MEDIATING INFLUENCE OF MORAL INJURY AND PTSD ON THE ASSOCIATION BETWEEN TRAUMA EXPOSURE AND SUICIDE ATTEMPTS

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Death due to suicide is the second leading cause of death among servicemembers. One factor that increases the likelihood of suicide is trauma. The influence of trauma on suicide attempts may be because it increases the severity of other factors associated with suicide. For example, perceived burdensomeness and thwarted belongingness are associated with PTSD and moral injury both of which are primary experiences that are present among those who attempt suicide. We also know that different types of traumatic experiences vary in how they impact people. To further understand the influence of traumatic experiences, PTSD, and moral injury on servicemembers attempting suicide, this study examined the mediating role of PTSD and moral injury on the association between childhood and combat related traumatic events and suicide attempts. Results suggest that PTSD fully mediates lifetime trauma and suicide attempts, while childhood trauma, combat trauma, and PTSD are significantly associated with suicide attempts. These findings help inform our understanding of risk factors associated with suicide, which can inform targeted prevention and intervention efforts.

Mediating Influence of Moral Injury and PTSD on the Association Between Trauma Exposure and Suicide Attempts

This dissertation by Megan Chavez Tomlinson, directed and approved by the candidate's committee, has been accepted and approved by the Faculty of The PGSP-Stanford Psy.D. Consortium, Palo Alto University in partial fulfillment of the requirements for the degree of

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CHAPTER I

LITERATURE REVIEW

Suicide is the second leading cause of death among soldiers of the U.S. military (Congressional Research Service, 2022), making it an important consideration for those in the mental health field who study and support soldiers and veterans. Deaths by suicide and suicide attempts in the military are especially linked to symptoms of posttraumatic stress disorder (PTSD; Freeman et al., 2000; LeardMann et al., 2013; Watkins et al., 2016). Suicide is also associated with traumatic experiences, in part, because these experiences can lead to PTSD, and because they may lead to the person who had the traumatic experiences to perceive themselves as a burden, isolate themselves from others, and desire to escape persistent and distressing trauma reminders (Briere et al., 2015; LeBouthillier et al., 2015).

Certain types of traumatic experiences have been associated with greater risk for suicide than others. Traumatic experiences that involve moral injury – perpetrating, failing to prevent, or witnessing acts that lead to a profound sense of betrayal of one's values – may be especially pernicious (Litz et al., 2009). Exposure to these types of traumatic experiences can result in emotions such as shame, guilt, betrayal, and disgust, and have been linked with suicide in servicemembers and veterans (LeBouthillier et al., 2015; Maguen et al., 2011). Although the association between trauma and suicide is clear, the unique association between different types of traumatic experiences and suicide attempts, and the potential mediating effects of moral injury and PTSD is less well understood. Further understanding the association between these variables can inform mental health treatment of servicemembers and veterans, thereby reducing the rising suicide rates among the military population.

Suicide

Interpersonal-Psychological Theory of Suicide

One of the most prominent and well researched theories of suicide that helps to understand suicide among trauma-exposed servicemembers is the Interpersonal Theory of Suicide (IPTS; Joiner, 2005; Bryan, Morrow et al., 2010). According to IPTS, two primary conditions must be present for a person to contemplate and attempt suicide: perceived burdensomeness and thwarted belongingness. Thwarted belongingness entails feeling not accepted by, affiliated with, and cared for by members of a group. Perceived burdensomeness entails causing hardship or distress for others and is associated with self-hate. Although some theories emphasize the role of hopelessness in suicide (Beck, 1986), according to IPTS, hopelessness must be related to perceived burdensomeness and lack of belongingness (i.e., that a person cannot change perceived burdensomeness and thwarted belongingness) for a person to desire and attempt suicide (Joiner, 2005).

According to IPTS, in addition to perceived burdensomeness and thwarted belongingness, a person must have the ability to engage in lethal self-injury to attempt suicide or die by suicide (Joiner, 2005). Acquired capability describes one's ability to kill oneself, which develops over time through exposure to painful or life-threatening experiences or stimuli. People with an acquired capability for suicide have a diminished fear of self-injury and death, and a greater capacity for physiological pain due to their habituation to these factors. The acquired capability for self-harm may emerge from genetic vulnerabilities and continued exposure to painful as well as dangerous events such as past suicidal behavior, combat exposure, and physical abuse (Chu et al., 2017). Furthermore, a person must have access to lethal means, actions or objects that have a high likelihood of resulting in death, to end their own life. Thus,

individuals with a combination of thwarted belongingness, perceived burdensomeness, acquired capability, and access to lethal means are at significant risk for lethal suicide.

Suicide Among Servicemembers and Veterans

Rates of suicide in the military are higher than those of civilians and have gradually been increasing over the past 10 years among active duty servicemembers in general (i.e., across all branches of the military; 20% increase) and active-duty members of the Army in particular (30%; Baldor & Burns, 2020). Similarly, veteran suicide rates are 1.5 times the rate of the general adult population (Hoge, 2019; Office of Mental Health and Suicide Prevention, 2020). There are several risk factors for suicide attempts for veterans and servicemembers. Among members of the U.S. Army, young age (i.e., 17-30 years-old), being male and Caucasian, lower enlisted rank, having less than a high school education, previous deployment, being within the first year of service, being a victim of a minor violent crime, perpetrating a major violent crime, psychopathology, and having a history of family violence and childhood abuse have been associated with greater risk for attempting suicide (Allen et al., 2005; Black et al., 2011; Perales et al., 2012; Ursano et al., 2018). Risk factors for suicide among Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans include Hispanic ethnicity, history of sexual assault, previous suicide attempts, and low postwar social support (Lee et al., 2018). Additionally, veterans and servicemembers are more likely than civilians to use lethal means such as firearms as their attempt method, which likely contributes to veterans being twice as likely to die by suicide (Anestis & Bryan, 2013; Kaplan et al., 2007).

One reason for the discrepancy between the use of more lethal means for suicide among members of the military compared to civilians can be explained by acquired capability. Servicemembers train extensively in how to kill with firearms and are exposed to fear inducing

stimuli to reduce their fear response in combat situations and ultimately combat itself. This habituation to death, pain, and violence likely contributes to greater acquired capability compared to civilians (Anestis & Bryan, 2013), therefore placing veterans and servicemembers at greater risk for engaging in lethal suicidal behaviors.

Another factor that puts servicemembers at greater risk for suicide is their access to lethal means, one of the more deadly of which are firearms. As a part of their firearms training, it is common for servicemembers to have relatively frequent access to firearms, both government-issued and personal. The combination of access to firearms, as well as heightened acquired capability among this population makes them at greater risk for lethal suicide, however it does not explain why servicemembers and veterans might attempt suicide.

Trauma, PTSD, and Suicide in the Military

Trauma

Exposure to various types of traumatic events over a person's lifetime are common, particularly among servicemembers (Dedert et al., 2009) and can heighten the risk of attempting suicide. By virtue of their profession, servicemembers are exposed to many traumatic experiences in the context of war that most civilians would never encounter in their lifetime (Anestis et al., 2009). Studies have found that servicemembers report higher rates of adverse childhood experiences compared to civilians (Blosnich et al., 2014), with the most frequently occurring experience being childhood physical assault (Dedert et al., 2009). Not all traumatic experiences affect members of the military the same (Green et al., 2000).

Combat-Related Trauma

While at war, military servicemembers may be exposed to a number of potentially traumatic events including combat, serious accidents, witnessing injury and death, and handling

human remains (Maguen et al., 2010). Exposure to war and especially combat can leave a deep and lasting psychological impact given the innately distressing experiences that are common to these environments (Grossman, 2000). Greater combat exposure has been linked with greater suicide risk in servicemembers (Bryan et al., 2015; Bullman & Kang, 1996). A reason for this association is the profound psychological toll repeated exposure to such painful experiences can have. Additionally, suicide risk may be elevated among servicemembers as a result of acquired capability, where fearlessness of death coupled with a heightened tolerance for pain increases a person's capability to attempt suicide (Bryan & Cukrowicz, 2011).

Childhood Trauma

Although combat may be the experience that is most emblematic of military trauma, trauma in childhood may be more influential (Cabrera et al., 2007). Rates of childhood trauma among servicemembers and veterans are high, with 35% of active-duty servicemembers across all branches endorsing experiencing some type of abuse occurring before the age of 18 (RTI International, 2009). Among those who experienced abuse in childhood, 26% reported experiencing physical abuse, and 9% reported sexual abuse (RTI International, 2009). Research shows that soldiers and veterans with a history of childhood trauma are also at greater risk for suicide attempts and dying by suicide (Blosnich & Bossarte, 2017; Gradus et al., 2013; Nichter et al., 2020). Specifically, childhood sexual, physical, and emotional abuse, and emotional and physical neglect have been associated with a heightened risk for suicide and suicide attempts (Black et al., 2011; Gradus et al., 2013 Perales et al., 2012). Multiple factors may be contributing to the relationship between childhood trauma and suicide. Trauma exposure in childhood may disrupt a child's confidence in their ability to cope with future challenging situations (Van Voorhees et al., 2012). Additionally, childhood maltreatment has been associated with deficits in

emotional learning and emotion regulation development (Gillespie et al., 2009; Van der Kolk, 2005, 2014). Therefore, a person's confidence in their ability to cope with stressors, as well as their psychological capacity to use effective coping skills can be greatly disrupted. This can cause feelings of hopelessness and overwhelm in the face of stressful events, and lead to maladaptive coping and other negative mental health outcomes such as engaging in suicidal behaviors (Perales et al., 2012; Van der Kolk, 2014).

Posttraumatic Stress Disorder

Inherent in the diagnosis of posttraumatic stress disorder (PTSD) is the experience of trauma. PTSD has been seen in veterans and servicemembers throughout wars. In World War I it was known as "shellshock" and later in World War II, the Korean War, and the Vietnam War, the term "battle fatigue" was used to describe the symptoms we now associate with PTSD (Birmes et al., 2003). The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) criteria for PTSD symptoms are grouped into three categories: re-experiencing of the traumatic event, avoidance of reminders of the event, and hyper arousal. These symptoms can manifest as recurrent and intrusive memories or dreams, avoidance of people, places, or stimuli, emotional numbing, irritable behavior and angry outbursts, and feelings of guilt and shame. For a person to be diagnosed with PTSD, symptoms must be present for more than a month, and must cause impairment in social, occupational, or other areas of functioning.

PTSD is more common among military servicemembers than among civilians (Kessler et al., 2005). A reason for this may be that servicemembers experience more combat and other atrocities of war as well as higher rates of childhood trauma than civilians. According to the National Center for PTSD, approximately 11-20% of veterans who served in the OEF and OIF

conflicts have PTSD in a given year, with a large meta-analysis showing rates around 23% (Fulton et al., 2015; National Center for PTSD, 2018), making PTSD the most commonly diagnosed mental health disorder among veterans (Hoge et al., 2004). PTSD rates among active-duty servicemembers have been steadily increasing, with 3.5% of female and 1.9% of male active-duty servicemembers reporting having a diagnosis of PTSD in 2019 (Defense Health Agency, 2019). Members of the U.S. Army are at greater risk for trauma-related disorders as they consistently report higher rates of PTSD relative to other military branches (Judkins et al., 2020). A primary reason for this is that members of the Army are exposed to more combat on average than members of other military branches (Baker et al., 2009).

Consistent with the history of PTSD as a diagnosis originating in soldiers at war, one of the most common predictors of PTSD among members of the U.S. military is exposure to combat (Xue et al., 2015). However, combat may not be the most influential traumatic experience. Childhood trauma is also associated with PTSD in active-duty and veteran populations (Agorastos et al., 2014; Ford & Kidd, 1998). Moreover, risk for developing PTSD increases as the number of childhood traumatic experiences increases (Agorastos et al., 2014). Childhood trauma involving physical neglect, physical abuse, exposure to family violence, and sexual abuse has been associated with PTSD symptom severity, above and beyond the effects of combat exposure in OEF/OIF servicemembers and veterans (Cabrera et al., 2007; LeardMann et al., 2010; Van Voorhees et al., 2012). Childhood trauma also appears to be a risk factor for future PTSD when a servicemember is exposed to combat later in life. Research suggests that childhood trauma makes servicemembers more vulnerable to PTSD symptoms in adulthood through emotional numbing and avoidance PTSD symptoms developed in childhood impeding their ability to seek out social support in adulthood (Van Voorhees et al., 2012). If the

servicemember later deploys to a combat zone, they are less equipped to cope with the additional stressors of war in ways that would be adaptive, such as talking to friends and fellow soldiers about their experience. Instead, they engage in avoidant ways of coping (Van Voorhees et al., 2012). This creates a cumulative effect of traumatic experiences that make individuals more susceptible to develop PTSD. These findings highlight not only the detrimental impact of traumatic experiences that are more interpersonal in nature, but also the significant impact traumatic and stressful experiences that occur in childhood can have on mental health well into adulthood.

PTSD and Suicide

The association between PTSD and suicide has been well established (Bryan et al., 2016; Fanning & Pietrzak, 2013; Gradus et al., 2013; Tarrier & Gregg, 2004). Active-duty and veteran members of the U.S. Army are almost 15 times more likely than civilians to have PTSD, placing them at very high risk for suicide (Ursano et al., 2014). Army soldiers with PTSD have been shown to be five times more likely to have experienced suicidal ideation or attempted suicide compared to soldiers without PTSD (Ramsawh et al., 2014). Research further suggests that one of the strongest predictors among OEF and OIF veterans enrolled in VA services for attempting suicide is PTSD (Lee et al., 2018). The association between PTSD and suicide may be best explained through the IPTS framework, as studies have shown that PTSD significantly predicts greater perceived burdensomeness and thwarted belongingness among servicemembers (Bryan, Morrow et al., 2010), which are two of the three key factors contributing to suicide (Joiner, 2005). Although trauma and PTSD may be among the potent predictors of suicide among military servicemembers, other factors may also be important.

Moral Injury and Suicide

Moral Injury

Moral injury refers to the deep psychological, biological, spiritual, behavioral, and social distress a person experiences due to a discrepancy between their own moral code and beliefs, and the actions they or others have taken (Litz et al., 2009). For moral injury to occur, a person must first experience a transgression, such as witnessing or learning about inhumane actions, failing to prevent behaviors that go against their moral code, or engaging in unethical behavior (Litz et al., 2009). As a result of the transgression, individuals experience inner turmoil and dissonance, resulting in feelings of anxiety, guilt, and shame depending on how they perceive themselves and their role in the transgression. Transgressions characteristic of potentially morally injurious events (PMIE) can take three primary forms. The first is transgression-self, which is characterized by a person engaging in an act that goes against their own moral code (e.g., killing a civilian). The second is transgression-other, which corresponds to a person witnessing another engage in an act that goes against their moral code (e.g., witnessing a fellow soldier harm a child combatant). The third form is betrayal, which is characterized by a person feeling betrayed by a trusted other (e.g., having your actions disavowed by military leaders; Nash et al., 2013).

Moral injury is common among those serving in the OEF/OIF wars, with a substantial proportion (43%) of Marines reporting being exposed to a morally injurious event while deployed (Gray et al., 2012). Servicemembers in Afghanistan and Iraq may be more likely to experience moral injury due to their involvement in wars characterized by more unconventional features such as killing a child soldier, seeing injured or dead women and children, and firing at an unclear enemy; all of which are considered ethically ambiguous and morally questionable situations (Litz et al., 2009). Recent research has further linked moral injury with each of the

four PTSD symptom clusters (emotional numbing, reexperiencing, avoidance, and hyperarousal; Bryan et al., 2016), which speaks to the emotional distress morally injurious experiences can evoke.

Moral Injury and Trauma

To further understand moral injury, researchers have examined traumatic events that occurred prior to and during combat and the association of these events with categories of moral injury (i.e., transgression-self, transgression-other, and betrayal; Bryan et al., 2016). Research conducted among military servicemembers suggests that pre-enlistment/pre-deployment stressors as well as combat-related experiences are associated with experiencing transgression-other and transgression-self, whereas pre-enlistment/pre-deployment stressors, combat-related trauma, and other interpersonal stressors are associated with betrayal (Bryan et al., 2016).

Moral Injury and Combat

Combat in war often comes with exposure to death and destruction, which can influence a person's psychological well-being (Grossman, 2014). Combat involving potentially transgressive acts (e.g., witnessing/failing to prevent atrocities/massacre, witnessing/failing to prevent harm to a noncombatant, and injuring/killing a noncombatant) are reportedly some of the most traumatic experiences a servicemember can endure during war (Frankfurt et al., 2017; Grossman, 2014). Combat trauma is associated with guilt and shame (Frankfurt et al., 2017; Hendin & Haas, 1991; Vermetten & Jetly, 2018), two key emotional responses that are in turn associated with moral injury and suicide (Bryan et al., 2014). Among soldiers involved in the OEF/OIF wars, 12% of those deployed to Afghanistan and as many as 48% who were deployed to Iraq endorsed being responsible for the death of an enemy combatant (Hoge et al., 2004; Maguen et al., 2010). Thus, it is important to assess military servicemembers who return from

war for exposure to experiences that can result in moral injury and provide appropriate support as needed.

Moral Injury and Child Abuse

Although moral injury involving transgressions against oneself and others may occur more frequently in combat, moral injury as a result of betrayal by a trusted other may be more common in childhood. Traumatic experiences occurring during childhood have been linked to moral injury, especially for members of the military (Bryan et al., 2016; Williamson et al., 2021). Specifically, childhood emotional, sexual, and physical abuse, and neglect, along with witnessing assault or death in childhood, have all been associated with higher expressions of moral injury among military servicemembers (Battaglia et al., 2019; Bryan et al., 2016; Williamson et al., 2021). The higher rate of moral injury found among servicemembers with a history of childhood abuse and maltreatment may be related to emotional, cognitive, and behavior responses such as feelings of shame, guilt, maladaptive coping, and feelings of hopelessness that are present in child abuse and moral injury. Importantly, child abuse and moral injury have been associated with poor mental health outcomes including PTSD and suicide (Hendin & Haas, 1991; Vermetten & Jetly, 2018; Williamson et al., 2021).

Moral Injury and Suicide

Following moral injury, people may experience heightened guilt and shame, which can ultimately lead to suicidal behaviors (Litz et al., 2009). Within the IPTS framework, moral injury may lead to perceived burdensomeness due to the emotional distress the morally injured person may experience, making them feel as though their emotional reaction is a burden to others. Moral injury may lead to thwarted belongingness due to having perpetrated or witnessed acts that are morally or ethically questionable, which may lead them to isolate themselves from others so

as to avoid being judged by others. The morally injured person may also be unable to forgive themselves for failing to live up to their own moral or ethical code, contributing to feelings of hopelessness. Consistent with this, research suggests that moral injury is associated with suicidal ideation and suicide attempts (Bryan et al., 2014; Levi-Belz & Zerach, 2018). This may make moral injury from military and non-military trauma another potential mechanism by which traumatic experiences may be associated with suicide. However, this has not been examined empirically. Therefore, the current study proposes to examine the mediating effects of PTSD symptoms and moral injury on the association between childhood trauma and military trauma and suicide attempts. The following hypotheses were tested:

Hypothesis 1: Military trauma (experiencing, witnessing, and perpetrating violence and death in combat) and childhood trauma (emotional, physical, and sexual abuse, and neglect), will be positively associated with suicide attempts.

Hypothesis 2: PTSD and moral injury will be positively associated with suicide attempts.

Hypothesis 3: PTSD will mediate the association between trauma and suicide attempts such that higher levels of childhood and military trauma will lead to higher levels of PTSD symptoms, which will in turn lead to more suicide attempts over and above other lifetime traumas.

Hypothesis 4: Moral injury will mediate the association between trauma and suicide attempts such that higher levels of childhood and military trauma will lead to higher levels of morally injurious experiences, which will in turn lead to more suicide attempts over and above other lifetime traumas.

CHAPTER II

METHOD

Participants

Participants in this study were 29,016 active duty, reserve, national guard, and veteran members of the U.S. Army who participated in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). Specifically, data from the STARRS – Longitudinal Study Wave 1 (STARRS-LSW1) was used. STARRS-LSW1 data was collected between September 2016 to March 2018. The focus of the STARRS studies is to assess risk and resilience for physical and mental health, suicide and suicidal behaviors, military and employment status, and personal characteristics during the military and into civilian life (Ursano et al., 2020). All participants provided informed consent prior to completing the study and consented to have the information they provided in the survey linked with their Army data, as well as with their DoD records. The Inter-university Consortium for Political and Social Research (ICPSR) granted Palo Alto University access to the Army STARRS survey data.

After addressing missing data, the sample included a total of 5,330 participants. The average age of participants was 34 years-old, with 88% identifying as male and 12% identifying as female. The majority of the sample were married (66%), and identified as heterosexual (94.4%), with 3% identifying as bisexual, and 2% identifying as gay or lesbian. Roughly half of the participants reported going on a combat deployment (49%).

Table 1

Sample Descriptive Statistics

Variable	Mean	*SD*	*n* (%)
Age	33.6	7.64	5,329 (100%)
Gender			
Male			4,707 (88%)
Female			623 (12%)
Sexual Orientation			
Heterosexual			5,031 (94%)
Gay or Lesbian			106 (02%)
Bisexual			164 (03%)
Marital Status			
Married			3,512 (66%)
Never Married			845 (16%)
Divorced			717 (14%)
Separated			236 (04%)
Widowed			15 (0.3%)
N/A			5 (0.1%)
Combat Deployed			
Yes			2,610 (49%)
No			2,716 (51%)

Measures

The Army STARRS research team developed all measures that constitute the Army STARRS-LS. All questions were self-report, and participants accessed surveys containing the questions either through the web or computer-assisted telephone interview. Basic demographic information was collected including age, gender, sexual orientation, marital status, and number of combat deployments.

Suicide Attempts

Suicide attempts were measured using two items from an adapted version of the Columbia-Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011). Participants answered: "How many suicide attempts did you ever make in your life?" and "How many of your attempts occurred before you enlisted in the military?" The total number of attempts that occurred over the course of the participant's military career were then calculated by subtracting total attempts from attempts prior to enlistment. Research suggests that the C-SSRS has good convergent and divergent validity, moderate to strong internal consistency, and high sensitivity and specificity for suicidal behavior classifications (Posner et al., 2011).

Combat Related Trauma

Traumatic experiences occurring during deployment (e.g., combat experiences, physical and sexual assault, bullying, exposure to destruction/death) were measured using an adapted version of the Deployment Risk and Resilience Inventory (DRRI), which research suggests has good internal consistency reliability as well as validity (King et al., 2006). The DRRI consists of 14 items and asks participants to report how many times during their deployment they were exposed to various combat related experiences (e.g., "have direct responsibility for the death of an enemy combatant") using a 5-point scale (0, 1, 2-4, 5-9, and 10 or more). A total score was calculated by summing all items. This scale demonstrated poor internal consistency reliability ($\alpha = .54$).

Childhood Trauma

Childhood trauma was measured using two measures, both adapted from the Childhood Trauma Questionnaire (CTQ), which research suggests has good internal consistency reliability and validity (Bernstein et al., 1994). On the first measure, participants reported which of seven

experiences they had before age 18 (e.g., "your mother or father died") on a dichotomous yes/no scale. On the second measure, participants reported how often they had each of 15 experiences before age 18 (e.g., "you were sexually abused at home") on a 5-point scale ranging from *very often* to *never*. Total scores were calculated by summing across all items in both measures. Total scores range from 22-110, with higher scores indicating greater exposure to stressful and traumatic experiences during childhood. The first measure exhibited poor internal consistency reliability ($\alpha = .53$), while the second measure had excellent internal consistency reliability ($\alpha = .89$).

PTSD

PTSD symptoms over the past 30 days were measured using the PTSD Checklist (PCL; Weathers et al., 1993), which research suggests has strong validity in military samples and good concordance with DSM-IV diagnostic criteria for PTSD (Wilkins et al., 2011; Kessler et al., 2013). The PCL is a 16-item self-report measure that asks participants how much various symptoms of PTSD (e.g., "repeated, disturbing dreams of a stressful experience") bothered them on a 5-point scale ranging from *extremely* to *not at all*. Total scores ranged from 16-80 and were calculated by summing all items. This scale demonstrated excellent internal consistency reliability ($\alpha = .94$).

Moral Injury

Moral injury was measured using an adapted version of the Moral Injury Events Scale (MIES; Nash et al., 2013), which research suggests has good construct validity and temporal stability (Bryan et al., 2016 Nash et al., 2013). Participants rated how often they experienced eight potentially morally injurious events (e.g., "you violated your morals by failing to do something you should have done") on a 5-point scale ranging from *very often* to *never*. A total

score was calculated by summing all items and ranged from 8-40. The Moral Injury scale demonstrated poor internal consistency reliability ($\alpha = .47$).

Lifetime Trauma

Lifetime trauma was measured using two measures, similarly adapted from the DRRI. On the first measure, participants reported which of 14 stressful or traumatic experiences (e.g., "you were physically or sexually assaulted") have occurred over the past 12 months using a dichotomous yes/no response. On the second measure, participants reported which of 11 stressful or traumatic experiences (e.g., "witnessed someone being seriously injured or killed") occurred since their last survey (except for experiences occurring during deployment) using a dichotomous yes/no response. Scores for both measures were totaled by summing all items. Total scores ranged from 25-125. Both measures of lifetime trauma demonstrated poor internal consistency reliability ($\alpha = .52$ and $\alpha = .54$).

Data Analysis

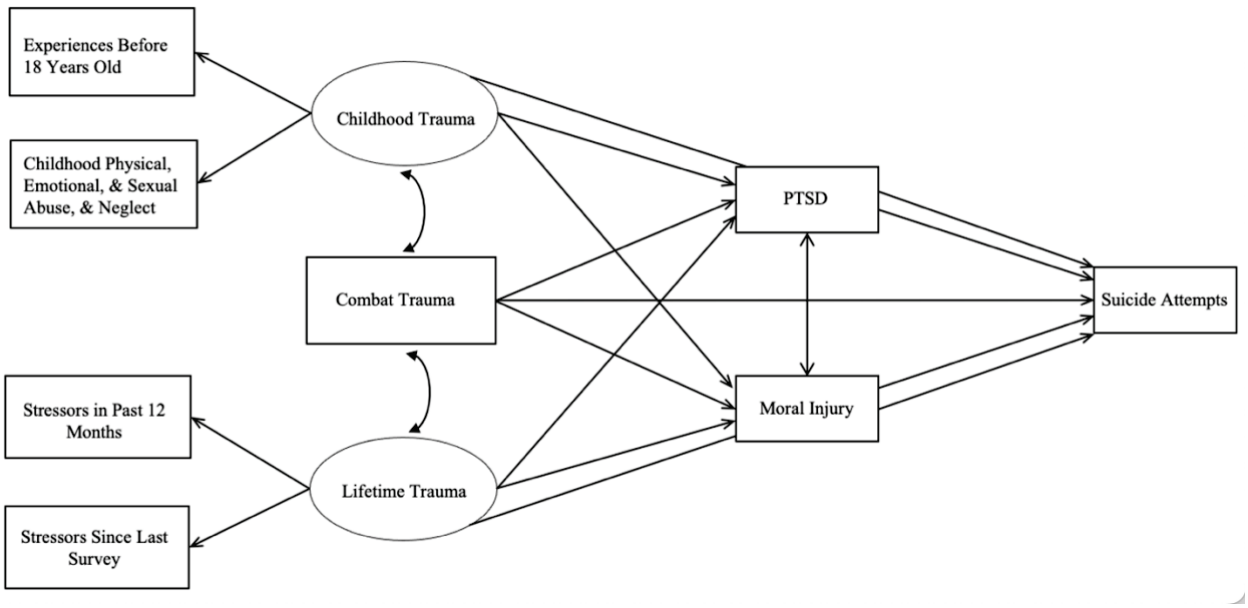
Descriptive statistics were run using IBM SPSS Statistics (Version 27). Missing data was found across all variables at random. This was addressed by excluding cases with missing responses and imputing data using full information maximum likelihood (FIML). After addressing missingness, the total number of observations was 5,330.

Hypotheses 1 and 2 were tested using bivariate correlations between all variables in the model (childhood trauma, military trauma, lifetime trauma, PTSD symptoms, moral injury, and suicide attempts). Hypotheses 3 and 4 were tested using structural equation modeling (SEM; Kline, 2015) via the *lavaan* package in R. Unweighted least squares (ULS) was used as an estimator to account for non-normally distributed data. Indications of model fit included root mean square error of approximation (RMSEA; Steiger & Lind, 1980), Comparative fit index

(CFI; Bentler, 1990), Tucker-Lewis index (TLI; Tucker & Lewis, 1973), and standardized root mean square residual (SRMR; Hu & Bentler, 1995). Model fit indexes indicated good fit. In this model, the observed measurement of military trauma, and latent measurements of childhood trauma and lifetime trauma were used as predictors, observed measurements of PTSD and moral injury were mediators, and the observed measurement of suicide attempts was used as the outcome variable (see Figure 1). The variance of the latent variables of childhood trauma and lifetime trauma were set to a variance of 1 to make them standardized measures. Prior to this, the model was estimated without mediators to examine direct effects of trauma on suicide attempts.

Figure 1

Proposed Model: Moral Injury and PTSD as Mediators of Childhood, Military, and Lifetime Trauma on Suicide Attempts



CHAPTER III

RESULTS

Overall, 29% of the sample reported traumatic experiences outside of deployments over the past year, 27% experienced morally injurious events, and 27% reported lifetime traumatic experiences occurring since participant's last survey. A smaller percentage of participants reported childhood physical and sexual abuse (18%), trauma that occurred before 18 years of age (15%), and combat related traumatic experiences (12%). PTSD was endorsed by 13% of the participants in the current study compared to 6% of the U.S. population (Goldstein et al., 2016). Participants endorsed diagnostic levels of PTSD (13%). PTSD symptoms and childhood trauma had modest positive associations with suicide attempts, whereas combat trauma had a modest negative association with suicide attempts (see Table 2). Traumatic events in general had a modest association with PTSD symptoms (r_{mean} = |.23|), which was larger than the association of traumatic events with both moral injury (r_{mean} = |.14|) and suicide attempts (r_{mean} = |.10|; t = 7.46, p < .05). Neither lifetime trauma nor moral injury had statistically significant associations with suicide attempts.

Table 2

Correlations Between Variables

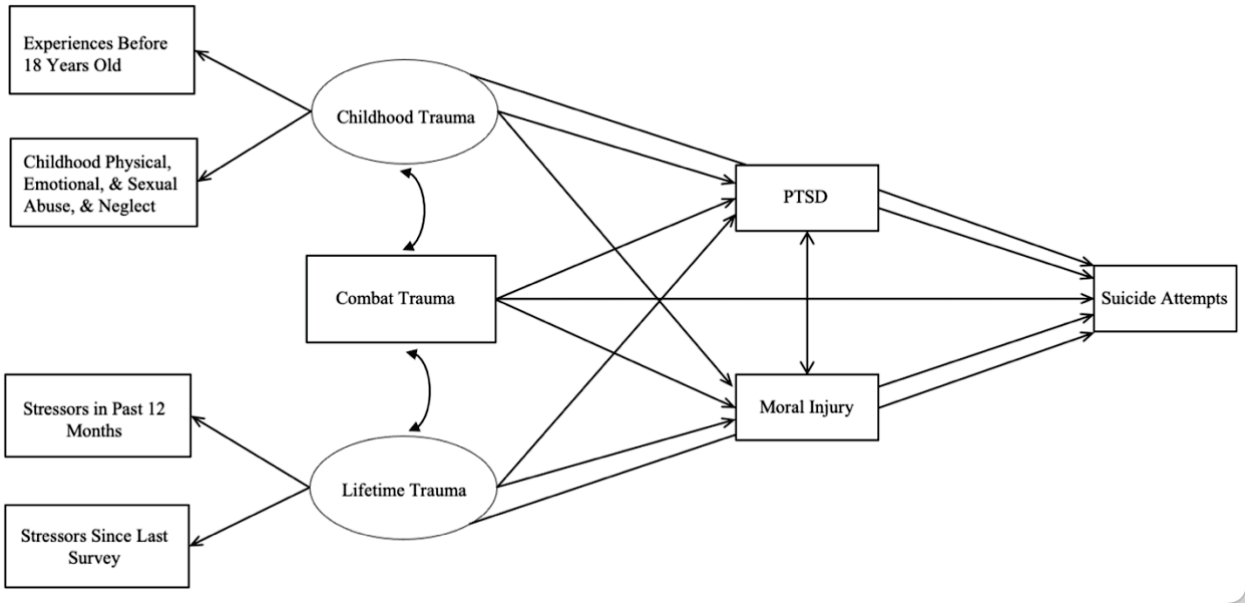
	1	2	3	4	5	6	7	8
1. Child Abuse & Neglect	(.89)							
2. Trauma before Age 18	.38	(.53)						
3. Life Trauma Past Year	.16	.16	(.52)					
4. Life Trauma Since Last Survey	.13	.10	.32	(.54)				
5. Combat Trauma	-.03	.04	.11	.26	(.54)			
6. Suicide Attempts in Army	.13	.19	.03	.00	-.15			
7. Moral Injury	.23	.09	.16	.07	.04	.13	(.47)	
8. PTSD	.19	.10	.28	.23	.34	.15	.26	(.94)
Skew	1.5	1.0	1.4	1.5	.60		.49	.96
Kurtosis	2.2	.51	3.2	2.6	.20		.42	-.00
D	.16	.23	.22	.25	.09		.11	.15

Note. D = Kolmogorov-Smirnov statistic; Correlations > |.05| are statistically significant at $p <$ .05; Cronbach's alpha on diagonal.

The possible mediating effect of PTSD and moral injury on the association between childhood trauma, combat trauma, and lifetime trauma on suicide attempts was examined using SEM, which converged with excellent fit (RMSEA = .00, CFI = 1.00, TLI = 1.03, SRMR = .04). Both combat and lifetime trauma had medium-sized associations with PTSD symptoms, although the association between childhood trauma and PTSD symptoms was modest (see Figure 2). Childhood trauma and lifetime trauma had small associations with moral injury, although combat trauma had no statistically significant association with moral injury. Results further indicated that PTSD did not mediate the association between childhood and combat trauma, but there was complete mediation of lifetime trauma and suicide attempts by PTSD. Moral injury had no statistically significant association with suicide attempts.

Figure 2

Moral Injury and PTSD as Mediators of Childhood, Military, and Lifetime Trauma on Suicide Attempts



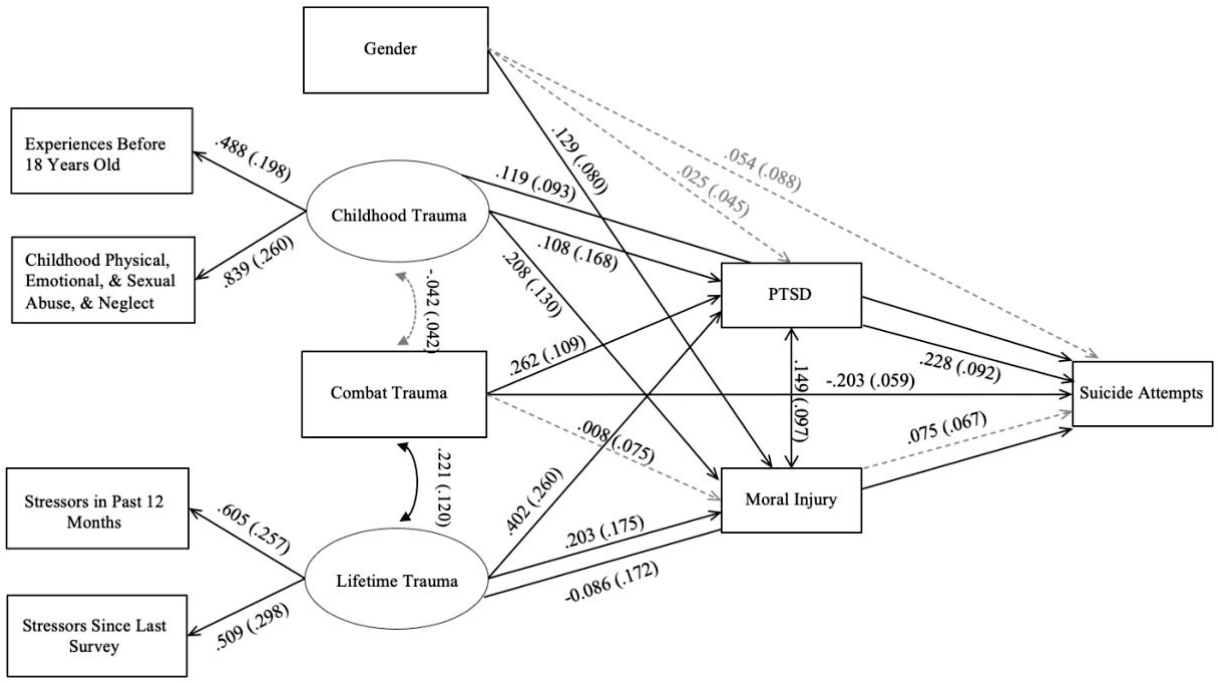
Note. Standard errors (*SE*) are in parentheses; all paths drawn in solid black lines are statistically significant at $p < .05$, whereas paths in dashed grey lines are not statistically significant.

Post Hoc Analyses

In primary analyses, the demographics of the study sample broadly reflected those of the U.S. Army. However, it is possible that the results of the model may differ by gender. This possibility was examined in a series of three post hoc analyses. In the first analysis, gender was included as a covariate in the original model. In this model, gender was not a significant predictor of suicide attempts or PTSD, however it was a modest predictor of moral injury, indicating that women were somewhat higher in moral injury when trauma and PTSD were controlled for (see Figure 3).

Figure 3

Moral Injury and PTSD as Mediators of Childhood, Military, and Lifetime Trauma on Suicide Attempts (Gender as a Covariate)

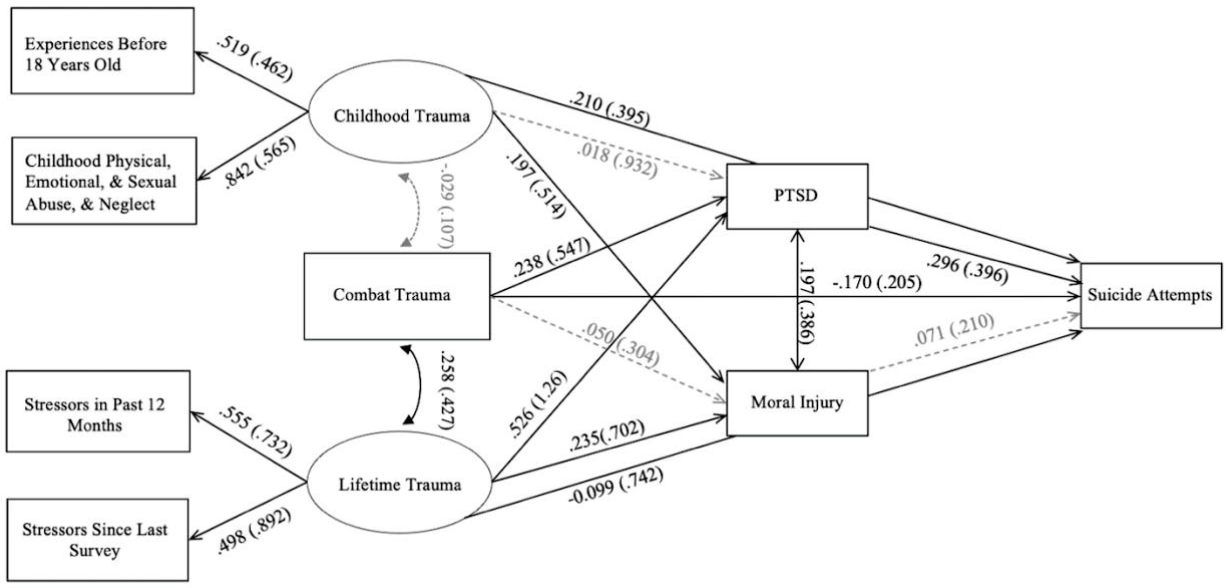


Note. Standard errors (*SE*) are in parentheses; all paths drawn in solid black lines are statistically significant at $p < .05$, whereas paths in dashed grey lines are not statistically significant.

The second model examined only female participants, and the third model examined only male participants. Results for male and female veterans varied minimally, with the only difference being that for male veterans a modest association was found between childhood trauma and PTSD; in contrast, this association was not statistically significant for female veterans (see Figures 4 and 5).

Figure 4

Moral Injury and PTSD as Mediators of Childhood, Military, and Lifetime Trauma on Suicide Attempts (Women Only)



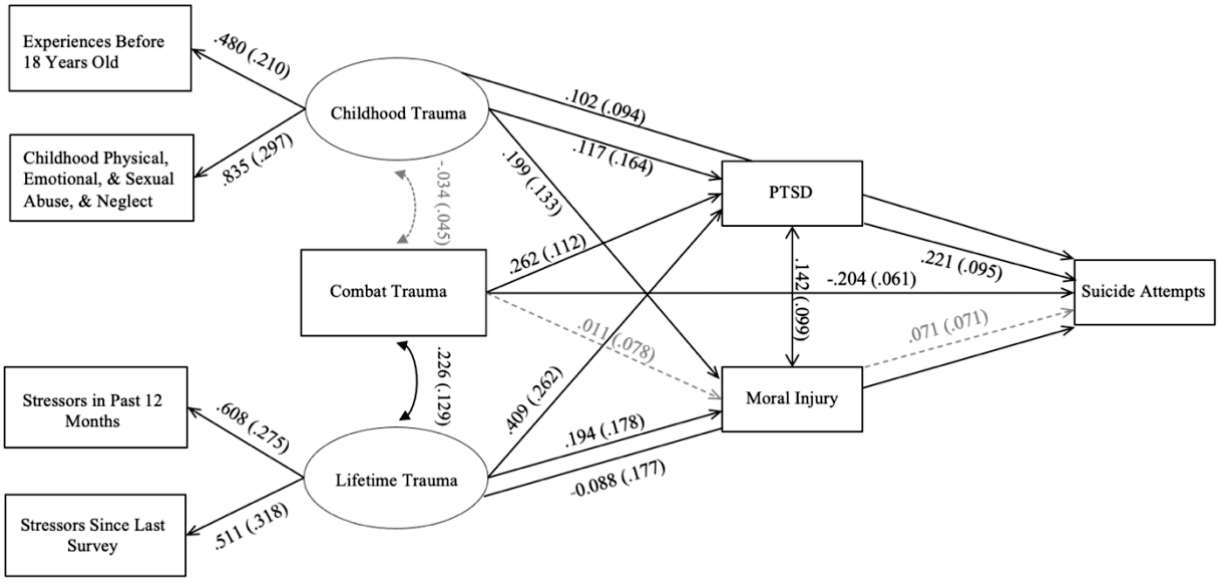
Note. Standard errors (*SE*) are in parentheses; all paths drawn in solid black lines are statistically significant at $p < .05$, whereas paths in dashed gray lines are not statistically significant.

For women, lifetime trauma had a positive effect on PTSD. Additionally, moderate association was found between PTSD and suicide attempts and combat trauma and lifetime trauma. In the third and final model, for women, modest association was found between moral injury and lifetime trauma, childhood trauma, and PTSD, as well as a modest association between combat trauma and PTSD. Additionally, in the women-only model, there was a modest negative association between combat trauma and suicide attempts and lifetime trauma and suicide attempts (see Figure 4). For men, there was a moderate association between lifetime and combat trauma and PTSD, and a modest association between combat and lifetime trauma, childhood trauma, PTSD, and suicide attempts, childhood and lifetime trauma and moral injury, PTSD and

suicide attempts, and PTSD and moral injury (see Figure 5). There was a modest negative association between combat and lifetime trauma and suicide attempts.

Figure 5

Moral Injury and PTSD as Mediators of Childhood, Military, and Lifetime Trauma on Suicide Attempts (Men Only)



Note. Standard error (*SE*) are in parentheses; all paths drawn in solid black lines are statistically significant at $p < .05$, whereas paths in dashed gray lines are not statistically significant.

CHAPTER IV

DISCUSSION

In this study we examined the mediating effects of PTSD and moral injury on the relationship between traumatic experiences and suicide attempts among servicemembers. Consistent with our hypotheses, results suggested that childhood trauma and PTSD were associated with an increased risk for attempting suicide, and that to some extent PTSD mediated the influence of trauma on suicide attempts. Contrary to hypotheses, there was also no direct or mediating effect of moral injury on suicide attempts. These findings have implications for improving our understanding of psychological trauma and developing effective interventions to prevent and mitigate the impact of traumatic experiences.

Interpretations of Important Findings

Results of this study suggest that PTSD fully mediated the association between lifetime trauma and suicide attempts. This finding is consistent with IPTS framework (i.e., that the accumulation of traumatic experiences over a person's lifetime can result in perceived burdensomeness, thwarted belongingness, and acquired capability, all of which are in some way captured in PTSD symptoms). However, potentially more interesting is the finding that PTSD only partially mediated the association between childhood trauma and suicide attempts. One possible interpretation of this is that because childhood is a critical period for the development of emotion regulation and distress tolerance skills, trauma during this period is especially disruptive, leading to increased likelihood of suicide even beyond the effects of PTSD. For example, childhood trauma may render people more likely to experience helplessness and engage in self-destructive means of coping when strong emotions arise (Gillespie et al., 2009; Van der Kolk, 2005, 2014). Another interesting finding is that although combat trauma

contributed to PTSD, it was negatively associated with suicide attempts. This may be due to the nature of combat and of military deployments more generally. Namely, research suggests that servicemembers who deployed more often (and thus who had higher levels of combat exposure) experienced a stronger sense of meaning in life (Bryan, Elder et al., 2013), which may in turn have been protective against suicide attempts, especially when PTSD symptoms are considered.

There were several surprising findings concerning moral injury. First, moral injury was not significantly associated with suicide attempts. This may be due at least in part to PTSD and child abuse having a greater influence on suicide attempts than moral injury. Second, child abuse was positively associated with moral injury even when controlling for other traumatic experiences. This is consistent with research in this area showing that adverse childhood experiences have unique effects on moral injury (Williamson et al., 2021). The interpersonal nature of both childhood trauma and moral injury may best explain this association, as many forms of child abuse, neglect, and sexual abuse lead to a sense of betrayal that is similar to the sense of betrayal that stems from morally injurious experiences.

Unexpectedly, combat was not associated with moral injury. This is likely due to the measures the Army STARRS study team developed to examine combat exposure, which were neither comprehensive with respect to the varieties of combat exposure nor designed to measure the frequency of this exposure. Another explanation for the lack of association between combat trauma and moral injury may be that childhood trauma, specifically instances of physical or sexual abuse and neglect, has a greater traumatic impact than combat trauma. Research suggests that adverse childhood events are a risk factor to moral injury development in adulthood and over the course of a person's military career (Battaglia et al., 2019), which is replicated with the results of this study.

The post hoc analyses further clarified our primary analysis. First, the findings that women had more moral injury than men is consistent with research suggesting that woman have higher rates of reporting experiences of betrayal and witnessing situations they felt were morally wrong compared to men (Maguen et al., 2020). For example, women are disproportionately more likely to experience military sexual trauma, an experience that would qualify as morally injurious and result in a sense of betrayal. Additionally, those with more marginalized identities, such as women in the military, may be more likely to witness morally injurious events and develop moral injury as a result of their reaction due to the social groups they belong to and the power dynamics involved (e.g., a female soldier witnessing another female soldier be sexually harassed by a higher ranking male officer, and not reporting the incident due to fear of repercussions). Second, the modest association between childhood trauma and PTSD for men but not for women suggests that for women in the military, the kinds of stressors experienced outside the context of childhood (potentially including sexual harassments and assaults and other female-specific traumas) are more detrimental than what men have experienced. Research on the differential influence in the severity of specific kinds of lifetime stressors (not possible in this study due to how trauma was measured) for women and men could clarify this.

Clinical Implications

The findings of this study highlight the importance of assessing childhood trauma, given its association with PTSD, moral injury, and suicide attempts. This may be true even in cases of veterans seeking treatment for PTSD for which combat trauma is the presumed Criterion A stressor. Although the gold standard treatments for veterans seeking treatment for PTSD and other trauma-related conditions are prolonged exposure (Peterson et al., 2019) or cognitive processing therapy (Resick et al., 2016), in cases in which patients experienced multiple traumas,

including those occurring in childhood, suicide assessment and management should also comprise a piece of their treatment plan.

Limitations and Directions for Future Research

There are several notable limitations to this study. Data for this study were cross-sectional, which limits our ability to claim causality for our predictive and mediating effects. Additionally, the measures used to examine combat trauma, lifetime trauma, and moral injury exhibited poor internal consistency. The lack of internally consistent measures may make effect estimates less precise (e.g., lower than what may be accurate). This internal consistency is due in part to a small number of items used to measure study constructs, which also limited our ability to examine subtypes of trauma such as physical and sexual abuse in childhood, different types of combat exposure, and various kinds of lifetime trauma. Additionally, minimal demographic data was collected. Principally, data on race and ethnicity was missing from the sample, which inhibited our ability to examine the impact of race and ethnicity on different variables. Perceived burdensomeness and thwarted belongingness are also two key factors contributing to suicide that were unable to be examined. Future research should thus replicate the results of this study using more refined and detailed measures of all variables, measures examining perceived burdensomeness and thwarted belongingness, and a longitudinal design.

Summary

The mediating effects of PTSD and moral injury were examined when understanding the association between different types of trauma and suicide attempts among servicemembers. PTSD exhibited full mediation of lifetime trauma and suicide attempts, while childhood trauma, combat trauma, and PTSD were all significantly associated with suicide attempts. These findings further our understanding of how PTSD and moral injury may influence the association between

different types of traumatic experiences and suicide attempts. Developing clinical interventions and support systems that specifically target childhood and gender-related trauma are likely to be highly effective at reducing moral injury, PTSD symptoms, and suicide attempts. Moreover, the findings from this research can inform military suicide prevention efforts as it identifies risk factors associated with suicide attempts that can be integrated into assessment and referral practices across servicemember services and programs.

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