The link between deployment-related injuries and suicidal thinking in the Army National Guard: Examining the role of perceived burdensomeness and hopelessness

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Abstract

Objective: In 2020, Army National Guard members demonstrated greater risk of suicide than their military and civilian counterparts. Though literature on deployment-related experiences and suicidal ideation (SI) is mixed, investigations of specific deployment-related experiences (e.g., injuries) may further elucidate the relationship between deployment and suicide risk. Deployment-related injuries, including pain severity and functional impairment, have been linked to increased risk of SI, and correlates like perceived burdensomeness (PB) and hopelessness. The current study sought to examine the cross-sectional relationship between deployment-related injuries, including pain severity and functional impairment, and severity of SI through PB and hopelessness.

Method: Immediately post-deployment, Army National Guard members (N = 2,261) completed validated self-report measures on past-week SI, PB, hopelessness, and single-items regarding injury sustained during deployment and associated functional impairment and pain severity.

Results: Indirect effect analyses revealed that experience of deployment-related injury was related to SI through PB and hopelessness (R^2=.1993), functional impairment was related to SI through PB, and pain severity was related to SI through PB. Contrary to hypotheses, hopelessness was not associated with SI when PB was simultaneously considered.

Conclusions: Army National Guard members who develop a sense of PB related to their injury and functional impairment of that injury may be at increased risk for suicidal ideation. Military suicide prevention efforts may be potentiated through targeting distorted cognitions such as PB and hopelessness, especially in service members who have been injured.

Keywords: military deployment/National Guard/military Veterans; suicidal ideation, perceived burdensomeness, hopelessness, injury

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In 2020, overall rates of suicide deaths for National Guard members were 27.0/100,000, a significant increase from 2019 (20.5/100,000; Department of Defense (DoD), 2021). National Guard (both Army and Air Force) suicide rates remain higher than the general U.S. population (27.0/100,000 and 13.9/100,000 respectively; DoD, 2021; Drapeau & McIntosh, 2020). Given these rates, research has investigated military-related risk factors for suicidal thoughts and behaviors (STBs) in this population. One potential military-specific risk factor that has received substantial interest is history of deployment (i.e., whether personnel were deployed, regardless of number of deployments) and deployment-related experiences (Reger et al., 2018).

Systematic reviews of the literature regarding deployment history and suicide demonstrate a complex relationship and highlight the importance of considering *experiences* during deployment, not just deployment history (Reger et al., 2018). For example, a meta-analysis of deployment related experiences and their relationship to STBs demonstrated a potentially strong link between injury experienced during deployment and subsequent STBs (Bryan et al., 2015); however, too few of studies existed to make firm conclusions about these relationships.

Deployment-Related Injuries and STBs

It is estimated that approximately 21,000 service members experienced injuries of varying severity during deployments to Iraq and Afghanistan (Heaton et al., 2012). One deployment-related injury regularly linked to risk for STBs is traumatic-brain injury (TBI). In a meta-analysis of the literature on factors related to STBs following TBI, McIntire et al. (2021) reported that mild TBI is associated with a greater risk of suicide attempt and severe TBI was

associated with greater risk for both suicidal ideation (SI) and suicide attempts. Moreover, Vanderploeg and colleagues (2015) found that broadly defined deployment injury (e.g., loss of bodily function/limb; injury in motor vehicle accident, combat, or blast) was significantly associated with increased SI in a sample of Florida National Guard members. Although evidence demonstrates a connection between deployment injuries and SI, no investigations into the mechanisms underlying this association have been conducted despite Reger and colleagues (2018) call for such work.

Perceived Burdensomeness and SI

One potential mechanism of the deployment injury to SI relationship is perceived burdensomeness (PB). The interpersonal theory of suicide (ITS) posits that the co-occurrence of the psychological constructs of PB and thwarted belongingness create vulnerability for suicidal desire (Joiner, 2005; Van Orden et al., 2010). Perceived burdensomeness (the perception that one's existence is a burden to family, friends, and society) has been shown to be a consistent correlate of the severity of SI (Chu et al., 2017) and has been shown to relate to recent SI severity in Army National Guard (ARNG) samples (Anestis et al., 2015).

Deployment-related injuries may understandably be associated with the experience of PB as it may lead to increased need for instrumental support from military peers and loved ones. In some cases, injury could even lead to premature repatriation and/or military discharge, which may also exacerbate feelings of PB on fellow service members, the military, and their country (Selby et al., 2010). Additionally, injuries that result in high levels of pain or sustained pain may increase vulnerability for SI through PB. In support of this hypothesis, patients reporting elevated levels of chronic pain also report elevated levels of PB after controlling for comorbidities such as depression, age, and gender (Kanzler et al., 2012).

PB may emerge following a deployment injury due to functional impairment alongside level of pain severity. Veterans who report greater interference in daily life due to pain were more likely to report current SI (Blakey et al., 2018). Injury-related impairment has also been associated with the development of PB in older adults (Cukrowicz et al., 2011) and military personnel (Kanzler et al., 2012). Individuals whose injuries are associated with greater levels of impairment may develop a sense of PB as they may require greater reliance on support systems (Selby et al., 2010).

Hopelessness and SI

The functional impairment and pain severity of deployment-related injuries may also confer risk for SI through perceptions of hopelessness as well as PB. Hopelessness is defined as a cognitive style in which individuals have negative beliefs about one's ability to improve the future (Klonsky et al., 2012). Hopelessness and SI have been found to be significantly positively correlated in military personnel generally (Anestis et al., 2015) and in samples with primarily ARNG members (Martin et al., 2016). Hopelessness has been associated with deployment-related injuries, such as TBI (Brenner et al., 2018; Simpson & Tate, 2002)

It may be that pain persistence and functional impairment of deployment injury increases likelihood of experiencing hopelessness. Veterans suffering with chronic pain have noted hopelessness due to pain following deployment (Matthias et al., 2014) and patients with chronic pain who report SI often highlight the role of hopelessness regarding their pain in describing the development of their SI (Tang & Crane, 2006). Furthermore, individuals with greater levels of functional impairment may also develop a sense of hopelessness regarding their ability to cope with sudden changes in quality of life due to their injuries (Tang & Crane, 2006). Despite the

evidence supporting the role of hopelessness within the relationship between injury and SI, there is a dearth of research focusing on this relationship as it pertains to deployment-related injuries.

Current Investigation

The current investigation aims to determine if deployment-related injuries relate to increased SI through the experience of PB and hopelessness. Given the existing literature demonstrating that pain persistence and functional impairment may be important aspects of injury worth considering in connection to PB and hopelessness (Blakey et al., 2018; Matthias et al., 2014), the current investigation specifically examined if either or both of these aspects of injury relate to increased SI through PB and hopelessness. It was hypothesized that incidence of deployment-related injury would relate to increased severity in SI through both PB and hopelessness assessed immediately post-deployment in ARNG members. No predictions were made regarding which indirect effect would be stronger as no previous research has attempted to parse out these effects. Furthermore, it was hypothesized that those currently experiencing injury-related pain and/or pain-related impairment would endorse increased SI through PB and hopelessness.

Method

Participants and Procedure

This study was approved by the University of Wisconsin-Madison Institutional Review Board and the W.S. Middleton Memorial Veterans Hospital Research & Development Committee. The current investigation analyzes immediate post-deployment data of a prospective study of ARNG service members assessed before, post, and six to nine months post deployment. Only immediate post-deployment data were analyzed for the current study, as this time point included by far the largest sample size and provided timely report of deployment-related

experiences. Recruiting procedures can be read elsewhere (Goldberg et al., 2019). Briefly, ARNG members deployed from 2008 to 2010 volunteered to participate in this anonymous survey using paper and pencil assessments. Data used herein were collected during mandatory reintegration events. At each time point, participants were given information regarding study procedures, confidentiality, and the voluntary nature of the study. Participants were informed that they could withdraw from the study at any time without penalty.

Measures

Demographic questionnaire. Participants' binary sex (i.e., male, female), age, and race/ethnicity were assessed using a demographic questionnaire.

Deployment-related injury. The following single item with a yes/no answer choice was used to assess deployment-related injury, "were you injured during your most recent deployment?" This item was followed by another that read, "are you still dealing with the injury/ies (or consequences of the injury/ies)?" with a yes/no answer choice. A single item was used to assess current impairment associated with recent deployment injury. It read, "To what extent has your injury/ies affected your ability to pull your own weight and contribute to others' well-being?" Participants responded on a 7-point Likert scale from 1 (not at all) to 7 (definitely). Finally, one item was used to assess current pain, "how severe is your pain?" Participants responded on a 10-point Likert scale from 1 (no pain) to 10 (maximum pain).

Perceived Burdensomeness. The six-item perceived burdensomeness subscale of the Interpersonal Needs Questionnaire-15 (INQ-15; Van Orden et al., 2012) was used to assess the construct. Responses to the six items are made on a 1 (not at all true for me) to 7 (very true for me) Likert-type scale. The perceived burdensomeness subscale demonstrated adequate internal consistency in the current study ($\alpha = .85$**).**

Hopelessness. The Beck Hopelessness Scale (BHS; Beck et al., 1974) is a 20-item measure used to assess levels of past-week hopelessness cognitions all of which include a true false response format. BHS total scores range from 0-20 with higher scores representing higher levels of hopelessness. The BHS demonstrated adequate internal consistency in the current study ($\alpha = .83$).

Past-week SI. The Beck Scale for Suicide Ideation (BSS; Beck, Steer, & Ranieri, 1988) is a 21-item measure that assesses past week SI and historical suicidal behavior. Participants respond to each item using a Likert-type scale with responses ranging from 0-2. As the current investigation was focused on how deployment-related injury relates to SI, the last two items of the BSS that assess historical suicidal behavior were not included. Thus, a greater total score on the 19 items of the BSS reflects increased suicidal thinking, intent, and planning for suicide. The first 19 items of the BSS demonstrated high internal consistency in the current study ($\alpha = .93$).

Analytical Strategy

Descriptive statistics were conducted to determine the number and sample percent of participants who experienced a deployment-injury. To determine if the incidence of deployment-injury (yes versus no) was related to SI through increased PB and hopelessness, indirect effect analyses were conducted using non-parametric bootstrapping techniques with 5,000 resamples using the SPSS PROCESS Macro. PB and hopelessness were entered as simultaneous mediators.

As hypotheses regarding the impact of deployment-injury related functional impairment and pain on SI through hopelessness and PB only pertain to participants who endorsed an injury, subsequent analyses were conducted only in respondents who indicated “yes” on the item asking about whether injury(ies) continued to remain a concern. First, bivariate correlations were conducted to determine simple relationships between SI, PB, hopelessness, deployment-related

injury functional impairment and current pain. To determine if functional impairment and/or current pain of deployment injury were related to SI through increased PB and hopelessness, indirect effect analyses were conducted. Specifically, two indirect effect analyses were conducted with SI as the outcome and PB and hopelessness as the mediators, the first with functional impairment entered as the predictor variable and the second with current pain entered as the predictor.

Results

See Table 1 for a detailed demographic description of the study sample separated by history of deployment injury. More than one in four (27.33%) of the sample indicated one or more deployment injuries. The majority of the sample self-identified as male sex assigned at birth and racially White.

See Table 2 for descriptive statistics and bivariate correlations between all study variables. Significant correlations (rs = .14 to .55, ps < .001) were seen between key study variables (i.e., SI, PB, hopelessness, pain associated with deployment injury, and perceived functional impairment due to deployment injury). Correlations of SI with PB and hopelessness were moderate magnitude (rs = .42 and .35, respectively). Correlations of SI with pain and impairment were small magnitude (rs = .14 and .16, respectively). Pain and impairment were moderately correlated (r = .43).

Indirect Effect of Deployment-Related Injury Status on SI

The first indirect effect model tested if deployment injury was related to SI severity through both PB and hopelessness. The results of the full model significantly predicted SI (R^2=.1993, F(3, 2183)=181.07, p<.001). Injury status positively predicted hopelessness (β=.1454, 95%CI[.1371,.1537]) and PB (β=.1273, 95%CI[.0576,.1970]). No direct effect of

injury status on SI was found (β=.0042, 95%CI[-.0088,.0172]). Indirect effects of injury status to SI were found through hopelessness (β=.0198, 95%CI[.0021,.0405]) and PB simultaneously (β=.0542, 95%CI[.0206,.0955]). A contrast of these indirect effects demonstrated a stronger effect through PB compared to hopelessness (β=-.0344, 95%CI[-.730,-.0029]).

Indirect Effect of Deployment-Related Injury Functional Impairment on SI

The next indirect effect model tested if current functional impairment of deployment injury was related to SI severity through both PB and hopelessness. This model was conducted only in those participants who indicated a deployment injury. The results of the full model significantly predicted SI (R^2=.1676, F(3, 508)=34.09, p<.001). Functional impairment was positively related to hopelessness (β=.0210, 95%CI[.0119,.0301]) and PB (β=.0913, 95%CI[.0414,.1412]). No direct effect of functional impairment on SI was found (β=.0075, 95%CI[-.0017,.0166]). An indirect effect of functional impairment on SI was found through PB (β=.0061, 95%CI[.0019,.0125]) but not hopelessness (β=.0014, 95%CI[-.0012,.0044]).

Indirect Effect of Deployment-Related Injury Pain on SI

The final indirect effect model tested if current pain associated with deployment injury was related to SI severity through both PB and hopelessness. This model was conducted only in those participants who indicated a deployment injury. The results of the full model significantly predicted SI (R^2=.1649, F(3, 505)=32.25, p<.001). Pain severity was unrelated to hopelessness (β=.0377, 95%CI[-.0070,.0824]) and PB (β=.2161, 95%CI[-.0277,.4599]). No direct effect of pain on SI was found (β=.0109, 95%CI[-.0326,.0543]). An indirect effect of pain severity on SI was found through PB (β=.0574, 95%CI[.0133,.1190]) but not hopelessness (β=.0189, 95%CI[-.0019,.0466]).

Discussion

The present study sought to determine whether deployment-related injury, and related pain and functional impairment, may be related to increased SI through PB and hopelessness in a sample of ARNG members recently returned from deployment. Extant literature has demonstrated a complex relationship between deployment and STBs (Reger et al., 2018). Despite studies linking deployment injuries to SI (e.g., Vanderploeg et al., 2015), no studies have investigated the psychological correlates of these injuries that may increase risk for SI. This work may be integral for clinical and systemic interventions to reduce suicide risk in injured ARNG members.

Results of this study show that a deployment-related injury is positively related to SI through increased PB and hopelessness. It appears that deployment-related injuries are correlated with increased SI; however, injury status is not associated with SI when controlling for the role of PB and hopelessness. This finding is consistent with research that has demonstrated a meaningful relationship between service-related injuries and the development of PB in military personnel (e.g., Selby et al., 2010) and patients with chronic pain (Kanzler et al., 2012). Studies have also indicated a link between deployment injuries and hopelessness (Matthias et al., 2014) and there is substantial evidence that points to hopelessness as a correlate of SI (Klonsky et al., 2017; Van Orden et al., 2010; Wenzel & Beck, 2008). It should be noted that injury status was indirectly associated with SI through *both* PB and hopelessness, not one or the other; however, the strength of this effect was strongest through PB. This could indicate that deployment-related injuries could confer risk for later SI through both psychological constructs representing two meaningful treatment and assessment targets, but PB may be of particular relevance.

This project also sought to determine how injury-related sequelae, not simply the presence or absence of an injury, relates to risk for SI through PB and hopelessness. In those who

suffered a deployment-related injury, increased functional impairment was related to both PB and hopelessness but only indirectly associated with SI through PB. This finding indicates that ARNG members who report functional impairment related to a deployment injury may be more likely to develop SI because of increased vulnerability for perceptions of burdensomeness. Functional impairment may lead to a stronger reliance on loved ones or other support systems to complete day-to-day activities, as well as social and occupational difficulties (Kanzler et al., 2012), which may increase the likelihood of distorted cognitive perceptions such as the belief the others would benefit more from their death, a core component of PB (Van Orden et al., 2010).

Contrary to hypotheses, the relationship between functional impairment and SI was not demonstrated through hopelessness when PB was simultaneously considered. This finding may be in-part due to the stronger relationship between SI and PB (r = .42) than SI and hopelessness (r = .35) observed in this study. Injury-related functional impairment was positively correlated (weakly) to both PB and hopelessness, but it could be that impairment confers its most risk for SI when the impairment begets a sense of PB compared to general conceptions of hopelessness. The three-step theory (3ST; Klonsky et al., 2021) of suicide denotes that hopelessness is likely not to lead to intense SI unless a sense of broadly defined pain is simultaneously present and that this pain eclipses one's connection to life. Thus, hopelessness in combination with pain may have been the ideal mediator of the impairment to SI relationship according to this theory.

Finally, this study also investigated if deployment injury-related pain is related to SI through PB and hopelessness. Contrary to hypotheses, the relationship between pain severity and SI was not demonstrated through hopelessness when PB was simultaneously considered. Once more, this finding may be in part due to the stronger relationship between SI and PB than SI and hopelessness observed in this study, although research has demonstrated that PB predicts SI

beyond hopelessness (Kanzler et al., 2012). Despite literature linking hopelessness, pain severity, and SI, there is a dearth of literature examining the extent to which hopelessness *about* pain severity contributes to SI (Tang & Crane, 2006). Replication of these findings is needed to draw any further conclusions regarding the contribution of hopelessness as a mediator of pain-severity and SI. However, this finding indicates that ARNG members who report pain severity associated with deployment injury may be more likely to develop SI because of increased vulnerability of perceived burdensomeness. Akin to functional impairment, pain severity may lead to a greater reliance of support systems which may impact perceptions of burdensomeness. Given that the literature on the relationship between pain severity and SI is mixed, further replications of this finding are warranted.

Limitations and Future Directions

The findings of this study should be considered in light of the following limitations. The use of cross-sectional study design limits the ability to determine causality and directionality between SI, deployment-related injuries, and correlates such as PB and hopelessness. Given the dynamic nature of pain severity and functional impairment (Glette et al., 2020), as well as SI (Kleiman & Nock, 2018), studies which utilize ecological-momentary assessment (EMA) may aide in further understanding in the role of these variables in the development of SI. Additionally, these data were collected immediately post-deployment limiting any long-term conclusions about these relationships. As deployment experiences and the relationship between suicide risk and deployment vary widely between military branches and over time (Reger et al., 2018), these results may not generalize to other branches of the military. Furthermore, single items were used to measure functional impairment and pain severity associated with deployment-related injuries. Future studies should consider measuring these constructs with validated

measures including the Numerical Pain Rating Scale, the Brief Pain Inventory, and Oswestry Disability Index (Chapman et al., 2011). Finally, all independent variables (e.g., injury status, functional impairment, and pain severity) were assessed using single item measures. The validity of these items is unknown, and it is possible that participants may have interpreted these items differently than researchers intended. Ideally, future studies should use validated measures of pain and consequences of injury such as the Defense and Veterans Pain Rating Scale (Buckenmaier et al., 2013) for pain severity and interference in military personnel.

Implications

Despite these limitations, the present study adds nuance to our understanding of the role of PB and hopelessness in the relationship between deployment-related injuries and SI. These data indicate that PB and hopelessness may be important treatment targets for those who may experience SI following deployment-related injuries. For example, healthcare professionals may assess PB and hopelessness in patients who have experienced deployment-related injuries in an attempt to identify those who may be at increased risk of suicidal ideation. Clinicians may benefit from incorporating cognitive interventions which specifically target these distorted perceptions, such as brief cognitive behavioral therapy for suicide prevention (BCBT-SP; Bryan & Rudd, 2018). Military suicide prevention efforts may be more fruitful when targeting distorted perceptions following deployment, especially in those who were injured. Leaders and policy makers may consider incorporating trainings associated with identifying PB and hopelessness in ARNG members who have experienced deployment-related injuries. Screening military personnel for these SI correlates for those who have been deployed may help in the early identification of those at risk of suicidal thoughts and behaviors.

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Table 1. Characteristics of study sample stratified by self-reported deployment injury (*N*=2,261)

Variable	Deployment Injury (*n*=618) Mean / *N* (%)	No Deployment Injury (*n*=1,643) Mean / *N* (%)
Age	28.05 (7.32)	27.11 (7.06)
Binary Sex		
Female	79 (12.85%)	161 (9.85%)
Male	536 (87.15%)	1474 (90.15%)
Self-Identified Race		
American Indian or Alaskan Native	11 (1.81%)	24 (1.49%)
Asian or Pacific Islander	15 (2.47%)	31 (1.92%)
Black, not of Hispanic origin	22 (3.62%)	48 (2.97%)
Hispanic	28 (4.61%)	55 (3.41%)
White, not of Hispanic origin	531 (87.48%)	1,456 (90.21%)
SI in the past week		
Yes	181 (29.62%)	432 (26.85%)
No	430 (70.38%)	1,177 (73.15%)

Table 2. Correlations and Descriptive Statistics of Study Variables

Variables	1	2	3	4	5
1. Suicide Ideation	--				
2. Burdensomeness	.42***	--			
3. Hopelessness	.35***	.55***	--		
4. Pain	.14***	.19***	.18***	--	
5. Impairment	.16***	.19***	.21***	.43***	--
Mean	1.22	8.16	3.04	3.74	2.81
SD	2.90	4.57	3.38	2.21	1.67
Range	0 - 38	6 - 42	0 - 20	1 - 10	1 - 7

Note: ***$p < .001$. Suicide Ideation = Beck Scale for Suicide Ideation. Burdensomeness = Interpersonal Needs Questionnaire, Perceived Burdensomeness Subscale. Hopelessness = Beck's Hopelessness Scale. Pain = Rating of current pain related to deployment injury. Impairment = Perceived functional impairment of deployment-related injury. Correlations and descriptive statistics for variables 1 to 3 reported using the full sample. Correlations and descriptive statistics for variables 4 and 5 reported using only those who indicated a deployment injury.