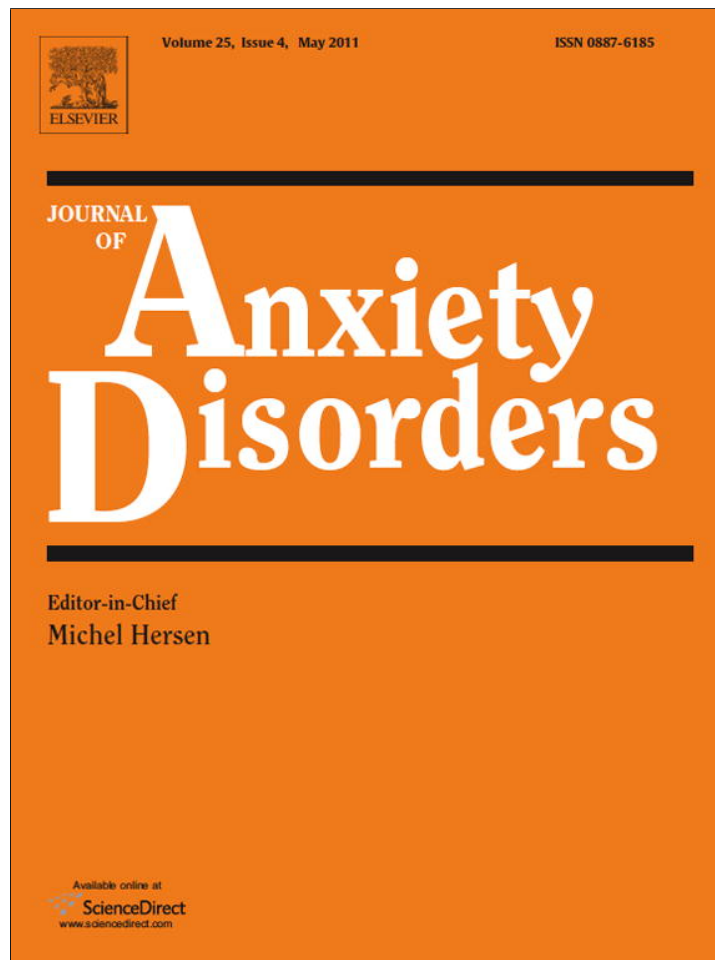


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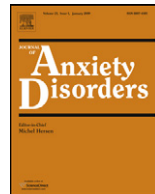


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Killing in combat, mental health symptoms, and suicidal ideation in Iraq war veterans

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ARTICLE INFO

Article history:

Received 7 October 2010

Received in revised form 14 January 2011

Accepted 14 January 2011

Keywords:

Posttraumatic stress disorder

Suicide

OEF/OIF

Military

ABSTRACT

This study examined combat and mental health as risk factors of suicidal ideation among 2854 U.S. soldiers returning from deployment in support of Operation Iraqi Freedom. Data were collected as part of a postdeployment screening program at a large Army medical facility. Overall, 2.8% of soldiers reported suicidal ideation. Postdeployment depression symptoms were associated with suicidal thoughts, while postdeployment PTSD symptoms were associated with current desire for self harm. Postdeployment depression and PTSD symptoms mediated the association between killing in combat and suicidal thinking, while postdeployment PTSD symptoms mediated the association between killing in combat and desire for self harm. These results provide preliminary evidence that suicidal thinking and the desire for self-harm are associated with different mental health predictors, and that the impact of killing on suicidal ideation may be important to consider in the evaluation and care of our newly returning veterans.

Published by Elsevier Ltd.

1. Introduction

Suicide rates among Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) military personnel and veterans are a growing public health concern, with the Department of Defense (DoD) and the Veterans Administration (VA) conducting several initiatives to decrease rising rates (Weiderhold, 2008). For example, in 2005 and 2006, suicide rates were significantly higher than the U.S. Army's ten year average (Castro, McGurk, & Wright, 2008), and in 2008 suicides among active-duty soldiers were the highest they have been in 28 years, even surpassing rates among civilians with similar demographics (Kuehn, 2009). Suicide risk is increased for OEF/OIF veterans diagnosed with mental health disorders, including posttraumatic stress disorder (PTSD), depressive disorders, and alcohol problems (Jakupcak et al., 2009; Kang & Bullman, 2008; Pietrzak et al., 2009). Findings with OEF/OIF veterans mirror past studies with Vietnam veterans that have also

found a relationship between mental health symptoms, suicide risk, and completed suicides (Bullman & Kang, 1994; Boscarino, 2006; Fontana & Rosenheck, 1995; Hendin & Haas, 1991).

There are several other variables that increase suicide risk among veterans, and these are important to consider as part of any comprehensive risk model. In particular, there is evidence that service members with a family history of suicide attempts, predeployment mental health diagnoses, or a history of a prior suicide attempt are at greater risk for suicide (Ritchie, Keppler, & Rothberg, 2003; Roy & Janal, 2005). The importance of considering these variables is evidenced by research demonstrating that among military personnel who were admitted for suicidal ideation or attempt, 67% had a history of prior suicidal attempts or gestures and nearly half had received prior psychiatric medications (Ritchie et al., 2003).

A number of studies have also found an association between combat exposure and subsequent suicidal ideation (Fontana, Rosenheck, & Brett, 1992; Hendin & Haas, 1991; Pietrzak et al., 2009; Thoresen & Mehlum, 2008). Some studies have attempted to dismantle this finding by examining whether particular types of combat exposure are more malignant with respect to suicide risk. Fontana et al. (1992) found that killing or failing to prevent death or injury was associated with suicide attempt, while being a target of attempted killing or injury was more strongly associated with PTSD. They concluded that experiences involving high personal responsibility, such as killing in combat, may be important to examine as

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predictors of suicide. Similarly, Hendin and Haas (1991) found that guilt about combat actions was the strongest predictor of suicidal ideation and attempts. In particular, many of the suicidal veterans in their study reported killing women and children while feeling fear or rage.

In sum, there are a number of key factors that have been shown to increase suicide risk among service members and veterans. These factors are important to consider when developing and testing models of suicide risk. Less is known, however, about the association between suicidal ideation and specific risk factors such as mental health concerns and killing in combat among post-deployed OIF soldiers. Identification of specific suicide risk factors has important implications for the evaluation and treatment of our newly returning service members.

The purpose of this study was to examine factors that are associated with increased suicidal ideation in returning OIF veterans at a large Army medical facility. We examined predeployment risk factors, such as family history, prior suicide attempts, and proxies of prior mental health diagnoses to understand if prior findings generalize to newly returning veterans. Additionally, we were interested in better understanding the differential contribution of combat variables, including being injured, witnessing death, witnessing killing, and killing in combat. We were particularly interested in killing in combat as a predictor of suicidal ideation and whether the association was direct or mediated by PTSD and/or depression. We also examined the association between suicidal ideation and mental health symptoms related to PTSD, depression, and alcohol problems. We hypothesized that each of the predeployment risk factors would be significantly associated with suicidal ideation. We also hypothesized that of all of the exposure variables, killing would have the strongest association with suicidal ideation either directly or indirectly, when mediated by PTSD and/or depression symptoms. Finally, we hypothesized that although PTSD has been shown to be an important risk factor in suicidal ideation, depression would also be a strong predictor. To our knowledge, this is the first study to examine the association of killing and mental health concerns with suicidal ideation in a large sample of post-deployed soldiers.

2. Methods

2.1. Participants

Cases included 2854 OIF soldiers who presented for their routine postdeployment screening from November 2005 to June 2006. Our initial sample included 3141 cases that completed postdeployment screening, however only 3016 of these soldiers had served overseas as part of OIF, and 162 were excluded due to missing data. Soldiers had a mean age of 28 years ($SD=6$; range = 19–52). Other demographic and military service characteristics are reported in Table 1.

2.2. Measures

2.2.1. Demographics and psychiatric history

Soldiers reported the following demographic and military service variables: age, gender, race/ethnicity, educational status, relationship status, and number of OEF/OIF deployments. We also measured several risk factors for suicidal ideation: (1) Past suicidal attempts: "Have you ever attempted to kill yourself?" (2) Family history of suicide attempts: "Do you have relatives who have attempted suicide?" (3) Past psychiatric medication: "Have you ever been on any medication for emotional problems?" and (4) Past psychiatric counseling: "Have you received mental health or alcohol counseling in the past?" Each of these risk factors is scored

Table 1

Descriptives for demographic and military variables ($N=2854$).

Variable	Percentage	N
Gender		
Male	93	2667
Female	7	187
Spouse/partner		
Yes	76	2178
No	24	674
Race/ethnicity		
American Indian/Native Alaskan	2	42
Asian/Pacific Islander	6	163
Black	13	345
Hispanic	11	304
White	65	1800
Other	3	93
Education		
Less than high school	3	98
High school/GED	34	965
Some college	40	1139
Associates degree	6	173
College graduate (Bachelors degree)	14	393
Post graduate/prof. degree	3	86
Number of OEF/OIF deployments		
One	63	1776
Two	32	892
Three or more	5	141

dichotomously (*yes/no*) and we used each as independent variables in the regression analyses that predicted suicidal ideation (Table 2).

2.2.2. Combat exposure

Soldiers responded to four questions in order to assess various aspects of combat exposure: (1) "During combat operations did you become wounded or injured?" (2) "During combat operations did you see the bodies of dead soldiers or civilians?" (3) "During combat operations did you personally witness anyone being killed?" and (4) "During combat operations did you kill others in combat (or have reason to believe that others were killed as a result of your actions)?" The response format for each question was dichotomous (*yes/no*).

2.2.3. Primary Care PTSD Screen (PC-PTSD)

PTSD was assessed using the PC-PTSD (Prins et al., 2003). The PC-PTSD is a four-item self-report screening instrument for PTSD that utilizes a dichotomous response format (*yes/no*) for each symptom: re-experiencing, avoidance, emotional numbing, hyperarousal. Using a PC-PTSD cutoff score of 3 and the Clinician Administered PTSD Scale (CAPS; Blake et al., 1995) as the gold standard for PTSD diagnosis, the PC-PTSD demonstrated acceptable sensitivity and specificity, with a correlation of .83 with CAPS diagnoses. For the purposes of this study, we used the sum of the PC-PTSD as a continuous variable in our regression equation. Cronbach's alpha for the PC-PTSD in current sample was .79.

2.2.4. Patient Health Questionnaire-8 (PHQ-8)

Depression was indexed using the PHQ-8 (Kroenke et al., 2009). The PHQ-8 is an eight-item, self-administered scale that is based on DSM-IV diagnostic criteria. The PHQ-8 is identical to the PHQ-9 without the suicide item, given that suicidal ideation was our dependent variable. Each item is scored on a four-point scale with responses ranging from *not at all* to *nearly every day*. In this study, we used the sum of the PHQ-8 as a continuous variable in our regression equation. The Cronbach's alpha for the PHQ-8 in this sample was .88.

2.2.5. Alcohol Use Disorder Identification Test (AUDIT)

Alcohol abuse was assessed using the AUDIT (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). Alcohol consumption scoring is

Table 2
Regression models of predeployment, deployment and mental health predictors of suicidal ideation.

Predictors	Suicidal thinking			Desire for self-harm		
	Wald	OR	95% CI	Wald	OR	95% CI
Education	1.66	.83	.62–1.11	.00	1.01	.64–1.61
Family history of suicide	.50	.79	.40–1.54	.01	.94	.25–3.50
Prior suicide attempt	15.33**	4.69	2.17–10.18	12.54**	13.94	3.24–59.94
Prior psychiatric medication	5.92*	2.78	1.22–6.33	.00	.00	.00–.00
Prior psychiatric counseling	2.43	.55	.26–1.17	.27	.68	.16–2.87
Injured in combat	.55	.77	.39–1.54	1.12	1.88	.58–6.02
Seeing dead bodies	.36	.75	.30–1.90	.49	1.84	.33–10.32
Witnessing killing	.05	1.10	.48–2.51	.60	.57	.13–2.39
Killing	.44	1.27	.63–2.57	.01	1.07	.29–3.94
Alcohol abuse	1.13	1.03	.98–1.07	.00	1.00	.90–1.12
PTSD	3.14	1.22	.98–1.51	6.73**	1.73	1.14–2.62
Depression	77.06**	1.23	1.17–1.29	.78	.95	.84–1.07

Note: $N = 2854$.

* $p \leq .05$.

** $p \leq .01$.

based on a five-point scale that ranges from *never* to *daily or almost daily*. For the purposes of this study, we used the sum of the AUDIT as a continuous variable in our regression equation. The Cronbach's alpha for the AUDIT in the current sample was .78.

2.2.6. Suicidal ideation

Suicidal ideation at postdeployment screening was assessed using two items: (1) "Over the last 2 weeks, how often have you had thoughts that you would be better off dead, or of hurting yourself in some way?" which we defined as suicidal thinking, with the response scored on a four-point scale with responses ranging from *not at all* to *nearly every day* and (2) "Do you feel like hurting yourself at this time?" which we defined as desire for self-harm, with a dichotomous response format (*yes/no*). The two items were weakly correlated ($r = .10$, $p < .001$). For the purposes of our analyses, we examined each as separate dependent variables in our regression equations.

2.3. Procedure

Data were derived from a postdeployment screening database at a large Army medical facility. The program is an expanded version of a standard postdeployment screening program conducted throughout the Army and Department of Defense for all service members 90–180 days after returning from an operational deployment (the Post-Deployment Health Reassessment program; Department of the Army, 2006). All cases who returned from OIF deployments were eligible for inclusion. The program provides a general health assessment, including mental health screening. In this study, soldiers completed a set of screening measures and self-reported demographics and deployment-related information. Soldiers subsequently were seen by medical personnel for injury prevention (including reported suicidal ideation), smoking cessation, or other reported physical or mental health concerns as needed, and a credentialed behavioral health provider met individually with each soldier. All study procedures were approved by Madigan Army Medical Center's IRB.

2.4. Data analysis

Analyses in this study were performed using the statistical software package SPSS version 15.0 and M-plus, version 5.2. We computed the percentage of individuals in our sample who endorsed suicidal ideation, including suicidal thoughts and the desire for self harm. We next conducted multiple and logistic regression analyses to test models of suicidal ideation.

Prior to conducting regression analyses, we examined whether any of our demographic or military service variables were significantly correlated with suicidal ideation (i.e., suicidal thinking and desire for self-harm). We found that only education was significantly correlated with suicidal thinking ($r = -.04$; $p < .05$), which was subsequently included in our regression equations. In our regression analyses, we controlled for education, and entered pre-deployment variables predicted to place individuals at greater risk for suicide (e.g., family history of suicide, prior suicide attempt, past psychiatric medication, past psychiatric or alcohol counseling), military exposure variables (being injured in combat, exposure to dead bodies, witnessing killing, and killing), and postdeployment PTSD, depression and alcohol.

Finally, we used M-plus, version 5.2, to test a just-identified mediation model in order to better understand whether the association between killing and suicidal ideation was mediated by PTSD and/or depression symptoms.

3. Results

We found that 2.3% of soldiers ($n = 67$) reported suicidal thinking and .60% ($n = 16$) reported the desire for self-harm. Overall, 2.8% ($n = 79$) of soldiers reported suicidal thinking, the desire for self harm, or both.

Results of our first logistic regression analysis that examined the predeployment, deployment and mental health variables indicated that three variables were significant predictors of postdeployment suicidal thinking: prior suicide attempt ($Wald = 15.33$, odds ratio (OR) = 4.69, $p < .01$), prior psychiatric medication ($Wald = 5.92$, OR = 2.78, $p < .05$), and postdeployment depression ($Wald = 77.06$, OR = 1.23, $p < .01$). Two variables were significant predictors of the postdeployment desire for self-harm in our logistic regression analysis: prior suicide attempt ($Wald = 12.54$, OR = 13.94, $p < .01$) and postdeployment PTSD ($Wald = 6.73$, OR = 1.73, $p < .01$).

Finally, in order to better understand the putative association between killing and suicidal ideation, we conducted a mediation analysis. Our goal was to test whether the association between killing and suicidal thinking and killing and desire for self harm was mediated by PTSD and/or depression. We conducted a just-identified mediation model and controlled for past suicidal attempts and prior medication use.

Results indicated that the total effect of killing on suicidal thinking ($\beta = .13$, $SE = .05$, $p = .01$) was best explained by an indirect effect ($\beta = .06$, $SE = .01$, $p < .01$) in which depression ($\beta = .04$, $SE = .01$, $p < .01$) and PTSD symptoms ($\beta = .02$, $SE = .01$, $p < .05$) mediated the relationship between killing and suicidal thinking, with the direct effect between killing and suicidal thinking being non-significant.

Consequently, we concluded that the relationship between killing and suicidal thinking was mediated by depression and PTSD symptoms. Although we found that the total effect of killing on desire for self harm was non-significant, we proceeded to test for indirect effects based on mounting evidence that researchers should not require a significant total effect before proceeding with tests of indirect effects (Hayes, 2009; MacKinnon, Krull, & Lockwood, 2000; Shrout & Bolger, 2002). In fact, Shrout and Bolger (2002), among several other researchers, have argued that first establishing a direct effect, in this case between killing and desire for self harm, is not required, particularly in cases where the effect size is small or suppression is a possibility, and given our small effect size, we proceeded with mediational analyses. We found an indirect effect ($\beta = .04$, $SE = .02$, $p = .01$) in which PTSD symptoms mediated the association between killing and desire for self harm ($\beta = .05$, $SE = .02$, $p < .05$), with the direct effect between killing and desire for self harm being non-significant. Thus, data indicate that the relationship between killing and desire for self harm was mediated by PTSD symptoms. Finally, the path between depression symptoms and desire for self harm was also non-significant, indicating that the association between killing and desire for self harm was not mediated by depression but only by PTSD symptoms.

4. Discussion

Our results highlight a number of risk factors that are associated with suicidal ideation in newly returning OIF veterans. Prior suicide attempt strongly predicted both suicidal thinking and desire for self harm, with prior psychiatric medication only predicting current suicidal thinking. Furthermore, impact of killing on suicidal thinking was mediated by depression and PTSD symptoms, and impact of killing on the desire for self harm was mediated by PTSD symptoms. This is the first known study that examined these particular suicide risk factors in newly returning OIF veterans.

Although providers who work with returning soldiers are generally aware of prior suicide attempts and psychiatric medication as important risk factors, killing in combat, and the guilt and shame that may follow, are not traditionally conceptualized as risk factors for suicide. This finding is consistent with research conducted with veterans of prior eras (Fontana et al., 1992), and highlights the importance of assessing for killing, especially killing that has resulted in guilt (Hendin & Haas, 1991). Assessing for killing experiences should be done sensitively and within the context of screening for exposure to other combat experiences in order to reduce stigma. Future research should aim to better understand the particular circumstances of killing that may exacerbate risk for suicide. For example, are those who kill enemy combatants as likely to endorse suicidal thinking as compared to those who kill civilians in the war zone? Are there particular symptom profiles of those who report killing that place individuals at risk of suicide? Answering these questions may help improve screening for those at greatest risk of suicide.

This information also can be used to inform larger conceptual models of suicide risk as we continue to expand our understanding of how veterans are impacted by taking a life. For example, killing and suicide risk also may be associated with moral injury (Litz et al., 2009). More specifically, moral injury requires an act of transgression that severely and abruptly contradicts a personal or shared expectation about the rules or the code of conduct, results in dissonance or conflict, and may lead shame, guilt, and a failure to forgive oneself (Litz et al., 2009); killing and suicide risk may be associated with each of these components of moral injury.

We also found that depression symptoms were most predictive of suicidal thinking, and that PTSD symptoms were most predictive of the desire for self harm. This finding may be best explained by

a number of third variables. In particular, some individuals with PTSD may have other characteristics that place them at higher risk for the desire for self harm, such as impulsivity, anger/hostility, comorbid personality disorders, and a history of childhood abuse (Oquendo et al., 2005). Furthermore, guilt and/or shame may also act to mediate these relationships and should be explored in future studies as part of a larger model. Differences in our findings with respect to predictors of suicidal thinking versus the desire for self harm highlight the need for future studies that disentangle the complex factors that are associated with both of these forms of suicidal ideation.

Our findings also highlight the importance of screening for mental health disorders as part of any comprehensive treatment plan, with particular attention to those who screen positive for PTSD or depression. Screening and follow-up are particularly important given that the highest risk of suicide is within the first two years following inpatient discharge (Kapur, While, Blatchley, Bray, & Harrison, 2009) and that stigma and barriers to care are strongly associated with suicidal ideation (Pietrzak et al., 2009). Early identification may help save lives of those that may otherwise not engage in or be likely to drop out of care. Monitoring mental health symptoms over time is also an important component of care, given the association between mental health symptom severity and increased suicidal ideation.

There are several limitations of this study that should be noted. First, the current study is retrospective. More prospective studies are needed to be able to control for baseline symptoms and to track suicidal ideation and mental health symptoms over time. Second, this investigation was conducted with U.S. OIF soldiers at one large Army installation; therefore, these results may not generalize to other military branches (e.g., Air Force), veterans of other wars, or the entire U.S. Army population. Third, it is important to account for the fact that our outcome measures were self-report measures used for mental health screening rather than diagnostic instruments; therefore, these results should be replicated with clinician-rated diagnostic tools. Caution must therefore be taken when attempting to generalize results to those with mental health diagnoses given that we measured mental health symptom severity. We used single indicators for our suicidal ideation measure, and while there is precedent for doing so, future studies should use more comprehensive measures and also assess for suicide plans and recent attempts. These measures were obtained as part of a non-anonymous, routine deployment screening process; a variety of biases may motivate soldiers to under-report or over-report symptoms. Therefore, results of the current study predict suicidal ideation that soldiers were willing to report during the screening process.

5. Conclusions

We found that 2.8% of newly returning soldiers endorsed suicidal ideation, and that prior suicide attempt, prior psychiatric medication, and killing in combat were each significantly associated with suicidal ideation, with killing exerting a mediated effect through depression and PTSD symptoms. We also found that those who endorsed depression symptoms were at greatest risk of suicidal thinking; and that those endorsing PTSD symptoms were at greatest risk for the desire for self-harm. This is the first published study of OIF soldiers that found a mediated relationship between killing and suicidal ideation. Killing, in particular, is not routinely examined when assessing suicide risk. Present findings are significant because they suggest that killing may be important when assessing for suicidal ideation and developing models of suicide risk. Findings of this study have important implications for the evaluation and treatment of our newly returning service members.

Acknowledgements

This study was funded by a VA Health Services Research and Development (HSR&D) Career Development Award (RCD 06-042). The authors would like to thank Jeane Bosch and Erin Madden for their assistance with this manuscript. The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or representing the views of the Department of the Army or the Department of Defense.

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