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Veteran Suicide Exposure: Associations with Guilt, PTSD, and Suicidality

RESEARCH

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ABSTRACT

Veterans commit suicide at a rate 1.5 times greater than their non-veteran civilian counterparts. Not only is this a public health concern due to the substantial loss of life, but because of the impact on suicide survivors. Research indicates exposure to suicide by others is related to posttraumatic stress disorder (PTSD) symptoms, depression, anxiety, non-suicidal self-injury, and suicidality (in the form of suicidal thoughts and behaviors). The present study uses self-report survey data from 186 Post-9/11 veterans of Iraq and/or Afghanistan, who were recruited as part of a larger study, to expand on this research to evaluate whether there is a cumulative effect such that knowing more others who have died by suicide increases veterans' guilt, PTSD symptoms, and suicidality. A series of hierarchical multiple regression analyses revealed that, as hypothesized, the more comrades a veteran or active service member has lost to suicide, the greater PTSD symptoms and suicidal thoughts and behaviors they reported, above and beyond that predicted by combat casualty experiences. Further, no evidence of habituation to suicide exposure was found. The results illustrate that the alarming rise in veteran suicide in the Post-9/11 era may be a self-compounding problem that needs greater attention, such as addressing PTSD and guilt, to reverse the trend.

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Historically, suicide rates for active-duty military service members have been lower than that for the population of the United States (US) at large (Rothberg et al., 1987). However, recent reports show that this gap has closed and, more alarmingly, the rate of suicide by those who have left active duty is 1.5 times the rate of the population at large (US Department of Defense [DoD], 2018). Even more strikingly, DoD reported that female veterans are 2.4 times more likely than non-veteran women to die by suicide. The data also indicate that while veterans account for 7.6% of the US adult population, they account for 18% of the completed suicides nationwide. Moreover, younger veterans, aged 18–34, and those who have left active service within the past year are particularly vulnerable (United States Department of Veteran's Affairs Office of Mental Health and Suicide Prevention, 2018). The combined veteran and active-duty data indicate that suicide remains a significant problem despite efforts by researchers, organizations, and clinicians to stop suicidal behavior in military affiliated communities.

Research has revealed predictors of suicide that may be especially relevant to combat veterans, including Post-9/11 veterans of Iraq and/or Afghanistan wars. For example, combat experiences involving the death or injury of civilians, enemy forces, or friendly comrades, are predictive of suicidal thoughts and behaviors directly, and are associated with posttraumatic stress disorder (PTSD), guilt, and depression, all of which have also been linked to suicidality (e.g., Bryan et al., 2013; Currier et al, 2015; Farnsworth et al, 2014; Fontana et al., 1992; McCue et al., 2021). These findings, especially those illustrating the psychological impact of losing friendly comrades in combat, raised the question of whether the loss of friendly comrades to suicide may also contribute to negative mental health outcomes in veteran communities.

Bandura and Walters' (1977) Social Learning Theory suggests that veterans who know others that have died by suicide may be more likely to endorse suicidal thoughts and behaviors via observational learning. Specifically, individuals often use others' behaviors as a guide in generating their own subsequent behaviors in similar situations, particularly if the models are perceived to be alike in terms of age, sex, competence, and background—including military history (Bandura & Walters, 1977; Gade & Wilkins, 2012; Schunk, 1987). Particularly relevant to this study, models have also proposed that suicidal behaviors can be viewed from Social Learning Theory as having been observationally learned (Lester, 1987). For other antisocial activities, such as hazing, the actions of similar others are influential predictors of whether individuals partake in these behaviors, as indicated in a study of university varsity teammates (Hamilton et al., 2016). Observational learning via media, social media, and word of mouth can also influence both prosocial and antisocial behavior, in accordance with Social Learning Theory (Pirkis, 2009; Stack, 2005; Tatum et al, 2010). Not all observational learning is negative, however. Correlational studies have shown that modeling and self-efficacy training informed by Social Learning Theory each related to reduced suicidal ideation amongst active-duty service members in Serbian and Montenegrin militaries (Aseltine & DeMartino, 2004; Gordana & Milivoje, 2007). On the other hand, Social Learning Theory suggests individuals, including service members and veterans, who learn of their comrades dying by suicide either directly or indirectly, may be influenced to do the same when faced with distress or difficulty, potentially creating a cycle of veteran suicide (Bandura & Walters, 1977; Lester, 1987).

Two studies have examined the psychological impact of suicide exposure on active and veteran military personnel. Cerel et al. (2015) conducted a self-report study of 931 veterans and found that nearly half (47.1%) reported lifetime exposure to suicide, using a dichotomous yes/no variable to indicate whether the participant knew at least one person who had died by suicide. Cerel and colleagues' (2015) sample had a mean age of 61.6 years (SD = 15.42), was mostly (91.6%) male, less than half had a history of combat deployment (45.2%), and all respondents resided in the state of Kentucky, each of which limited the study's generalizability. While limited, the study found that suicide exposure was positively linked to increased levels of depression, anxiety, and suicidal ideation. Further, perceived closeness to the deceased increased the odds of developing clinical depression, clinical anxiety, and PTSD (Cerel et al., 2015).

Hom et al. (2017) expanded on previous research using a larger nationally recruited sample of 1753 active and veteran service members whose gender distribution (81.5% male) more closely represented that of the active-duty population (83.5% male; DoD, 2018) and comprised a younger cohort (M_{age} = 33.44, SD = 13.38). Using a dichotomous operational definition of suicide exposure (yes/no), over half (57.3%) of their sample reported knowing someone who had died by suicide. Suicide exposed respondents were more likely to endorse suicidal ideation, suicide plans, and non-suicidal self-injurious (NSSI) behaviors than those not exposed to suicide. As in the previous study, Hom and colleagues' findings revealed that greater closeness to the deceased was associated with more suicidal thoughts, plans, and attempts. These findings provide evidence that veterans who know someone who has died by suicide are more likely to experience a range of psychological distress. In neither of these studies was the military status of the suicidal decedent evaluated, therefore the psychological impact of losing military comrades to suicide remains unexplored. Given the prevalence of suicide within military affiliated communities, a more direct study may provide insight into whether there is an observational effect as veterans may

be more likely to model their behavior after those they perceive to be like themselves (Chinman et al., 2015; Parks et al., 2001).

No previous study has explored associations between military occupational specialty (MOS) or rank and suicide exposure. Given that rank and occupational specialty are correlated with combat exposure, trauma-related guilt, and suicidality in the form of past suicidal thoughts, previous attempts, and likelihood of future attempts (Bryan et al., 2013; McCue et al., 2021), they may be important considerations in the study of psychopathology and suicide risk in military affiliated communities. Finally, given the link between combat experiences and psychological distress (Bryan et al., 2013; McCue et al., 2021), accounting for these experiences may better illustrate the unique impact of suicide exposure on psychopathology and suicide risk.

The purpose of the current study was to expand upon the research of Cerel et al. (2015) and Hom et al. (2017) to explore if suicide exposure is associated with guilt, PTSD, and suicidal thoughts and behaviors among Post-9/11 active duty and veteran personnel who served in Iraq and/or Afghanistan. To evaluate whether there is an observational learning effect amongst Post-9/11 veterans regarding suicidality, respondents were asked to only consider fellow service members and veterans who had died by suicide and to not report others they know who may have taken their own lives.

The following hypotheses were tested: (a) MOS and rank will be associated with suicide exposure such that having a lower rank and combat-oriented MOS are each associated with greater suicide exposure; (b) greater suicide exposure will predict guilt, PTSD symptom endorsement, and suicidality above and beyond combat casualty experiences; and (c) there is a habituation effect of further suicide exposure on guilt, PTSD symptom endorsement, and suicidality in which greater exposure is not associated with increased symptomatology.

METHODS

PARTICIPANTS

Post-9/11 combat veterans and active-duty personnel who served in Iraq and/or Afghanistan were recruited via word of mouth and social media platforms targeting the US Military Academy Alumni network, the US Marine Corps (USMC) Reconnaissance Association, and Student Veterans of America, yielding an initial sample of 223. One person who did not deploy to Iraq and/or Afghanistan after September 11, 2001, was excluded from this study. Of the remaining 222 who met inclusion criteria, 36 (16.7%) had incomplete responses and were removed by listwise deletion (Little's MCAR ^{2} (166) = 180.45, p = 0.210). The final sample therefore included 186 men and women, including both active duty (n = 56, 29.9%) and veteran (n = 130, 70.1%) service members. Table 1 below presents descriptive information including personal and military demographics of the study sample, as well as those reported by the 2018 DoD and 2010 USMC census reports for comparison purposes. The sample in the current study was under-representative of Black, Air Force and Navy, and junior enlisted service members, and over-representative of White, Marine Corps, and higher-ranking personnel. The sample included all major MOS categories, but the distributions were not similar to those reported in the 2010 USMC census.

MEASURES

A demographic questionnaire asked about age (M = 37.7, SD = 6.7), gender, employment status, marital status, ethnicity, branch of service, and military service information.

Suicide Exposure

To assess the degree of suicide exposure, participants responded to a single study-specific question, "How many veteran or active-duty military personnel do you know who have committed suicide?" Respondents then wrote their answer to the question in a text box embedded within the survey. This variable was used as a continuous variable in hypothesis testing. While not analyzed in this way, suicide exposure was categorized into 5 groups based on levels of exposure from "none" (0) to "extreme" (15 or more). Presentation can be seen in Table 2 below, which provides details for the study's key variables of interest.

Rank

This study coded rank in a continuous manner based on responses to the question, "What was (or is) the highest paygrade you achieved in the military?" Respondents then selected from E-1 to O-6 (no general officers or admirals participated in this study). However, this study did not operationalize rank directly from the paygrade chart with E-1 through E-9 as the lowest 9 ranks and O-1 through O-10 as the highest ranks. Rather, we coded rank in a way that aligns with the duties, responsibilities, and experience of each rank as delineated by the US Army (USA, 2006) *Field Manual 3-21.20* and United States Marine Corps (USMC, 2019) *Reference Publication 1-10.1*. These doctrinal manuals show that, for example in a ground combat MOS, an E-7 is likely to have similar responsibilities to an O-2, and therefore we coded these ranks side-by-side (as 8 and 9, respectively), rather than 8 units apart (USA, 2006; USMC, 2019). The ranks were coded from 1–20 consecutively in this order: E1–E6, O1, E7, O2, W1–W3, E8, O3, W4–W5, O4, E9, O5–O6.

	% TOTAL SAMPLE (N)	2018 DOD	Z SCORE
Race/Ethnicity			
Native	0.5% (1)	1.1%	0.8
Asian	2.7% (5)	4.5%	1.1
Black	2.7% (5)	17.1%	6.7***
Pac Islander	0% (0)	1%	3.9***
White	82.2% (152)	68.9%	3.8***
Multi	2.7% (5)	3%	0.9
Latino[a]	9.2% (17)	14.9%	1.8
Gender			
Female	16.2% (30)	16.5%	0.2
Male	83.8% (154)	83.5%	0.1
Branch			
Air Force	3.8% (7)	24.7%	8.8***
Army	39.2% (73)	36.1%	1.1
Marines	50.5% (93)	14.2%	10.1***
Navy	6.5% (12)	24.9%	7.9***
Rank			
E1–E5	27.6% (51)	50.6%	7.0***
E6–E9	21.6% (40)	21.8%	0.8
W1–W5	3.7% (7)	1.4%	2.2*
O1–O3	21.6% (40)	10.0%	4.1***
O4–O6	25.4% (46)	6.4%	7.2***
MOS[b]			
Special Operations[c]	3.2% (6)	0%	4.0***
Ranger/Recon/EOD	22.7% (42)	2.0%	9.5***
Combat Arms	25.9% (48)	23.9%	0.8
Medic/Corpsman	2.2% (4)	6.0%	2.8**
Pilot/Aircrew	11.9% (22)	2.9%	5.4***
Combat Support	21.6% (40)	28.9%	2.3**
Combat Service Support	11.9% (22)	43.1%	8.1***

Table 1 Characteristics of Study Sample and Normative 2018 DoD Sample with Results of Crosstab Subgroup Analysis Comparing Sample Distributions.

Note: Z-Scores represent the results of Chi-Square and crosstab analysis of the distribution of sample characteristics compared to normative data.

2018 DoD Demographic Data are based on active duty members only. Military occupational specialty (MOS) is the general job classification for servicemembers.

[a] Latino demographic data is based on both active & reserve 2018 DoD Demographic Data.

[b] MOS is based on 2010 USMC MOS data as no DoD wide MOS data was available.

[c] The Marine Corps had no Special Operations MOS in 2010, but does now.

* $p < .05$, ** $p < .01$, *** $p < .001$.

	% (N)	M (SD)
Suicide Exposure		4.4 (4.2)
None (0)	9.2% (17)	
Low (1–3)	49.7% (92)	
Medium (4–8)	27.6% (51)	
High (9–14)	9.7% (18)	
Extreme (15 or more)	3.8% (7)	
PTSD Symptom Score		1.8 (1.6)
<3	69.2% (129)	
≥3 (Positive screen)	31.8% (57)	
Suicidal Behaviors Score		2.5 (2.8)
<8	92.4% (172)	
≥8 (High risk)	7.6% (14)	
Feelings Of Guilt Score		11.4 (4.3)
Low (0–9)	36.8% (69)	
Medium (10–18)	54.6% (101)	
High (19–27)	8.6% (16)	
	RANGE	
Combat Experiences		
Enemy Responsible	0–372	12.7 (39.0)
Enemy Witness	0–500	25.2 (65.1)
Civilian Responsible	0–100	1.2 (7.6)
Civilian Witness	0–250	7.0 (24.7)
Ally Responsible	0–20	0.6 (2.0)
Ally Witness	0–150	5.0 (14.0)

Table 2 Sample Scores and Descriptive Statistics on Key Variables of Interest.

Note: PTSD Symptom Score is based on results from the PC-PTSD-5 (Prins et al., 2016), Suicidal Behaviors Score is based on results from the SBQ-R (Osman et al., 2001), and Feelings of Guilt Score is based on the PFQ-2 Guilt Subscale Score (Harder & Zalma, 1990).

Military Occupation Specialty (MOS)

MOS refers to someone's job in the military and this information was collected and coded as a continuous variable. Scores were assigned based on the MOS' assigned missions and the likelihood that these missions would result in the service member having direct contact with the enemy or encountering life-threatening situations as determined by US Army (2006) and USMC (2019) doctrinal publications. Based on the above process, lower scores on this variable are indicative of jobs that were more likely to encounter life-threatening situations based on the nature of their roles (special operations = 0, ranger/reconnaissance = 1, combat arms = 2). Middle scores (3 = medic/corpsman, 4 = pilot) were assigned to MOSs whose missions involve both direct action against enemy forces and serving in supporting roles, making them more likely than support personnel, but less likely than combat personnel to encounter life-threatening situations. Higher scores were assigned to those with MOSs whose missions were primarily supportive, making them less likely than other respondents to encounter life-threatening situations (combat support = 6, combat service support = 7). To check that our scoring system was valid, we solicited ratings based on the input of 25 veteran and active-duty personnel from the Army (7 personnel), Navy (3 personnel), Air Force (2 personnel), and Marines (13 personnel). Each rater had at least 10 years of service on active duty to ensure expertise and at least some understanding of joint service operations. Inter-rater reliability, based on the intraclass correlation coefficient, was found to be excellent (*ICC* = .998). Intraclass correlation coefficient estimates, and their 95% confidence intervals were based on a mean rating, absolute agreement, 2-way mixed-effects model.

Combat Casualty Experiences

We developed six questions to determine respondents' experiences in combat. These six experiences were labeled based on the recipient of violence (Enemy, Ally, or Civilian) and the respondent's perceived role in that violence (Responsible or Witness). For example, Enemy Responsible refers to feeling responsible for killing or wounding an enemy combatant, and CIVCAS Witness refers to witnessing a civilian non-combatant become injured or killed. Building off previous research (Fontana et al., 1992; McCue et al., 2021), respondents were given three sets of two similar open-response questions. Participants were asked to answer questions such as "How many US or allied comrades do you feel responsible for their being killed or wounded?" and "How many US or allied comrades did you witness killed or wounded?" The responses to the previous questions are presented as Ally Responsible and Ally Witness, respectively. Respondents were then asked the same questions, but with "allied comrades" replaced by the terms, "enemy fighters" and "civilian non-combatants." The continuous responses were entered manually by participants and were entered into the analyses as six separate variables.

Feelings of Guilt

The Personal Feelings Questionnaire-2 (PFQ-2; Harder & Zalma, 1990) is a 16-item self-report scale to assess guilt and shame proneness by having respondents consider how frequently they experience affective states associated with the constructs. For this analysis, only the guilt subscale was used. The guilt subscale consists of 6 questions designed to assess how frequently the respondent experiences emotional and cognitive states (such as "intense guilt," "mild guilt," and "regret") associated with guilt. Participants

are asked to rate how often they experience these states from 0 ("never") to 4 ("always"). Responses are scored and totaled to develop an aggregate score ranging from 0–24 on the subscale. In early research, the guilt subscale has been shown to be psychometrically sound, with acceptable levels of internal consistency (α = .72) and test-retest reliability (r = .85; Harder & Zalma, 1990). More recently, Rice and colleagues (2018) have found the scale to have stronger psychometric properties (Cronbach's α = .86; Rice et al., 2018). In the current study, the measure achieved good internal consistency (Cronbach's α = .87).

PTSD Symptom Endorsement

The Primary Care PTSD for DSM-5 Screener (PC-PTSD-5; Prins et al., 2016) presents the respondent with 5 "yes/no" questions designed to screen for the probability of PTSD diagnosis. Respondents are asked questions such as "In the past month have you been constantly on guard, watchful, or easily startled." Yes responses are assigned a 1 and No responses are scored 0, and these are summed to compute the total score, with higher scores indicating more severe symptoms. The measure has been shown to have adequate psychometric properties and be effective at distinguishing between clinical PTSD and non-clinical PTSD. In its initial publication, 94.7% of those scoring 3 or higher on the scale were concurrently diagnosed with PTSD based on a computer-assisted structured, diagnostic interview (Prins et al., 2016). This measure was validated and initially intended for veterans using US Department of Veterans Affairs (VA) healthcare services and has been mandated by the VA to screen for PTSD for all VA primary care patients annually. For the current study, the measure was completed by self-report and showed adequate internal consistency, with Cronbach's α = .77.

Suicidality

The Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al, 2001) is a 4-item self-report scale that asks respondents how often they have experienced different types of suicidal thoughts and behaviors. It presents participants with questions such as, "Have you ever thought about or attempted to kill yourself?" that they respond to using a Likert-style scale ("0 = never, 1 = it was just a brief passing thought, 3 = I have had a plan at least once to kill myself but did not try, 4 = I have attempted to kill myself"). Scores are summed for an overall score ranging from 3 to 18. The SBQ-R score predicts suicide risk group membership and Receiver Operating Characteristic (ROC) analysis suggests a recommended cutoff score of 8 to differentiate between high and low suicide risk groups (Bryan et al, 2010). In the present study, the measure showed adequate internal consistency with Cronbach's α = .78.

PROCEDURES

The research was reviewed and approved by the Institutional Review Board (IRB) at Alliant International University before any study procedures commenced. Respondents who self-selected to participate were directed to the study via a web-based link. Using Qualtrics software, each participant provided informed consent prior to commencing the self-report questionnaire. Participants were instructed they could discontinue the survey if they experienced psychological distress and to immediately contact either the VA suicide prevention hotline or the national suicide prevention hotline via phone or text if they needed immediate attention. Respondents were also provided several contacts for local mental healthcare providers as well as emergency contacts and providers of teletherapy. Though not required to participate in the study, respondents were offered the opportunity to provide their name as required by the IRB, and that information was kept separate from the de-identified study data.

Data Analysis

All data were analyzed using Statistical Package for the Social Sciences (SPSS) Version 26. The first hypothesis was evaluated using Pearson's correlation between rank and suicide exposure, then between MOS and suicide exposure. To examine the second hypothesis, we conducted a series of hierarchical multiple regressions to analyze the impact of suicide exposure on guilt, PTSD, and suicidal thoughts and behaviors. In stage 1 of the analyses, we entered military demographic controls of rank and MOS. In stage 2, we entered the six combat casualty experience variables. In the final stage, we entered suicide exposure. The resultant model tested the impact of suicide exposure on guilt, PTSD, and suicidal thoughts and behaviors, above and beyond combat casualty experiences, after controlling for military demographics.

To evaluate the third hypothesis, that the impact of each additional suicide exposure on psychological outcomes would peak at a certain threshold, we conducted trend analysis using quadratic regression to determine whether the data fit a linear or quadratic function better. If the data fit a quadratic function better, then we would have evidence of habituation, as there would have been a threshold level of suicide exposure after which further exposure did not result in greater deleterious psychological effects. In quadratic regression trend analysis, we added suicide exposure in stage 1 and suicide exposure squared in stage two of a hierarchical analysis for each criterion of interest. Then, we evaluated whether R^2_{Δ} and *F change* from stage 1 to stage 2 was significant, indicating that a quadratic, rather than linear, and therefore parabolic shape emerged in the data.

While there were no violations of homoscedasticity, linearity, or independence of residuals, two predictors were near, but not beyond, one threshold for multicollinearity.

These two variables—witnessing civilian casualties and feeling responsible for causing civilian casualties—had tolerances near, but above, .20. While the civilian casualty variables did not violate multicollinearity, their shared variance may help explain the surprising results regarding these two variables. Table 2 above displays the distributions of the combat experience variables. Note that the combat experience variables diverged from normality.

For purposes of analysis, observations greater than 3 standard deviations from the mean were trimmed to the next highest observation in accordance with the recommendations of Wilcox (2003). As a result, Enemy Responsible had an evaluated range of 0–100, Enemy Witness of 0–200, CIVCAS Responsible of 0–16. CIVCAS Witness of 0–100, Ally Responsible of 0–10, and Ally Responsible of 0–30. Finally, each criterion measure; guilt, suicidality, and PTSD symptoms; diverged modestly from normality. Due to violations of normality, all regression analyses were conducted using 1,000 bootstrapped samples. Results are presented below in terms of both standardized regression coefficients () and 95% confidence intervals around unstandardized regression coefficients (*B*).

RESULTS

Most respondents (*n* = 168, 91.3%) reported they knew at least one veteran or active-duty service member who had died by suicide. Mean suicide exposure in this sample was 4.38 (*SD* = 4.22; Range = 0–26). The most frequently endorsed veteran suicide exposure number was 3 (*n* = 39; 21.1%). Sixteen participants (8.7%) reported they knew more than 10 comrades who had died by suicide, and 3 (1.6%) respondents reported they knew more than 20.

Table 1 above presents demographic data and Table 2 above displays descriptives for several variables of interest from this study including suicide exposure, PC-PTSD 5 scores, SBQ-R scores, and PFQ-2 Guilt scores. The sample's demographics are compared to 2018 DoD data and subgroup analysis, which showed that the sample is whiter, more likely to have served in the Marines, and more likely to have had a combat-oriented MOS than DoD personnel at large. The differences are reported by Z-Scores determined by residual analysis between levels of each demographic variable in Table 1. Fourteen participants earned clinically noteworthy scores on the SBQ-R and 57 respondents endorsed a clinically significant number of responses to the PC-PTSD-5.

In support of Hypothesis 1, rank and MOS were each correlated with suicide exposure. As respondents endorsed higher ranks they had lower suicide exposure ($r = -.171$, $p < .05$). Those with higher scores on MOS, meaning they were in a support rather than combat-oriented occupational field, also had lower suicide exposure ($r = -.195$, $p < .01$).

Tables 3, 4 and 5 display the results of hierarchical regression analyses associated with hypothesis 2. Rank was

PREDICTOR	STAGE 1				STAGE 2				STAGE 3			
	R^2 = .046*				R^2 = .170***				R^2 = .186***			
		95 % C. I. B				95 % C. I. B				95 % C. I. B		
	β	LL	UL	sr^2	*β*	LL	UL	sr^2	*β*	LL	UL	sr^2
Rank	–.215**	–.286	–.051	.04	–.220**	–.291	–.055	.04	–.200**	–.225	–.038	.04
MOS	.004	–.332	.351	.00	.032	–.268	.415	.01	.052	–.223	.461	.01
Enemy Responsible					–.023	–.037	.032	.00	–.031	–.038	.031	.00
Enemy Witness					–.060	–.024	.016	.00	–.062	–.024	.016	.00
Civ Responsible					.137	–.035	.611	.01	.121	.071	.575	.01
Civilian Witness					.280**	.016	.085	.04	.304**	.020	.089	.04
Ally Responsible					.194*	.079	.750	.03	.178*	.056	.715	.03
Ally Witness					–.097	–.089	.030	.00	–.124	–.097	.022	.00
Suicide Exposure									.137	.064	–.008	.01

Table 3 Combat Experiences and Suicide Exposure as Predictors of Feelings of Guilt.

Note: N = 186. The dependent variable, Feelings of Guilt, is based on scores on the Guilt subscale of the PFQ-2 (Harder & Zalma, 1990).

95% C. I. B. is the 95% confidence interval around B.

LL and UL are the lower limit and upper limit of the 95% confidence interval around B, respectively.

sr^2 = Semi-partial r^2 is a measure of effect size.

PREDICTOR	STAGE 1				STAGE 2				STAGE 3			
	R^2 = .082***				R^2 = .185***				R^2 = .263***			
	95 % C. I. B				95 % C. I. B				95 % C. I. B			
	β	LL	UL	sr^2	*β*	LL	UL	sr^2	*β*	LL	UL	sr^2
Rank	–.231**	–.116	–.026	.05	–.226**	–.115	–.024	.04	–.181*	–.099	–.011	.03
MOS	–.114	–.232	.029	.01	–.106	–.226	.038	.01	–.062	–.182	.072	.00
Enemy Responsible					–.038	–.015	.012	.00	–.055	–.015	.010	.00
Enemy Witness					.090	–.005	.010	.00	.084	–.005	.010	.00
Civ Responsible					.065	–.072	.178	.00	.028	–.097	.142	.00
Civilian Witness					.122	–.005	.022	.02	.175	–.001	.025	.02
Ally Responsible					.187*	.027	.286	.03	.152*	.003	.151	.02
Ally Witness					–089	–.012	.033	.00	.029	–.019	.026	.00
Suicide Exposure									.299***	.064	.172	.08

Table 4 Combat Experiences and Suicide Exposure as Predictors of PTSD Symptom Endorsement.

Note: N = 186. The dependent variable, PTSD symptom endorsement, is based scores on the PC-PTSD-5 (Prins et al., 2016).

95% C. I. B. is the 95% confidence interval around B.

LL and UL are the lower limit and upper limit of the 95% confidence interval around B, respectively.

sr^2 = Semi-partial r^2 is a measure of effect size.

* $p < .05$, ** $p < .01$, *** $p < .001$.

PREDICTOR	STAGE 1				STAGE 2				STAGE 3			
	R^2 = .064**				R^2 = .125**				R^2 = .145***			
	95 % C. I. B				95 % C. I. B				95 % C. I. B			
	β	LL	UL	sr^2	*β*	LL	UL	sr^2	*β*	LL	UL	sr^2
Rank	–.248***	–.207	–.052	.05	–.267**	–.220	–.059	.05	–.244**	–.208	–.047	.04
MOS	–.017	–.251	.199	.00	.003	–.229	.238	.00	.025	–.196	.271	.00
Enemy Responsible					.231	–.007	.041	.00	.222	–.007	.040	.00
Enemy Witness					–.190	–.231	.022	.00	–.193	–.220	.022	.00
Civ Responsible					.042	–.162	.280	.00	.023	–.188	.253	.00
Civilian Witness					.131	–.008	.040	.01	.158	–.005	.043	.01
Ally Responsible					.108	–.075	.383	.01	.090	–.100	.257	.01
Ally Witness					.020	–.036	.044	.00	.010	–.043	.038	.00
Suicide Exposure									.151*	.002	.202	.02

Table 5 Combat Experiences and Suicide Exposure as Predictors of Suicidal Thoughts and Behaviors.

Note: N = 186. The dependent variable, Suicidal Thoughts and Behaviors, is based scores on the Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001).

95% C. I. B. is the 95% confidence interval around B.

LL and UL are the lower limit and upper limit of the 95% confidence interval around B, respectively.

sr^2 = Semi-partial r^2 is a measure of effect size.

* $p < .05$, ** $p < .01$, *** $p < .001$.

consistently an important predictor of favorable outcome, with increases in rank resulting in reduced scores on guilt, PTSD symptoms, and suicidality. However, MOS was not. When combat experiences were added to the models evaluating the impact of suicide exposure on guilt, PTSD, and suicidality (in stage 2), model fit improved dramatically for each criterion. Two combat experiences, witnessing the death or injury of a civilian, and feeling responsible for the

death or injury of a friendly comrade, were key predictors of both guilt and PTSD symptom endorsement, but not suicidal thoughts and behaviors. However, none of the enemy casualty variables were associated with negative psychological outcomes.

Results partially supported hypothesis 2. Suicide exposure predicted PTSD symptoms, and suicidal thoughts and behaviors above and beyond military demographic controls and combat experiences. After accounting for controls, suicide exposure uniquely accounted for 7.8% of the variance in PTSD symptom endorsement and 2.7% of the variance in suicidal thoughts and behaviors. However, suicide exposure was not related to guilt (sr^2 = .016, p = .06), in contrast with the second hypothesis. Since suicide exposure was the sole variable entered in the final stage of each model, we can interpret R^2_{Δ} as the variable's effect size, or the amount of total variance it uniquely accounted for in guilt, PTSD symptoms, and suicidal thoughts and behaviors, respectively.

Hypothesis 3 was not supported as quadratic regression showed no improvement in model fit from linear to quadratic stages. As such, no parabolic shape emerged in the data and there was no evidence of a threshold point after which there were reduced impacts of further suicide exposure on guilt, PTSD symptoms, or suicidal thoughts and behaviors. Each criterion variable, guilt (R^2_{Δ} = .010, p = .17), PTSD symptoms (R^2_{Δ} = .004 .01, p = .33), and suicidality (R^2_{Δ} = .010, p = .17) were better explained by linear analysis than by quadratic analysis. This linear relationship suggests that, in contrast to our hypothesis, there was no evidence of a habituation effect for suicide exposure on guilt, PTSD symptom endorsement, or suicidality.

DISCUSSION

The findings from the current study build upon previous research showing a connection between suicide exposure, depression, and anxiety, noting that when a veteran knows someone who has died by suicide, they report greater symptoms of depression and anxiety (Cerel et al., 2015) and suicidal ideation, suicide plans, and non-suicidal self-injurious (NSSI) behaviors (Hom et al., 2017). Findings from the current study indicate that suicide exposure is associated with PTSD severity and suicidality, and therefore may provide additional intervention targets. Specifically, the results indicate that for Post-9/11 veterans, greater suicide exposure leads to increased psychological distress, which may lead to suicidality.

MOS and rank were found to correlate with suicide exposure. Those with higher ranks endorsed lower levels of suicide exposure and those with support-oriented specialties did the same. Further, as rank decreased, guilt, PTSD severity, and suicidality all increased. These results are unsurprising given data from the United States Department of Veteran's Affairs Office of Mental Health and Suicide Prevention (VA, 2018) indicating that those at the greatest risk of suicide are those who held lower ranks. Additionally, as researchers have noted a link between combat exposure, guilt, and suicidal thoughts and behaviors (Bryan et al., 2013; McCue et al., 2021), and since MOS defines the missions a service member is likely to undertake and the people he or she is likely to undertake them with, it was expected that those with combat-oriented occupations would have greater suicide exposure than those with support-oriented roles. This suggests that MOS and rank may be useful additions to mental health risk assessments.

Of note, while previous studies have reported suicide exposure prevalence of 47% (Cerel et al., 2014) and 57% (Hom et al., 2017) in veteran communities, 91% of respondents in this sample knew at least one veteran who had died by suicide. It is possible that because all respondents in this survey had deployed to combat in accordance with the study's inclusion criteria, they had greater exposure to stressors associated with psychopathology. It may also be possible that the high number of respondents with combat-oriented MOSs may have resulted in increased suicide exposure, as we found that those with combat-oriented MOSs report greater suicide exposure than those in support-oriented specialties.

While adding combat experiences to the model improved model fit dramatically, an unanticipated result emerged from this set of predictors. Unexpectedly, witnessing a civilian killed or wounded was significantly associated with negative psychological outcomes, while feeling responsible for the death or injury of a civilian was not. It is possible that there is not a strong enough distinction between witnessing and feeling responsible for causing civilian casualties. Each of these variables had tolerances slightly above .20, which is one threshold for the assumption of multicollinearity. While other indicators of multicollinearity, such as Variance Inflation Factor (VIF = 10) and bivariate correlation (r =.7), were not close to thresholds for multicollinearity, future research may consider an operationalization that better differentiates between witnessing and feeling responsible for civilian casualties.

The implications of this research are noteworthy. Suicide is already a troubling problem for DoD and VA officials. As noted, veterans complete suicide at a rate of 1.5 times the population at large after controlling for factors such as age and race (VA, 2018). The findings of this study suggest that the more active and veteran service members a Post-9/11 veteran knows who have died by suicide, the more severe their symptoms of PTSD and suicidal thoughts and behaviors

are. As time passes, we may expect more members of this community to die by suicide, leaving their comrades with greater suicide exposure. This could be expected to result in further psychopathology and suicidality amongst their surviving comrades. As such, suicide amongst military affiliated communities is a problem that must be addressed to prevent it from becoming more prevalent than it already is.

This study was limited by several factors. First, the sample was extremely homogeneous in terms of several demographic variables including race and rank. While homogeneity in terms of branch of service was an intended feature of this study, as members of the US Army and US Marine Corps were more likely to deploy to Iraq or Afghanistan than members of the other US armed services, other forms of homogeneity were unintended. Due to the lack of diversity in this sample, the generalizability of the findings may be limited. Second, self-report data is subject to respondent under or over-reporting and is limited by the efficacy of the respondent's memory. Third, this study did not ask respondents about social closeness to the decedent(s). Since we used a continuous measure of suicide exposure, it could have been quite cumbersome, especially for those 16 respondents who knew more than 10 veterans who had died by suicide to capture their perceived closeness to each decedent. Future research may consider adopting a continuous operationalization of suicide exposure and an operational definition of social closeness that would allow researchers to capture this data. Fourth, this research did not include a measure of time since combat exposure. More recent experiences may be more consequential and, as time passes, one could expect suicide exposure to increase as well, which may have important implications for our analysis. Finally, our operational definition of rank, while we feel was an improvement over simply replicating the pay chart, could have been improved further. Using concepts often employed in trauma therapy such as index, or most impactful trauma, we could have captured the respondent's rank at the time of exposure rather than their highest rank, thus improving the quality of the construct (Resick, et al., 1992). Future research may consider adapting this study's definition of rank while limiting responses to rank at the time of a respondent's most distressing combat experience.

Despite these limitations, this is the first study to quantitatively evaluate whether knowing more veterans who have died by suicide increases reported guilt, PTSD symptoms, and suicidal thoughts and behaviors amongst Post-9/11 veterans of Iraq and/or Afghanistan. The findings suggest that suicide exposure is associated with more severe psychological disturbances and that an observational learning effect may be present. Armed with this knowledge, clinicians can tailor interventions to those active and veteran service members who have lost comrades to suicide by focusing on how similar others have overcome hopeless situations without resorting to suicide. To reinforce the efforts of clinicians, public and nonprofit organizations may consider a modeling campaign that shares stories about service members who have emerged from suicidality without taking their lives.

DATA ACCESSIBILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

COMPETING INTERESTS

The authors have no competing interests to declare.

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