

The Impact of Killing on Mental Health Symptoms in Gulf War Veterans

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This study examined the impact of killing on posttraumatic stress symptomatology (PTSS), depression, and alcohol use among 317 U.S. Gulf War veterans. Participants were obtained via a national registry of Gulf War veterans and were mailed a survey assessing deployment experiences and postdeployment mental health. Overall, 11% of veterans reported killing during their deployment. Those who reported killing were more likely to be younger and male than those who did not kill. After controlling for perceived danger, exposure to death and dying, and witnessing killing of fellow soldiers, killing was a significant predictor of PTSS, frequency and quantity of alcohol use, and problem alcohol use. Military personnel returning from modern deployments are at risk of adverse mental health symptoms related to killing in war. Postdeployment mental health assessment and treatment should address reactions to killing in order to optimize readjustment.

Keywords: killing, veterans, gulf war, PTSD, alcohol

Military personnel involved in war kill as part of their mission, although few studies have examined the rates of those involved in killing or the mental health impact of taking another life. In a population-based epidemiological study of Gulf War veterans, 14% of male soldiers reported killing another person (Carney et al., 2003), and these numbers are even higher when surveying combat veterans. Hoge and colleagues (2004) found that 77% to 87% of soldiers in infantry units returning from Operation Iraqi Freedom (OIF) reported shooting or directing fire at the enemy, 48% to 65% reported being responsible for the death of an enemy

combatant, and 14% to 28% reported being responsible for the death of a noncombatant.

The few studies that have examined killing in the war zone as a risk factor for combat-related posttraumatic stress disorder (PTSD) have found that taking another life is an important and robust predictor (Fontana & Rosenheck, 1999; MacNair, 2002). Each of these studies controlled for exposure to other combat variables to ensure that the results were not attributable to combat exposure alone, but due to the particular effects of killing. More specifically, in their model of war zone stressors and PTSD, Fontana and Rosenheck (1999) demonstrated that the impact of killing differentially impacted PTSD symptoms compared with other combat-related factors, such as exposure to death or perceived threat. While killing had a strong direct effect on PTSD, exposure to death and injury and perceived threat did not. Our goal was to determine whether these results would replicate in Gulf War veterans.

Thus far, the few studies that exist mainly examined the relationship between killing and PTSD, although alcohol problems and depression also are common and important to assess in veterans returning from overseas deployments. After controlling for general combat experiences, Maguen and colleagues (2010, 2009) found an association between killing and problem drinking among Vietnam and Iraq War veterans. Although PTSD and depression are often highly comorbid, Maguen and colleagues (2010, 2009) did not find an association between killing and depression among either Vietnam or Iraq War veterans. Consequently, our goal was to determine whether these alcohol and depression results would replicate in Gulf War veterans.

There are a number of variables that are important to consider when evaluating the mental health impact of killing. First, it is

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important to ensure that the impact of killing is not attributable to related variables, such as exposure to death or witnessing killing. For example, one study found that among Gulf War veterans, 52% of men and 45% of women saw dead bodies or individuals who were seriously maimed or injured, with 22% of men and 14% of women witnessing someone dying (Carney et al., 2003). Another study found that among soldiers serving in Operation Iraqi Freedom (OIF), 77% reported seeing dead bodies and 56% reported witnessing killing (Maguen et al., 2010). Consequently, in this study, we controlled for exposure to death and dying and witnessing killing in our examination of the association between killing and a variety of postdeployment mental health measures.

Perceived threat is another variable that has been found to be important in predicting PTSD among veterans and is often included in comprehensive models of postdeployment functioning (e.g., King, King, Foy, Keane & Fairbank, 1999; King, King, Gudanowski & Vreven, 1995; Kulka et al., 1990). Perceived threat, which is a subjective response to a hostile environment and an important marker of peritraumatic response, is consistently associated with the onset of adverse mental health symptoms across samples (e.g., Holbrook, Hoyt, Stein, & Sieber, 2001; Marmar, Weiss, Metzler, Ronfelt, & Foreman, 1996; McCaslin et al., 2006). As a result, we also controlled for perceptions of danger in our exploration of the impact of killing on postdeployment mental health.

The purpose of this study was to examine the relationship between killing and postdeployment mental health in Gulf War veterans, after controlling for important variables such as perceived danger, exposure to death and dying, and witnessing killing. To our knowledge, this is the first study to examine the consequences of taking another life among Gulf War veterans. Although prior research has mainly focused on PTSD, our goal was to replicate and extend these findings by examining the impact of killing on additional postdeployment mental health measures, such as depression and alcohol use. Identifying the impact of killing has important implications for the evaluation and treatment of our newly returning service members.

Method

Procedure and Participants

Participants were obtained via the Defense Manpower Data Center and a national registry of Gulf War veterans. Mangione's (1998) multistep method was employed to optimize participant response rate. First, potential participants were mailed a letter explaining the study's purpose. More specifically, participants were told that the study would pertain to multiple aspects of their deployment experiences. Confidentiality was assured, and the voluntary nature of participation was emphasized. Second, the original letter was followed by a survey package containing a collection of stressor and health outcome measures. Third, a reminder card was sent, followed by a re-mailing of the package to nonrespondents, and then a final reminder card. Of the 495 veterans who were identified, 320 returned completed questionnaires in 2002. Our study sample included 317 veterans who responded to the question about killing in the war zone. Although posttraumatic stress symptomatology (PTSS) was assessed among the entire sample, depression and alcohol questionnaires were only admin-

istered to half the sample as part of a purposeful design to reduce time burden on participants while still retaining a broad array of measures. All procedures and measures were approved by the VA Boston Healthcare System Institutional Review Board and conformed to standards for the protection of human subjects. Participants were 64.8% Caucasian, 15.2% Black, 13.7% Hispanic, 1.6% American Indian/Alaskan Native, and 1% Asian/Pacific Islander; 3.8% identified as Other. For other demographic characteristics of participants, see Table 1.

Measures

Veterans reported age, gender, race/ethnicity, educational status, and relationship status. They also were asked to respond to four questions, each indexing a particular component of their war zone experience: (a) perceived danger, (b) exposure to death and dying, (c) witnessing killing of a fellow soldier, and (d) killing. Perceived danger was assessed using the item, "I felt that I was in danger of being killed or wounded" and was rated on a five-point Likert scale, ranging from *strongly disagree* to *strongly agree*. Those endorsing *somewhat agree* or *strongly agree* were rated as experiencing perceived danger when percentages of individuals experiencing each item were calculated, and this item was used as a continuous variable in the regression equations. Exposure to death and dying was assessed using the item, "I was exposed to the sight, sound, or smell of dying men and women" and was rated on a dichotomous scale. Witnessing killing of a fellow soldier was assessed using the item, "I personally witnessed someone from my unit or an ally unit being seriously wounded or killed" and was rated on a dichotomous scale. Killing was assessed using the item, "I killed or think I killed someone in combat" and also was rated on a dichotomous scale.

PTSS was assessed using the *PTSD Checklist, Military Version*, a 17-item measure (PCL; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Weathers et al., 1993). Each item was rated on a five-point Likert scale, with responses ranging from *not at all* to *extremely*, and participants were asked to rate PTSS over the last 3 months. The PCL is widely used as a screen for PTSD, has been shown to have very good internal consistency, and correlates strongly with other measures of PTSD symptoms (Weathers et al., 1993). The PCL also demonstrates high diagnostic efficiency (i.e., .90; Blanchard et al., 1996). For the purposes of this study, we used a recommended cutoff score of 50 when reporting a positive screen for PTSD (Weathers et al., 1993) and a continuous symptom score in our regression analysis. The internal consistency of the PCL for our sample was .96.

Depression symptoms were assessed using an adapted version of the *Beck Depression Inventory-Primary Care* (BDI-PC; Beck, Steer, Ball, Ciervo, & Kabat, 1997). The original seven items from the BDI-PC were used with a variation in the response format. More specifically, participants were asked to rate symptoms over the last three months (e.g., "In the last three months, I have felt like a failure"), and unlike the original, each item was rated on a five-point scale, with responses ranging from *strongly disagree* to *strongly agree*. The BDI has excellent psychometric properties (Beck, Steer, & Garbin, 1988). We used a cutoff score of four when determining a positive screen for depression (Beck, Guth, Steer, & Ball, 1997), with *somewhat* or *strongly agree* being used as the threshold for a positive symptom score; we also include a

Table 1
Sociodemographic Characteristics of Gulf War Veterans

	<i>n</i> (%)		
	Killed (<i>n</i> = 34)	Did not kill (<i>n</i> = 283)	Total (<i>n</i> = 317)
Age, <i>M</i> (<i>SD</i>)*	41 (8.8)	45 (8.9)	44 (9.0)
Gender*			
Male	30 (88)	202 (72)	234 (74)
Female	4 (12)	79 (28)	83 (26)
Ethnicity			
White	22 (65)	178 (65)	202 (65)
Minority	12 (35)	96 (35)	108 (35)
Education			
Some high school	0 (0)	1 (.4)	1 (.3)
High school graduate	5 (15)	17 (6)	22 (7)
Vocation or technical training	2 (6)	27 (10)	30 (10)
Some college	15 (44)	119 (42)	135 (43)
Four-year college graduate	5 (15)	45 (16)	50 (16)
Some graduate or professional school	3 (9)	18 (6)	21 (7)
Graduate or professional degree	4 (12)	54 (19)	58 (18)
Marital status			
Single	9 (27)	74 (26)	84 (26)
Married	25 (74)	207 (74)	233 (74)

* $p < .05$. ** $p < .01$.

stricter criterion for depression, using only those who responded strongly agree to at least four items. In our regression analysis, we used a continuous depression symptom score. The internal consistency of the BDI-PC for our sample was .91.

Alcohol use was assessed using two separate measures: (a) an index of frequency and quantity of alcohol use and (b) the *CAGE* (Ewing, 1984), a measure of problem alcohol use.

Frequency and quantity of alcohol use was assessed using the following two questions: (a) "In the past three months how often have you had a drink containing alcohol?" with responses rated on a five-point scale ranging from *never* to *four or more times a week* and (b) "In the past three months, how many drinks containing alcohol have you had on a typical day when you were drinking?" with responses rated on a five-point scale ranging from *none* to *7 or more*. For the purposes of this study, a product of these two questions was used in the multiple regression equation indexing alcohol use, given that there is precedent for examining the product term of alcohol frequency and quantity among veterans (e.g., Savarese, Suvak, King, & King, 2001).

The *CAGE* is a four-item measure in which participants were asked four dichotomously rated questions related to their alcohol use prior to deployment and in the present. Questions included indicators of problem alcohol use, such as feelings of guilt in reaction to drinking, criticism from others regarding drinking, and wanting to cut down on drinking. For the purposes of this study, responding positively to two or more questions in the present was considered a positive screen for problem alcohol use (e.g., Hearne, Connolly, & Sheehan, 2002), although we also report results for a cut off score of one, given that there is also precedent of using a lower threshold with military samples (e.g., LeardMann, Smith, Smith, Wells, & Ryan, 2009). In our regression analyses, we used a continuous measure of problem alcohol use prior to deployment and in the present. The alpha reliability of this measure was .76 prior to deployment and .81 in the present.

Data Analysis

All of the analyses in this study were performed using the statistical software package SPSS version 17.0 for Windows. First, we calculated percentages of individuals who reported exposure to indices of combat and killing in war. Next, we computed the percentage of individuals in our sample who met screening criteria for PTSD, depression, and problem alcohol use. Finally, we conducted a series of regression analyses to identify predictors of each of the postdeployment mental health measures.

We conducted four hierarchical regressions to determine whether reported killing was significantly associated with PTSS, depression, frequency and quantity of alcohol use, and current problem alcohol use. In these analyses, we included related exposure variables to ensure that the results were not attributable to merely participating in combat (i.e., we controlled for perceived danger, exposure to death and dying, and witnessing killing of a fellow soldier).

In the first step of each regression, we entered demographic variables (i.e., age, gender, race/ethnicity, educational status, and relationship status). In the two regression equations related to alcohol use, we also were able to control for prior problem drinking in the first step. In the second step, we controlled for related exposure variables; and in the third step we entered reported killing.

Results

In this study, 46% of veterans reported perceiving danger during their deployment, 42% reported exposure to death and dying, 19% reported witnessing killing of a fellow soldier, and 11% reported killing in combat. We compared those who endorsed killing to those who did not and found that younger, $F(1, 313) = 5.41$, $p < .05$, and male veterans, $\chi^2(1) = 4.18$, $p < .05$, were more likely to report killing during the Gulf War than their counterparts.

Veterans also endorsed a wide range of mental health symptoms: 20% met threshold screening criteria for PTSS, 45% for depression (11% using a stricter cutoff score; see measures section), and 6% for current problem alcohol use (11% using a less strict cutoff score; see measures section). Veterans reported drinking an average of 2 to 3 times a month ($SD = 1.35$), with the mean amount of alcohol consumed being 1 to 2 drinks per occasion ($SD = 1.08$).

In the final hierarchical regression model predicting PTSS (Table 2), older age, ethnic minority status, lower education, perceived danger, and exposure to death and dying were each significant predictors. Reported killing remained significant, even after controlling for perceived danger, exposure to death, and witnessing killing.

In the final hierarchical regression model predicting depression symptoms (Table 2), being single, perceived danger, and exposure to death and dying were each significant predictors. However, neither witnessing killing nor reported killing were significant predictors of depression symptoms.

In the final hierarchical regression models predicting current frequency and quantity of alcohol use and current problem alcohol use (Table 3), after controlling for prior problem drinking, reported killing was the only significant predictor of each alcohol-related measure.

We used the false discovery rate procedure specified by Benjamini and Hochberg (1995) to adjust for multiple comparisons in our four outcomes, and we found that the three significant killing findings each remained significant.

Discussion

Despite the fact that the Gulf War was a relatively short and targeted mission, a significant number of veterans reported killing during their deployment, with even larger numbers reporting exposure to death and dying and witnessing killing of a fellow soldier. Killing in combat was a significant predictor of PTSS and multiple indicators of alcohol use, even after controlling for highly salient variables such as perceived danger, exposure to death and dying, and witnessing killing, suggesting that taking a life in combat is a critical ingredient in the development of postdeployment mental health concerns.

Our finding that killing is associated with PTSS is consistent with the few existing studies that evaluated the mental health impact of taking a life (e.g., Fontana & Rosenheck, 1999; MacNair, 2002), although this is the first study to document this association in Gulf War veterans. This also is the first study demonstrating an association between killing and several indices of alcohol use in Gulf War veterans. Of particular importance, killing was the only war zone variable that significantly predicted alcohol use, even when including important war zone experiences and controlling for preexisting alcohol problems. Given recent findings of elevated alcohol rates in veterans returning from modern deployments (e.g., Calhoun, Elter, Jones, Kudler, & Straits-Tröster, 2008; Maguen et al., 2010), the impact of killing seems critical and may play an important role in the evaluation and treatment of veterans with problem alcohol use.

The relationship between killing and alcohol use may reflect a method for veterans who are impacted by killing in war to regulate difficult emotions. Indeed, prior researchers have postulated that alcohol abuse may represent an effort to self-medicate avoidance or hyperarousal symptoms associated with PTSD (Bremner et al., 1996; Kulka et al., 1990). Another possibility is that the relationship between killing in war and alcohol use is mediated by variables such as impulsivity or invincibility. A recent study postulated that exposure to violent combat, including killing, may alter an individual's perceived threshold of invincibility, thereby increasing the likelihood of engaging in high risk behavior, including increased alcohol use (Killgore et al., 2008). It is important to note that these authors did not find a relationship between killing and impulsivity, suggesting that invincibility may be the important link.

We did not find an association between killing and depression, which is consistent with past studies (Maguen et al., 2010, 2009). Although depression is highly associated with PTSD and the two are often comorbid, when depression is examined as a whole, it is not associated with killing. It is important to note that while PTSD is always event-based, depression is not. A diagnosis of PTSD cannot be given without a potentially traumatic event. Relatedly, depression may be better predicted by other variables, such as family history, rather than by killing. While killing and exposure to killing were not strongly associated with depression, exposure to

Table 2
Hierarchical Regression Models of Posttraumatic Stress Symptomatology (PTSS) and Depression

Predictors	PTSS				Depression			
	β (Step 1)	β (Step 2)	β (Final model)	R^2 (ΔR^2)	β (Step 1)	β (Step 2)	β (Final model)	R^2 (ΔR^2)
1. Age	.01	.10	.11*	.14**	-.17	-.07	-.07	.10**
Gender	.06	.08	.10		.05	.08	.08	
Ethnicity	.18**	.16**	.15**		-.02	-.02	-.02	
Education	-.26**	-.17**	-.17**		-.15	-.10	-.10	
Marital status	-.13*	-.09	-.09		-.15	-.16*	-.16*	
2. Perceived danger		.32**	.31**	.37** (.23)**		.18*	.18*	.23** (.13)**
Exposure to death		.25**	.23**			.29**	.29**	
Witnessing killing		.12*	.10			.05	.05	
3. Killing			.11*	.38** (.01)*			.00	.23** (.00)*

Note. For final models, $F(9, 297) = 20.05, p < .01$ for PTSS; $F(9, 148) = 4.86, p < .01$ for Depression, Ethnicity: 0 = *Caucasian*, 1 = *ethnic minority*; Gender: 0 = *male*, 1 = *female*; Spouse: 0 = *single*, 1 = *married/in a relationship*. Numbers vary because of missing data.
* $p < .05$. ** $p < .01$.

Table 3
Hierarchical Regression for Models of Alcohol Use and Problem Alcohol Use

Predictors	Alcohol use				Problem alcohol use			
	β (Step 1)	β (Step 2)	β (Final model)	R^2 (ΔR^2)	β (Step 1)	β (Step 2)	β (Final model)	R^2 (ΔR^2)
1. Age	-.01	-.03	-.01	.07	.01	.02	.04	.09*
Gender	-.16	-.17	-.13		-.09	-.08	-.04	
Ethnicity	-.01		-.02	-.05	.16*	.16	.13	
Education	-.04		-.04	-.05	.03	.03	.02	
Marital status	-.15	-.16	-.15	-.16	-.17*	-.16		
Prior alcohol use	.13	.15	.17*		.18*	.19*	.22**	
2. Perceived danger		.01	-.02	.09 (.01)		.00	-.03	.10 (.01)
Exposure to death		-.05	-.08			.07	.04	
Witnessing killing		-.10	-.14			-.06	-.10	
3. Killing			.20*	.12* (.03)*			.21*	.13* (.04)*

Note. For final models, $F(10, 145) = 1.92, p < .05$, for alcohol use; $F(10, 145) = 2.23, p < .05$, for problem alcohol use. Ethnicity: 0 = *Caucasian*, 1 = *ethnic minority*; Gender: 0 = *male*, 1 = *female*; Spouse: 0 = *single*, 1 = *married/in a relationship*.

* $p < .05$. ** $p < .01$.

death seemed to be a strong predictor, suggesting that some aspects of exposure to combat increase risk for depression, while others do not.

There are several limitations of this study that should be noted. First, the current study was retrospective; consequently recall bias should be taken into account when interpreting these results. Relatedly, because these data were collected several years after the war, measures may reflect more chronic symptomology. Second, this investigation was conducted with American Gulf War veterans; therefore these results may not generalize to veterans of other wars. Additionally, although this was a national sample, results are not necessarily representative of the population of Gulf war veterans. Third, it is important to account for the fact that our postdeployment mental health measures were self-report and used for screening rather than as diagnostic instruments. Despite the fact that clinically significant cutoff scores have been recommended for each of these measures, these results should be replicated with clinician-rated diagnostic tools (e.g., Clinician Administered PTSD Scale for *DSM-IV*; Blake et al., 1995). Exposure variables, including our index of killing, were assessed using a single indicator, and future studies should replicate these results with more comprehensive measures. This is especially important in order to better understand which aspects of killing (e.g., circumstances of killing, person killed, etc.) are associated with increased mental health problems. However, it is important to note that there is precedent for examining single exposure items (e.g., LeardMann, Smith, Smith, Wells, & Ryan, 2009). Although we were able to index predeployment alcohol use, a limitation is that these reports were retrospective; additionally we were not able to control for predeployment PTSD or depression. Future investigations that utilize broader sets of health and deployment information are needed to further understand potential mediators and moderators in this model, such as prior mental health difficulties and prior trauma.

Our finding that killing in war is a significant, independent predictor of multiple mental health symptoms has important implications for the health care of veterans. A comprehensive evaluation of veterans returning from combat should include an assessment of killing experiences as well as reactions to killing and

precursors to killing, including witnessing the death of a fellow soldier and perceived danger, factors that may place veterans at even greater risk of developing mental health complications such as PTSD. This information can be used to inform larger conceptual models of mental health response, as we continue to expand our understanding of how veterans are impacted by taking a life. For example, the experience of killing also may be associated with moral injury (Litz et al., 2009) and changes in spirituality/religiosity (e.g., Fontana & Rosenheck, 2004). It is critical that future research examine the broad impact of taking another life in combat.

Overall, we found that a significant percentage of veterans serving in the Gulf War reported killing, which places them at risk for PTSD and elevated alcohol use. Including killing experiences as part of postdeployment evaluation and treatment planning will ensure that we are providing comprehensive health care to our modern deployment veterans as they embark on the journey of reintegration and readjustment to civilian life.

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