberger, 2010; Schonberger, Ponsford, Olver, & Ponsford, 2010). Specifically, individuals with major injuries were found to experience a lack of motivation for interconnectedness, loss of effective communication, decreased sexual interest or drive in marital relationship, tendency to isolate, and loss of autonomy (Collins & Kennedy, 2008; Senra, Oliveira, Leal, & Vieira, 2012; Verhaeghe et al., 2005), which all impact marital functioning. Furthermore, spouses of injured service members can

experience mood disturbances (Schonberger et al., 2010), increased anxiety and depression (Ponsford & Schönberger, 2010), social isolation (Marsh, Kersel, Havill, & Sleigh, 2002), poor family functioning (Kreutzer, Serio, & Berquist, 1994), and reduced life satisfaction (Livingston et al., 2010), which can all impact marital functioning.

There are several hypotheses to explore regarding the results of increased injury severity predicting the categorization of couples into a non-distressed group, an unexpected result. First, service members were all volunteers either in the hospital or a rehabilitation program. These types of environments oftentimes provide much needed support and may be a protective factor for both service members and their spouses. In considering the sample, scores of injury severity were slightly skewed such that approximately 25% of service members had a score of nine, which may represent a floor effect. Furthermore, there were three service members with fairly high injury severities ($ISS \geq LD50$), which was considered to be a “lethal dose” of an injury for 50%. Post-hoc analyses revealed that physical injury severity did not statistically significantly predict the categorization of dyadic adjustment when the service members with severe injuries were excluded. Similarly, post-hoc analyses were conducted to better understand whether there was a difference between moderate injuries and severe injuries. When only looking at the severe injuries above the median, the relation between injury severity and dyadic adjustment remained similar as the reported results such that worse injury severity predicted categorization into the better adjusted (non-distressed) group, however, the relation was no longer statistically significant. Interestingly, when only looking at moderate injuries below the median, the analysis indicated that worse injury severity predicted being categorized into a more distressed group, however, it is important to note that it was not statistically significant. This may indicate that more severe, life-threatening injuries may bring the couple closer together. It may be likely that higher couple identity as a dyadic team may be a protective factor. One possible factor not investigated within the present study is couple identity, or the incorporation of oneself as

part of the couple (i.e., “we-ness”). In one study assessing relationship functioning among couples in which one spouse had incurred a physical injury, higher couple identity minimized the negative effects of the injury, helped couples feel part of the dyadic team, and increased dyadic functioning (Badr, Acitelli, & Taylor, 2007). It may be this idea of “we-ness” that becomes a protective factor for the couples being categorized into a non-distressed relationship functioning group. Furthermore, military couples oftentimes undergo a lifestyle in which they must act as part of a team with one another, which may enhance this quality specifically within military couples. It is possible that injured service members’ relationships have strengths that other couples might not have. Post-hoc analyses revealed that Cohesion, which was the closest measure the present study had to assess for “we-ness”, did not moderate the relation between injury severity and mental health symptoms. The association between severe physical injuries and dyadic adjustment should be further explored in future studies, particularly in regards to life-threatening injuries being a possibly protective factor for relationships.

COUPLES’ DYADIC ADJUSTMENT

Dyadic adjustment in the present study revealed fairly high levels of distress. Dyadic adjustment was not associated with certain demographic features, such as the number of years married. In a National Guard study in which approximately 20% of service members incurred some minor polytraumatic injuries, approximately 43% of service members and 38% of spouses reported having a distressed relationship (Spira & Gorman, 2010). In another study assessing dyadic adjustment among couples consisting civilian patients who experienced mild to severe brain injuries and their spouse caregivers, mean scores on the RDAS were 47.5 for caregiver spouses and 47.0 for injured spouses (Kreutzer, Sima, Marwitz, & Lukow, 2016). In the present sample, mean scores on the RDAS were 47.2 for service members and 46.5 for spouses. This indicates that approximately 47.4% of couples were categorized into a distressed relationship group. In assessing Satisfaction specifically, 52.6% of couples were categorized into a

non-satisfied relationship group. The result of the present study appear to be consistent with those found by Kreutzer and colleagues (2016) in an injured population, such that there are high levels of distressed couples within the military injured population.

In assessing the subscales, results indicated that most of the physical and mental symptoms significantly predict couples' Satisfaction (service members' physical injury severity, posttraumatic stress, and depression, and spouses' posttraumatic stress and depression), but were not predictive of Consensus and Cohesion subscales. Only spouses' posttraumatic stress predicted Consensus and service members' depression predicted Cohesion. This provides evidence that Satisfaction is an important construct when assessing couples' relationship functioning, more so than constructs of Consensus and/or Cohesion. Marital relationships are often assessed and reported in terms of satisfaction. There is a large evidence to suggest that higher levels of psychological distress is linked to decreased marital satisfaction (Kurdek, 2005; Proulx, Helms, & Buehler, 2007; Renshaw et al., 2008; Renshaw et al., 2010; Smith, Breiding, & Papp, 2012).

COUPLES' INTIMATE SAFETY

Intimate Safety has never been previously studied within an injured population or with psychopathology so the present study was the first to explore the impact of physical injury and mental health symptoms on intimate safety. The present study had relatively high Intimate Safety scores and low variability obtained in this study (Table 7; mean = 3.06; range = 2.11 – 3.96 with higher scores representing better intimate safety). Only spouses' posttraumatic stress predicted couples' intimate safety among all of the multivariate analyses. It was surprising to not see any of the other variables predictive of intimate safety. One possible reason is that spouses' posttraumatic stress accounted for higher levels of variance compared to other predictors. Another reasons for this is a lack of variability among couples' intimate safety scores. Specifically, most couples reported having strong intimate safety within their relationship. Intimate safety is only recently

being studied in this context, and future research may clarify how mental health symptoms and physical injuries or illness impact the construct of intimate safety.

SUMMARY AND CONCLUSIONS

In sum, present study findings indicate that the primary constructs influencing couples' intimate safety and dyadic adjustment are spouses' posttraumatic stress symptoms and service members' symptoms of depression. For spouses, the rehabilitation process after service members have incurred physical injuries can be extremely stressful, despite not being the primary person receiving medical care (Badr, Acitelli, & Taylor, 2007; Dreyer & Nortvedt, 2008; Phillips, Fussell, & Rumsey, 2007; Ponsford & Schönberger, 2010; Schonberger, Ponsford, Olver, & Ponsford, 2010). Physical injuries incurred by service members impact the entire family structure, including each persons' mental health as well as the couples' relationship functioning. The distress experienced by spouses can manifest as symptoms of posttraumatic stress, as shown in the present study, and subsequently impact couples' relationship functioning.

Furthermore, physical injuries can cause emotional difficulty for service members. Amongst injured service members, the loss of physical functioning can sometimes result in feeling as though one has lost their identity, especially for those who sustained severe injuries impacting their military careers. This loss of identity as well as the lack of independence to care for oneself can lead to feelings of depression for service members. This explanation is likely why service members' symptoms of depression have a stronger impact on couples' intimate safety and dyadic adjustment more so than their posttraumatic stress symptoms.

Overall, it is important as service members go through hospitalization and rehabilitation that health care providers are assessing the needs of both the service member and the spouse. Overall, both service members and spouses' mental health symptoms factor into couples' ability to adjust after one spouse has incurred an injury.

When assessing couples' relationships, it is better to assess both spouses for a more accurate understanding of their relationship as a whole.

MILITARY IMPLICATIONS

Combat injuries incurred during war not only impact service members, but also their spouses and other family members. From the initial injury to hospitalization and rehabilitation to long-term care, service members and their spouses experience difficult emotional and practical problems. The recovery can have a profound effect on marital relationships, including intimacy, communication, and relationship distress. Our findings suggest that the severity of the injury does not predict couples' intimate safety or dyadic adjustment in a linear pattern. However, our findings do indicate that higher severity of physical injuries does result in couples being categorized into a non-distressed relationship group. This provides some rationale that high severity of injuries may have a positive and protective effect on couples' relationship functioning.

Furthermore, in 2007 the President's Commission on Care for America's Returning Wounded Warriors as well as the Defense Health Board Task Force on Mental Health recommended increased federal funding to support military families. Although this is much-needed support, in both cases the primary goal focused on supporting the mental health treatment of service members. A larger concern should be also placed upon the mental health care treatment of spouses as well. The present study provided strong evidence that spouses can experience equal or even higher levels of distress when caring for injured service members and that their mental health symptoms can have a strong impact on the couples' relationship altogether.

CLINICAL IMPLICATIONS

The findings of this study indicate that both service members and spouses' mental health symptoms are important to assess, even when it is not the primary factor being treated. In the current sample, the primary health care services are provided to service

members specifically for their combat physical injuries. Prior research as well as the results of the current study indicate it is important for providers to take into consideration both service members and spouses' mental health symptoms in developing health care and treatment plans for severe physical injuries sustained. This may be particularly important for the assessment of symptoms and measurement of couples' dyadic adjustment. Based on the findings of this study, it may be helpful to assess and encourage service members and their spouses to participate in mental health care services as part of the rehabilitation process for both their individual needs as well as their needs as a couple. Even in situations in which couples do not endorse mental health symptoms, participating in couples' therapy may still be beneficial in order to adjust to a new "normal" after service members have incurred combat physical injuries.

STUDY LIMITATIONS AND FUTURE DIRECTIONS

The current study has several limitations that should be noted and improved upon in future research studies. The present study had a small sample size of 38 married couples. Although regression analyses are able to maintain robustness with the present sample size, it is important to utilize caution about using advanced statistical methods in order to maintain as much statistical power as possible. The central limit theory suggests having at least 30 participants in a sample in order for a normal distribution to occur. The analyses consisted primarily of regression analyses, which are fairly robust with small sample sizes. Advanced statistical methods, such as path modeling, could be more informative; however, would have resulted in too great of a reduction in power within the present study. Future research should aim for larger sample sizes in order to not have concern about power. Furthermore, future research should integrate more technical statistical analyses, such as path modeling, in order to fully understand the relations between variables altogether in one model. Additionally, the present study design was cross-sectional, which limited the ability to infer causation as well as to examine longitudinal changes over time. A longitudinal design study would also be beneficial to

better understand both the short term and long term effects of physical injury severity and mental health symptoms experienced by both service members and their spouses. A longitudinal study could include with or without therapeutic interventions for couples. One such therapeutic intervention to be further explored within this population is Families Overcoming Combat Under Stress – Combat Injury (FOCUS-CI), which is the baseline of the present study. Future research should also consider the inclusion of a comparison group, possibly service members and their spouses who have not experienced combat physical injuries and subsequent hospitalization and rehabilitation. Furthermore, it would be beneficial to assess how different kinds of injuries (i.e. amputations, TBI, burns) relate differently to couples' dyadic adjustment. Future research may consider using additional measures, such as qualitative measures, in order to gain a better understanding of service members and spouses' experiences.

There are numerous other additional avenues that future research could explore. One aspect beyond the scope of the current study is to better understand what specific constructs within posttraumatic stress and depression tend to be more predictive of couples' intimate safety and dyadic adjustment. Another construct that could be beneficial to add to future research is communication within couples' relationships. The present study lacked a strong validated measure of couples' communication, although intimate safety was considered to tap into the emotional aspects within communication. Intimate safety is a newer concept to examine, especially within military and injured populations. This construct should continue to be explored by future researchers in order to understand the vulnerability and emotions couples face within their relationships when attempting to overcome physical injuries and mental health symptoms.

CONCLUDING COMMENTS

Marital relationships undergo many changes and hardships, particularly military marital relationships. Service members who have incurred combat physical injuries oftentimes face difficult recovery and rehabilitation phases that not only impact

themselves, but can also cause significant distress on their spouse. The current study examined not only how service members' physical injury severity impacts the marital relationship, but also how symptoms of posttraumatic stress and depression experienced by service members and their spouses also impact the marital relationship. This study focused on constructs of dyadic adjustment and intimate safety within marital relationships. Results indicated spouses' posttraumatic stress symptoms and service members' depression symptoms had profound negative impact on couples' dyadic adjustment and intimate safety. Clinicians, both in research and clinical work, should continue to assess, promote, and treat mental health symptoms among couples participating in rehabilitation services for combat physical injuries.

Table 36. Appendix 1: Injury Severity Scale

The Injury Severity Scale is copyrighted so it is unable to be included here. It can be obtained through Greenspan, McLellan, & Greig (1985; see references).

Table 37. Appendix 2: PTSD Checklist – Civilian Version (PCL-C)

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please tell me how much you have been bothered by each problem IN THE PAST MONTH. Please tell me if you have been bothered not at all, a little bit, moderately, quite a bit, or extremely.

In the past month...

	Not at all	A little bit	Moderately	Quite a bit	Extremely	Prefer not to answer
Repeated, disturbing memories, thoughts, or images of a stressful experience from the past	1	2	3	4	5	x
Repeated, disturbing dreams of a stressful experience from the past	1	2	3	4	5	x
Suddenly acting or feeling as if a stressful experience from the past were happening again (as if you were re-living it)	1	2	3	4	5	x
Feeling very upset when something reminded you of a stressful experience from the past	1	2	3	4	5	x
Having physical reactions (like heart pounding, trouble breathing, sweating) when something reminded you of a stressful experience from the past	1	2	3	4	5	x
Avoiding thinking about or talking about a stressful experience from the past or avoiding having feelings related to it.	1	2	3	4	5	x

Avoiding activities or

situations because they reminded you of a stressful experience from the past.	1	2	3	4	5	x
Trouble remembering important parts of a stressful experience from the past	1	2	3	4	5	x
Loss of interest in activities that you used to enjoy	1	2	3	4	5	x
Feeling distant or cut-off from other people	1	2	3	4	5	x
Feeling emotionally numb or being unable to have loving feelings for those close to you	1	2	3	4	5	x
Feeling as if your future somehow will be cut short	1	2	3	4	5	x
Trouble falling or staying asleep	1	2	3	4	5	x
Feeling irritable or having angry outbursts	1	2	3	4	5	x
Having difficulty concentrating	1	2	3	4	5	x
Having difficulty concentrating	1	2	3	4	5	x
Feeling jumpy or easily startled	1	2	3	4	5	x

Table 38. Appendix 3: Brief Symptom Inventory (BSI)

The following is a list of problems and complaints that people sometimes have. For each one, please tell me how much that problem has bothered or distressed you DURING THE PAST WEEK, INCLUDING TODAY. Please tell me if you have been bothered not at all, a little bit, moderately, quite a bit, or extremely.

During the past week, including today...

	Not at all	A little bit	Moderately	Quite a bit	Extremely	Prefer not to answer
Faintness or dizziness.	1	2	3	4	5	x
Feeling no interest in things.	1	2	3	4	5	x
Nervousness or shakiness inside.	1	2	3	4	5	x
Pains in heart or chest.	1	2	3	4	5	x
Feeling lonely.	1	2	3	4	5	x
Feeling tense or keyed up.	1	2	3	4	5	x
Nausea or upset stomach.	1	2	3	4	5	x
Feeling blue.	1	2	3	4	5	x
Suddenly scared for no reason.	1	2	3	4	5	x
Trouble getting your breath.	1	2	3	4	5	x
Feelings of worthlessness.	1	2	3	4	5	x
Spells of terror or	1	2	3	4	5	x

panic.

Numbness or tingling in parts of your body.	1	2	3	4	5	x
Feeling hopeless about the future.	1	2	3	4	5	x
Feeling so restless you could not sit still.	1	2	3	4	5	x
Feeling weak in parts of your body.	1	2	3	4	5	x
Thoughts of ending your life.	1	2	3	4	5	x
Feeling fearful.	1	2	3	4	5	x

Table 39. Appendix 4: Revised Dyadic Adjustment Scale (RDAS)

Most persons have disagreement in their relationships. Please tell me the approximate extent of agreement or disagreement between you and your participating partner for each of the following items. Please tell me if you and your participating partner always agree, almost always agree, occasionally agree, frequently disagree, almost always disagree, or always disagree.

	Always Agree	Almost Always Agree	Occasionally Agree	Frequently Disagree	Almost Always Disagree	Always Disagree	
Religious matters	5	4	3	2	1	0	
Demonstrations of affection	5	4	3	2	1	0	
Making major decisions	5	4	3	2	1	0	
Sex relations	5	4	3	2	1	0	
Conventionality (correct or proper behavior)	5	4	3	2	1	0	
Career decisions	5	4	3	2	1	0	
		All the time	Most of the time	More often than not	Occasionally	Rarely	Never
How often do you discuss or have you considered divorce, separation, or terminating your relationship?		0	1	2	3	4	5
How often do you and your participating partner quarrel?		0	1	2	3	4	5
Do you ever regret that you married (or lived together)?		0	1	2	3	4	5

How often do you and your participating partner “get on each other’s nerves”?

0	1	2	3	4	5
Every day	Almost every day	Occasionally	Rarely	Never	Prefer not to answer

Do you and your participating partner engage in outside interests together?

4	3	2	1	0	x
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How often would you say the following events occur between you and your participating partner?

Never	Less than once a month	Once or twice a month	Once or twice a week	Once a day	More often	Prefer not to answer
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Have a stimulating exchange of ideas

0	1	2	3	4	5	x
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Work together on a project

0	1	2	3	4	5	x
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Calmly discuss something

0	1	2	3	4	5	x
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Table 40. Appendix 5: Intimate Safety Questionnaire (ISQ)

For the following questions, please tell me how often each statement is true for you. Tell me if it is true for you never, rarely, sometimes, almost always, or always.

	Never	Rarely	Sometimes	Almost always	Always	Prefer not to answer
When I have thoughts or feelings that are vague or uncertain, I find it helpful to talk with my participating partner.	0	1	2	3	4	x
I feel comfortable telling my participating partner when he/she has irritated me.	0	1	2	3	4	x
When socializing with friends, I am more comfortable when my participating partner is not with me.	0	1	2	3	4	x
Sex with my participating partner makes me uncomfortable.	0	1	2	3	4	x
I feel uncomfortable telling my participating partner that he/she has hurt my feelings.	0	1	2	3	4	x
In public, I feel like I'm in danger of being "put down" by my participating partner.	0	1	2	3	4	x
I feel comfortable when my participating partner initiates sex with me.	0	1	2	3	4	x
I enjoy sharing my successes with my participating partner.	0	1	2	3	4	x

I feel like I have to watch what I do or say around my participating partner.	0	1	2	3	4	x
When things aren't going well for me, it's comforting to talk to my participating partner.	0	1	2	3	4	x
I am comfortable being physically affectionate with my participating partner.	0	1	2	3	4	x
My participating partner tells me things about him/herself that make me uncomfortable.	0	1	2	3	4	x
When I am with my participating partner I feel comfortable just being myself.	0	1	2	3	4	x
I feel comfortable initiating sex with my participating partner.	0	1	2	3	4	x
My friends seem to genuinely like my participating partner.	0	1	2	3	4	x
When I am with my participating partner I feel more safe and comfortable than I do with most others.	0	1	2	3	4	x
When I need to cry I go to my participating partner.	0	1	2	3	4	x
I don't feel comfortable telling my participating partner when he/she has made me angry.	0	1	2	3	4	x

Being physically affectionate with my participating partner makes me uncomfortable.	0	1	2	3	4	x
I feel comfortable telling my participating partner when I'm feeling scared/anxious.	0	1	2	3	4	x
I feel comfortable telling my participating partner things I would not tell anyone else.	0	1	2	3	4	x
I avoid having sex with my participating partner.	0	1	2	3	4	x
When my participating partner talks about something that is bothering him/her, he/she often ends up upset with me.	0	1	2	3	4	x
When we are out with other people my participating partner hurts my feelings or makes me mad.	0	1	2	3	4	x
When I'm upset, there are other people that I would rather talk to than my participating partner.	0	1	2	3	4	x
I feel close to my participating partner during and after lovemaking.	0	1	2	3	4	x
I feel comfortable telling my participating partner when I'm feeling sad.	0	1	2	3	4	x

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