



## RESEARCH ARTICLE

# Investigating the effects of suicide exposure among a clinical sample of active duty service members

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## Abstract

Suicide exposure warrants further investigation as a risk factor for suicide among military service members. This study aimed to examine associations among suicide exposure, suicidal ideation (SI), and psychological symptoms in a clinical sample of service members ( $N = 1,565$ , 64.4% suicide-exposed) and identify how one's relationship with the deceased impacts suicidality and psychological health in exposed individuals. A secondary analysis of cross-sectional survey data was conducted. Generalized linear regression analyses were used to identify associations between suicide exposure and both current SI and psychological symptoms among all participants; the associations between suicide exposure characteristics and psychological symptoms were only examined among exposed individuals. Exposure was not significantly associated with higher SI,  $\beta = .007$ ,  $SE = .16$ ,  $p = .965$ , but was associated with PTSD,  $\beta = 1.60$ ,  $SE = 0.49$ ,  $p = .001$ ; anxiety,  $\beta = .68$ ,  $SE = .31$ ,  $p = .031$ ; and insomnia symptoms,  $\beta = .98$ ,  $SE = .25$ ,  $p < .001$ . Among participants who had been exposed, high/long impact of exposure was positively associated with SI,  $\beta = 0.94$ ,  $SE = .26$ ,  $p < .001$ , and psychological symptoms, PTSD:  $\beta = 2.32$ ,  $SE = .77$ ,  $p = .002$ ; anxiety:  $\beta = 1.39$ ,  $SE = .50$ ,  $p = .005$ ; insomnia:  $\beta = .96$ ,  $SE = .39$ ,  $p = .015$ . Results illustrate the significant issue of suicide exposure within the military and show consideration of suicide exposure as a potential risk factor for adverse psychological outcomes is warranted.

Despite concerted prevention efforts, military suicide rates have risen for more than a decade (Armed Forces Health Surveillance Center [AFHSC], 2014; Psychological Health Center of Excellence [PHCoE], 2020). Suicide is currently the second leading cause of death within the military, with approximately 500 U.S. active duty service members and Reserve and National Guard personnel dying by suicide each year and thousands more attempting to end their lives (PHCoE, 2020). Although many risk and protec-

tive factors for suicide have been documented, researchers and clinicians still struggle to accurately identify individuals who are at high risk (Franklin et al., 2017). As such, novel approaches to the investigation of risk factors for suicide are critically needed to provide timely, evidence-based prevention and treatment efforts.

Emerging evidence suggests that suicide exposure (e.g., knowing someone who died by suicide) warrants further investigation among service members as a potential

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risk factor for suicide (Borges et al., 2017; Bryan et al., 2017; Hom et al., 2017). Research indicates that following the suicide death of a relative, friend, or colleague, individuals may experience an increased risk of suicidality. For instance, a large, random digit dial survey of adults in the United States reported that suicide-exposed individuals were significantly more likely to report suicidal ideation than those who had not been exposed (Cerel et al., 2016). Additionally, a study of a combined group of service members and veterans found that those who had been exposed to suicide were not only more likely to report suicidal ideation (SI) but also to report suicide plans and attempts (Hom et al., 2017). These findings are concerning, especially given that approximately half of service members, veterans, and civilian adults have known someone who died by suicide (Bryan et al., 2017; Cerel et al., 2015, 2016; Feigelman et al., 2018; van de Venne et al., 2020) and that for each suicide death, up to 135 people are exposed (Cerel, Brown, et al., 2019). A lack of data on the impact of suicide exposure specific to service members is problematic because it limits scholars' ability to determine how this population is affected while in service, and it impedes the development of tailored postvention efforts that could be administered by the military or community providers working with service members soon after exposure to suicide.

In addition to a need for focused research on the effects of suicide exposure among service members, it is imperative to explore why those who are exposed may be at higher risk for suicidality. An examination of psychological symptoms among the exposed may help elucidate who has a higher risk of suicidality. The death of a loved one or acquaintance may be traumatic, and trauma can have broad impacts on psychological health and functioning. Several studies have reported an association between suicide exposure and elevated levels of psychological symptoms, such as anxiety, depression, posttraumatic stress disorder (PTSD), and/or feelings of thwarted belongingness (Bryan et al., 2017; Campos et al., 2020; Cerel, Jones, et al., 2019; Cerel et al., 2016; Hom et al., 2018; Van Orden et al., 2010; Weisenhorn et al., 2016). Less information is available about two other highly prevalent issues among service members—substance use and sleep disruption—as they relate to the trauma of suicide exposure (Lande, 2012; Sinha, 2016; U.S. Department of Veterans Affairs [VA], 2007). One study has examined drinking as an outcome of suicide exposure in military personnel (Bryan et al., 2017), and none have examined sleep disturbance, although one case study mentioned insomnia in a unit following the suicide of a comrade (Carr, 2011; Lande, 2012). Although these symptoms are all known predictors of suicide (Borges et al., 2017; Liu et al., 2020), no prior study, to our knowledge,

has determined the extent to which they explain suicidality in suicide-exposed service members. This is critical, as theoretically, psychological symptoms could increase suicidal thoughts and behavior as individuals may desire to control or escape the negative cognitions and emotions they experience (Gilbert & Allan, 1998). Further understanding the association between psychological symptoms and suicidal thoughts and behavior could inform clinical treatment strategies among individuals who seek care.

When evaluating the association between suicide exposure and suicidality among service members, it may also be important to explore the individual's relationship with the deceased. Existing research shows the effect of exposure may vary by one's relationship with the deceased (e.g., friend, partner; Bryan et al., 2017; Cerel et al., 2017; Hom et al., 2017). However, data indicate that beyond the nature of this relationship, perceived closeness to the deceased may be a stronger risk factor for adverse psychological outcomes following suicide exposure (Soberay et al., 2022). Additionally, evidence shows the perceived impact of the death may also be relevant to risk level (Soberay et al., 2022). Specifically, in several studies, suicide-exposed individuals were asked to report the degree to which their lives were disrupted by the death, and the results showed the perceived impact was associated with poorer psychological outcomes and suicidality. One study even found that perceived impact contributed more to the odds of adverse outcomes than closeness to the decedent (Bryan et al., 2017; Cerel et al., 2017; Hom et al., 2017).

As the number of service members who die by suicide rises, so does the number of those who are exposed. Service members may be uniquely affected by suicide exposure due to the cultural norms and challenges that characterize military service, such as access to lethal means (i.e., firearms) and behavioral health stigma (Pak et al., 2020; Peterson et al., 2022). Thus, understanding the association between suicide exposure and subsequent suicidality is critically needed to reduce the impact of suicide on individuals and across the Armed Forces. This study adds to the existing body of knowledge by exploring the links between exposure to suicide and SI within a large group of active duty service members. The study aims were to (a) determine the associations between suicide exposure, SI, and other psychological symptoms; (b) ascertain whether the association between suicide exposure and psychological health differed by service member characteristic; and (c) explore how characteristics of one's relationship with the deceased impacts SI and psychological health among individuals exposed to suicide. The study findings can be directly used to identify high-risk service members following suicide exposure and refine the postvention support offered.

## METHOD

### Participants and procedure

Study data were derived from the Military Suicide Research Consortium (MSRC) Common Data Elements (CDE) database (Gai et al., 2021). CDE are common items related to suicide (see Measures) collected by MSRC-funded studies. The method of administering CDE varied across the studies and included in-person, telephone, and online survey administration. Additionally, participant characteristics varied by study and site, with studies including veterans, active duty service members, suicide survivors, and/or civilians in community and clinical settings. For the present study, only records for participants who reported current active duty service at the time of CDE completion ( $N = 1,714$ ) were included. Of those, we excluded participants who were missing responses for any of the following variables: gender ( $n = 6$ ), history of suicide exposure ( $n = 15$ ), current SI ( $n = 7$ ), prior suicidal attempts ( $n = 32$ ), or current psychological symptoms or interpersonal factors ( $n = 80$ ). Excluding participants with missing data for these variables resulted in the exclusion of participants from community-based CDE studies; thus, the final study sample was a clinical sample of 1,565 active duty military personnel. Due to the relatively small number of missing observations, we used the complete case analysis. Approval to use these data was obtained by MSRC and the U.S. Army Medical Research and Development Command Human Research Protection Office. The study protocol was determined to be exempt by the San Diego State University Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects. This work was reviewed and approved by the U.S. Army Medical Research and Development Command, Human Research Protection Office.

### Measures

All constructs were measured using validated scales, although some were adapted by MSRC CDE researchers. Descriptions of the survey items used in the MSRC CDE to assess each construct of interest are presented here, and more information can be found in Ringer et al. (2018) and Gai et al. (2021).

#### Current SI

The primary outcome of interest in this study, SI, was assessed using the four-item Depression Symptom Index Suicidality Subscale (Joiner et al., 2002). Participants

reported SI over the past 2 weeks on a 4-point scale ranging from 0 (*no or low indication of SI*) to 3 (*frequent or current SI*), with higher scores indicating higher SI. A sum score of all items was used for study analyses (range: 0–12). In the present sample, internal consistency was good, Cronbach's  $\alpha = .87$ .

#### Psychological health symptoms

**PTSD.** Symptoms of PTSD related to very stressful military experiences, using PTSD criteria outlined in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; American Psychiatric Association, 2013), were assessed using an eight-item version of the PTSD Checklist for *DSM-5* (Weathers et al., 2013). The items assessed symptoms over the past month (e.g., “How much have repeated, disturbing memories, thoughts, or images of a stressful military experience bothered you in the last month?”) on a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*). Items were summed for analysis (range: 8–40). In the present sample, internal consistency was very good, Cronbach's  $\alpha = .92$ .

**Anxiety.** An abbreviated version of the Anxiety Sensitivity Index–3 Cognitive Concerns subscale (Taylor et al., 2007) was used to assess the severity of concern related to anxiety symptoms. Five items (e.g., “When my thoughts seem to speed up, I worry that I might be going crazy”) were rated on a 5-point scale ranging from 0 (*very little*) to 4 (*very much*). A sum score of all items was used, with higher scores indicating higher symptom levels (range: 0–20). In the present sample, internal consistency was good, Cronbach's  $\alpha = .87$ .

**Insomnia.** Five items from the Insomnia Severity Index (Morin et al., 2011) were used to assess insomnia severity and its interference with daily activities. Items assessing insomnia severity (e.g., difficulty falling asleep) were rated on a 5-point scale ranging from 0 (*none*) to 4 (*very severe*). Similarly, items assessing insomnia interference with daily activities (e.g., “To what extent do you consider your sleep problem to interfere with your daily functioning currently?”) were rated on a 5-point scale (0 = *not at all*, 4 = *very much*). A sum score of all items was computed, with higher scores signifying more severe insomnia (range: 0–20). In the present sample, Cronbach's alpha was .81.

**Alcohol use.** The three-item Alcohol Use Disorders Identification Test (AUDIT-C; Bradley et al., 2003; Bush et al., 1998) was used to assess the frequency and quantity of alcohol consumption in the past year (e.g., “How often did you have a drink containing alcohol in the past year?”). Items were rated on a scale of 0–4 and summed, with higher scores representing higher levels of alcohol misuse (range: 0–12). In the present sample, Cronbach's alpha was .86.

## Interpersonal factors

**Thwarted belongingness.** A five-item version of the Interpersonal Needs Questionnaire Thwarted Belongingness subscale (Gutierrez et al., 2016; Van Orden et al., 2012) was used to assess feelings of social disconnect (e.g., “These days, I feel disconnected from other people”). Items were rated on a 7-point scale ranging from 1 (*not at all true for me*) to 7 (*very true for me*). A mean score of items was computed for analyses (range: 1–7), with higher scores indicating a higher level of greater thwarted belongingness. In the present sample, Cronbach’s alpha was .90.

**Prior suicide attempts.** A free-response item was included to assess prior suicide attempts: “How many times in your lifetime have you made an attempt to kill yourself during which you had at least some intent to die?” (Gai et al., 2021). Responses were categorized as 0, 1, 2, 3, and 4 or more.

## Suicide exposure

**History of suicide exposure.** Suicide exposure was assessed with a single “yes” or “no” item, “Do you know anyone who died by suicide?” (Gai et al., 2021). A “yes” response prompted the following additional questions about the suicide death.

**Characteristics of suicide death.** Three items were used to elicit details about the suicide death among participants who reported exposure. First, participants reported their relationship with the decedent in an open-response format. Three members of the study team reviewed all responses and categorized them into the following four categories: spouse/partner/family member, comrade, friend, and other/unknown. Second, participants were administered the two-item Suicide Exposure Experience Screener (SEES; Cerel et al., 2017; Maple et al., 2022). Respondents were asked to report their degree of closeness with the decedent on a 5-point scale ranging from 1 (*not close*) to 5 (*very close*) as well as the impact of suicide exposure on their life, choosing one of the following options: 1 (*the death had little effect on my life*), 2 (*the death had somewhat of an effect on my life*), 3 (*the death disrupted my life for a short time*), 4 (*the death disrupted my life in a significant way but no longer does*), or 5 (*the death had a significant effect on my life and still does*). In line with previous research (Cerel et al., 2014, 2017; Maple et al., 2019), responses to the suicide impact item were dichotomized into low or short-term impact (i.e., a rating of 1–3) and high or long-term impact (i.e., a rating of 4–5).

## Demographic characteristics and military service

Respondents provided their age (18–25 years, 25 years or older), gender (man, woman), race/ethnicity (Hispanic/Latinx, non-Hispanic Black, non-Hispanic White, all other racial and ethnic groups not included in the previous categories), educational attainment (high school diploma or equivalent, some college, college degree or more), relationship status (married or cohabitating, single, divorced or separated), and service branch (Air Force, Army, Coast Guard, Marine Corps, Navy).

## Data analysis

Descriptive statistics were computed for all variables, including means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Generalized linear regression analyses were used to identify associations between suicide exposure and current SI and psychological symptoms, controlling for prior suicide attempts and sociodemographic variables. To assess the first study aim (i.e., associations between suicide exposure, SI, and other psychological symptoms), point estimates and 95% confidence intervals (CIs) were computed. We also conducted mediation analyses to quantify the extent to which psychological symptoms separately and jointly mediated the association between suicide exposure and SI (Cheng et al., 2021; Hertzmark et al., 2018; Nevo et al., 2017). The mediation effect of these factors was quantified by comparing the models with and without the mediating variables using the following formula:  $1 - (\beta_{\text{mediator model}} / \beta_{\text{base model}}) \times 100$  (Hertzmark et al., 2018). The SAS %MEDIATE macro (Hertzmark et al., 2018) was used to calculate the proportion of the effect of the association between suicide exposure and SI that was mediated by psychological symptoms (i.e., PTSD, anxiety, depression, insomnia, and alcohol abuse symptoms). To investigate whether the effect of suicide exposure on suicide ideation differed by participant characteristics (i.e., the second study aim), we conducted interaction analyses with gender, age, and race/ethnicity separately. After finding a statistically significant interaction effect of gender and age among women only, we conducted regression analyses stratified by gender and age.

To investigate the third study aim (i.e., associations between the characteristics of suicide exposure and SI), we restricted the sample to participants who reported suicide exposure ( $n = 985$ ) and conducted the generalized linear regression to identify associations between

characteristics of suicide exposure (i.e., relationship to the decedent, degree of closeness with the decedent, and impact of suicide exposure) and each outcome separately (i.e., current SI, psychological symptoms, and interpersonal factor variables) while controlling for prior suicide attempts and sociodemographic variables. The test for interaction between characteristics of suicide exposure and participant characteristics (gender, race/ethnicity, age) was then repeated, but no interactions were observed. All analyses were conducted using SAS (Version 9.4) with significance tests set at an alpha level of .05.

## RESULTS

### Participant characteristics, psychological symptoms, and suicide exposure

Participant characteristics, suicide exposure, and psychological outcomes are shown in Table 1, stratified by gender for all included participants ( $N = 1,565$ ). Participants were generally younger than 25 years ( $n = 957$ , 61.1%), non-Hispanic White ( $n = 893$ , 57.1%), and unmarried ( $n = 978$ , 62.5%). Approximately half ( $n = 757$ , 48.4%) of the sample reported making at least one lifetime suicide attempt, and nearly two thirds ( $n = 1,009$ , 64.5%) reported exposure to suicide. Characteristics of suicide exposure among individuals who reported knowing at least one person who died by suicide ( $n = 985$ ) are shown in Table 2. Most of these individuals ( $n = 659$ , 66.9%) reported low/short-term impact of the exposure, though approximately two thirds ( $n = 630$ , 64.0%) reported being at least somewhat close to the decedent. Nearly one in five exposed participants ( $n = 176$ , 18.4%) reported losing a comrade to suicide.

### Associations between suicide exposure, psychological symptoms, and SI

Results of the general linear models examining the associations between suicide exposure, SI, and each of the psychological outcomes of interest are shown in Table 3. Among all participants, suicide exposure was not significantly associated with SI,  $p = .965$ , although it was associated with symptoms of PTSD,  $p < .001$ ; anxiety,  $p < .031$ ; and insomnia,  $p < .001$ .

To determine if the association between suicide exposure and SI differed by participant characteristics, interactions were examined for gender, age, and race/ethnicity. Due to a significant interaction by gender,  $\beta = -.93$ ,  $SE = 0.39$ ,  $p = .040$ , multivariate models were stratified by gender. The analyses of servicewomen were further stratified by age (i.e., 18–24 years, 25 years or older) due to a signifi-

cant interaction by age among women only,  $\beta = -1.70$ ,  $SE = 0.76$ ,  $p < .019$ . Thus, three models are presented in Table 4: all men, women younger than 25 years, and women 25 years of age and older. Among servicemen of all ages, suicide exposure was not significantly associated with SI,  $\beta = .06$ ,  $SE = 0.18$ ,  $p = .724$ , though symptoms of insomnia,  $\beta = 0.08$ ,  $SE = 0.02$ ,  $p < .001$ ; alcohol misuse,  $\beta = 0.09$ ,  $SE = 0.02$ ,  $p < .001$ ; and thwarted belongingness,  $\beta = -.43$ ,  $SE = 0.05$ ,  $p < .001$ , were. Furthermore, men who were single,  $\beta = .489$ ,  $SE = 0.20$ ,  $p = .015$ , endorsed significantly higher SI than those who were married. Men who identified as biracial, Asian, Pacific Islander, and/or Native American or Alaskan reported significantly lower degrees of SI,  $\beta = -.57$ ,  $SE = 0.27$ ,  $p = .041$ , than non-Hispanic White men. Among women younger than 25, suicide exposure was not significantly associated with SI,  $\beta = -.415$ ,  $SE = 0.37$ ,  $p = 0.269$ ; however, symptoms of anxiety,  $\beta = .095$ ,  $SE = 0.03$ ,  $p = .004$ , were positively associated with SI, whereas thwarted belongingness was inversely associated with suicide ideation  $\beta = -.571$ ,  $SE = 0.11$ ,  $p < .001$ . Additionally, within this age group, non-Hispanic Black women reported significantly lower levels of SI than non-Hispanic White women,  $\beta = -1.62$ ,  $SE = 0.46$ ,  $p < .001$ . Among women 25 years of age and older, suicide exposure was associated with lower SI,  $\beta = -2.12$ ,  $SE = 0.68$ ,  $p = .002$ , and no behavioral health symptoms or other characteristics were associated with SI following exposure to suicide.

### Associations between characteristics of suicide exposure, psychological symptoms, and SI

Table 5 shows the association between characteristics of suicide exposure, SI, and other psychological symptoms among participants who reported exposure to suicide ( $n = 985$ ). High/long-term impact of exposure was positively associated with SI,  $\beta = .94$ ,  $SE = 0.26$ ,  $p < .001$ , as well as PTSD,  $\beta = 2.32$ ,  $SE = 0.77$ ,  $p = .002$ ; anxiety,  $\beta = 1.39$ ,  $SE = 0.50$ ,  $p = .005$ ; and insomnia,  $\beta = .96$ ,  $SE = 0.39$ ,  $p = .015$ ; it was not associated with alcohol misuse. In addition, it was inversely associated with thwarted belongingness,  $\beta = -.40$ ,  $SE = 0.13$ ,  $p = .003$ . Compared with the degree of SI among individuals who reported the suicide death of a comrade, suicide ideation was significantly lower among those who reported the death of a close friend,  $\beta = -.65$ ,  $SE = 0.29$ ,  $p = .022$ , or whose relationship to the deceased was categorized as “other/unspecified,”  $\beta = -.83$ ,  $SE = 0.35$ ,  $p = .019$ . This finding was also observed when examining symptoms of PTSD and depression. SI was lower among individuals who reported any degree of closeness to the decedent compared with those who described the

TABLE 1 Participant characteristics, psychological health symptoms, and suicide exposure

Variable	All participants ( <i>N</i> = 1,565)				Men ( <i>n</i> = 1,226)				Women ( <i>n</i> = 339)			
	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>n</i>	%	<i>M</i>	<i>SD</i>
Age (years)												
< 25	957	61.1			721	58.8			236	69.6		
≥ 25	608	38.9			505	41.2			103	30.4		
Race/ethnicity												
Asian or Pacific Islander	47	3.0			31	2.5			86	25.4		
Hispanic/Latinx	243	15.5			186	15.2			57	16.8		
Native American or Alaskan	17	1.1			12	0.9			16	4.7		
Non-Hispanic Black	247	15.8			161	13.1			5	1.5		
Non-Hispanic White	893	57.1			748	61.0			145	42.8		
Unknown, biracial, or multiracial	118	7.5			88	7.2			30	8.8		
Educational attainment												
High school diploma/equivalent	799	51.1			639	52.1			160	47.2		
Some college	648	41.4			501	40.9			147	43.4		
College degree or higher	118	7.5			86	7.0			32	9.4		
Marital status												
Single	740	47.3			569	46.4			171	50.4		
Married/cohabitating	587	37.5			471	38.4			116	34.2		
Divorced/separated	238	15.2			186	15.2			52	15.3		
Service branch												
Army	697	44.5			579	47.2			118	34.8		
Air Force	28	1.8			22	1.8			6	1.8		
Coast Guard	12	0.8			8	0.7			4	1.2		
Marine Corps	328	21.0			270	22.0			58	17.1		
Navy	500	32.0			347	28.3			153	45.1		
Exposed to suicide	1,009	64.5			801	65.3			208	61.4		
Behavioral health												
PTSD symptoms <sup>a</sup>			19.85	9.58			19.56	9.38			20.92	10.21
Anxiety symptoms <sup>b</sup>			12.84	6.00			12.67	5.87			13.45	6.41
Insomnia symptoms <sup>c</sup>			11.27	4.79			11.17	4.79			11.62	4.79
Alcohol misuse <sup>d</sup>			3.19	3.25			3.35	3.31			2.62	2.98
Thwarted belongingness <sup>e</sup>			4.22	1.63			4.24	1.62			4.16	1.65
Suicidality <sup>f</sup>			3.59	3.11			3.60	3.12			3.56	3.12
Prior suicide attempt												
Never	808	51.6			665	53.4			153	45.1		
1	441	28.2			336	27.4			105	31.0		
2	152	9.7			106	8.6			46	13.6		
3	67	4.3			52	4.2			15	4.4		
≥ 4	97	6.1			77	6.3			20	5.9		

Note: *N* = 1,565. PTSD=posttraumatic stress disorder.

<sup>a</sup>Assessed using an eight-item version of the PTSD Checklist for DSM-5 (total score range: 8–40).

<sup>b</sup>Assessed using a three-item version of the Anxiety Severity Index (total score range: 5–20).

<sup>c</sup>Assessed using a five-item version of the Insomnia Severity Index (total score range: 0–20).

<sup>d</sup>Assessed using the three-item AUDIT-C (total score range: 0–15).

<sup>e</sup>Assessed using a five-item version of the Interpersonal Needs Questionnaire thwarted belongingness subscale (mean score range: 1–7).

<sup>f</sup>Assessed using a four-item version of the Depression Symptom Index-Suicidality Subscale (total score range: 0–12).

**TABLE 2** Characteristics of suicide exposure

Variable	n	%
Impact of exposure		
Low/short-term impact	659	66.9
High/long-term impact	326	33.1
Degree of closeness (range: 1–5)		
1 ( <i>not close</i> )	183	18.6
2	171	17.4
3 ( <i>somewhat close</i> )	245	24.9
4	212	21.5
5 ( <i>very close</i> )	173	17.6
Relationship to deceased		
Spouse/partner/close family	218	22.7
Comrade	176	18.4
Close friend	403	42.1
Other/unspecified	161	16.8

Note:  $n = 985$ .

relationship as “not close.” Several other participant characteristics were associated with SI among individuals exposed to suicide. Younger age was associated with higher degrees of SI,  $\beta = -.04$ ,  $SE = 0.02$ ,  $p = .043$ . Individuals who identified as non-Hispanic Black,  $\beta = -.63$ ,  $SE = 0.29$ ,  $p = .035$ , or Hispanic/Latinx,  $\beta = -.61$ ,  $SE = 0.28$ ,  $p = .029$ , reported significantly lower SI compared with non-Hispanic White individuals. Mediation analyses were also conducted to determine whether the association between the impact of suicide exposure and SI could be explained, at least in part, by the other psychological symptoms. The results indicated significant mediation such that 28.6%,  $p = .001$ , of the proportion of the effect of the impact of exposure on SI was explained by the combination of PTSD, anxiety, insomnia, alcohol misuse, and thwarted belongingness.

## DISCUSSION

Suicide is a pervasive problem in the military, with thousands of service members ending or attempting to end their lives annually, leaving behind friends, family members, and comrades (AFHSC, 2014; PHCoE, 2020). The study results show that the psychological impact of suicide exposure can be profound and varied among service members, and they also indicate that additional research may be needed to determine who may be most impacted, in what ways, and why. Contrasting prior reports (Hom et al., 2017; Maple et al., 2019), overall, individuals who reported exposure to suicide did not exhibit significantly higher symptoms of SI. Further, after stratifying the analyses by age and gender, we observed that SI was lower

among women over 25 who had been exposed to suicide than those who had not been exposed. These findings could reflect the unique population given that most prior suicide exposure research has included civilians, veterans who had separated from service, and/or National Guard personnel. It is possible that clinical samples of active duty service members may have higher levels of social support, connectedness, and resources to mitigate the impact of exposure. It is also possible that women who engage in coping strategies are more likely to reduce suicidality (e.g., accessing healthcare services) or experience a higher degree of posttraumatic growth in response to suicide exposure, as some prior studies have noted gender differences in these constructs (e.g., Mackenzie et al., 2006; Matheson et al., 2014; Thompson et al., 2016; Vishnevsky et al., 2010).

Although suicide exposure was not associated with SI in this study, significant associations between exposure and PTSD symptoms, anxiety symptoms, and feelings of thwarted belongingness were observed, replicating results of prior studies, including nonclinical research studies (Bryan et al., 2017; Cerel et al., 2015; Hom et al., 2017). We also sought to extend this line of research by examining symptoms of insomnia and alcohol misuse; only the former were significantly associated with exposure. Of note, the AUDIT-C assesses alcohol use over the past year, whereas the other psychological measures assess symptoms within the past 2–4 weeks. This may explain the divergent findings related to alcohol use. The connection between insomnia and suicide exposure may have important implications for suicide postvention screening and intervention among service members. Because mental health treatment stigma is a concern within the active duty community, service members may fail to report psychological symptoms or may even delay or avoid treatment (Stecker et al., 2013). In contrast, they may be more willing to report and engage in interventions related to sleep disruption (Hom et al., 2016), such as cognitive behavioral therapy for insomnia (Taylor et al., 2019) or image rehearsal therapy (Krakow & Zadra, 2006, 2010). Sleep interventions could mitigate other psychological symptoms (Schmied et al., 2022) and/or serve as a pathway toward engaging in psychological treatment for comorbid conditions.

This study further expands upon the existing literature by examining the mechanisms through which suicide exposure may relate to suicidality among individuals who have been exposed to suicide. Mediation analyses revealed that a substantial portion of the effect of the impact of exposure on SI was explained by the psychological symptoms assessed. Although cross-sectional data do not allow for causal inferences to be made, these results could be of use to clinicians when treating service members

TABLE 3 Associations between suicide exposure and suicidality, psychological health symptoms, and interpersonal factors

Variable	Suicidal ideation <sup>a</sup>		PTSD symptoms		Anxiety symptoms		Insomnia symptoms		Alcohol misuse		Thwarted belongingness	
	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE
Suicide exposure	.007	0.16	1.60	0.49**	.68	0.31*	.98	0.25***	.05	0.17	-.00	0.08
Prior suicide attempts	.22	0.06**	.68	0.18***	.51	0.12***	.33	0.09***	.09	0.06	-.09	0.03**
Male gender	.01	0.19	1.39	0.57*	.90	0.37*	.55	0.29	-.72	0.20**	-.08	0.10
Age (years)	-.12	0.19	3.34	0.57***	1.03	0.36**	.31	0.29	.17	0.20	-.08	0.10
Race/ethnicity												
Non-Hispanic White (Ref.)	-	-	-	-	-	-	-	-	-	-	-	-
Biracial, Asian, Pacific Islander, Native American, or Alaskan	-.55	0.25	1.61	0.75*	.05	0.48	.66	0.38	-.36	0.26	.05	0.13
Hispanic/Latinx	-.54	0.22	-.69	0.67	-.03	0.43	-.45	0.34	.10	0.23	.00	0.12
Non-Hispanic Black	-.53	0.22	1.69	0.67*	-.24	0.43	-.61	0.34	-.17	0.24	.08	0.12
Educational attainment												
High school diploma/equivalent (Ref.)	-	-	-	-	-	-	-	-	-	-	-	-
Some college	.33	0.17	1.46	0.52**	.69	0.33*	.46	0.26	.20	0.18	-.03	0.09
College degree or higher	.37	0.33	1.87	0.98	-.85	0.64	-.12	0.50	-.00	0.34	.18	0.17
Marital status												
Married/cohabitating (Ref.)	-	-	-	-	-	-	-	-	-	-	-	-
Divorced/separated	.40	0.24	-.01	0.70	-.18	0.45	.32	0.36	.82	0.24**	-.15	0.09
Single	.38	0.18	-1.00	0.55	-.29	0.35	-.79	0.27**	.62	0.19**	-.08	0.09
Model statistics	$R^2 = .02,$	$p < .001$	$R^2 = .09,$	$p < .001$	$R^2 = .03,$	$p < .001$	$R^2 = .04,$	$p < .001$	$R^2 = .02,$	$p < .001$	$R^2 = .01,$	$p = .290$

Note:  $N = 1,565$ . PTSD = posttraumatic stress disorder; Ref. = reference category.

<sup>a</sup>Each column represents a multivariable linear regression model.

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



**TABLE 4** Associations between suicide exposure and suicidality, stratified by age and gender

Variable	Men, all ages ( <i>n</i> = 1,226) <sup>a</sup>		Women, 18–24 years ( <i>n</i> = 236)		Women, ≥ 25 years ( <i>n</i> = 103)	
	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>	<i>B</i>	<i>SE</i>
Suicide exposure	.06	0.18	−.41	0.37	−2.12	0.68*
Psychological health symptoms						
Prior suicide attempt	.13	0.06	.11	0.15	−.03	0.24
PTSD	.02	0.01	.01	0.02	−.04	0.04
Anxiety	.03	0.02	.09	0.03**	.12	0.07
Insomnia	.08	0.02**	.01	0.05	.09	0.07
Alcohol misuse	.09	0.02**	.07	0.06	.07	0.10
Thwarted belongingness	−.43	0.05***	−.57	0.11***	−.13	0.20
Characteristics						
Race/ethnicity						
Non-Hispanic White (Ref.)	−	−	−	−	−	−
Biracial, Asian, Pacific Islander, Native American, or Alaskan	−.57	0.27*	−.34	0.56	−.89	0.89
Hispanic/Latinx	−.42	0.24	−.73	0.53	−.55	0.89
Non-Hispanic Black	−.32	0.25	−1.62	0.46**	−.55	0.89
Educational attainment						
High school diploma/equivalent (Ref.)	−	−	−	−	−	−
Some college	.18	0.19	.32	0.39	1.17	0.95
College degree or higher	.29	0.36	1.29	1.19	1.62	1.06
Relationship status						
Married/cohabitating (Ref.)	−	−	−	−	−	−
Divorced/separated	.28	0.25	.50	0.63	−.15	0.79
Single	.49	0.20*	.07	0.41	−.36	0.75
Model statistics	$R^2 = .14, p < .001$		$R^2 = .27, p < .001$		$R^2 = .02, p = .050$	

Note: PTSD = posttraumatic stress disorder; Ref. = reference category.

<sup>a</sup>Each column represents a multivariable linear regression model.

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

following suicide exposure. For example, implementing cognitive behavioral therapies could lessen the impact of suicide exposure by reducing and managing symptoms of psychological disorders, such as PTSD, anxiety, and insomnia. Ensuring that symptoms are managed could, in turn, mitigate the impact of the suicide exposure and potentially prevent ideation or behaviors from developing or worsening.

Another aim of this study was to determine whether characteristics of suicide exposure, including one's relationship with the decedent, exacerbated the psychological impact of the suicide. Among exposed service members in the sample, those who reported that the death had a high/long-term impact on them had significantly higher levels of SI, PTSD, anxiety, insomnia, and thwarted belongingness, indicating a critical need for peers, military leaders, and clinicians to ask service members about the perceived impact from all suicide exposures (Maple et al., 2022). Additionally, the study findings illustrate the

substantial impact of the suicide death of a fellow service member: SI among service members who lost a comrade was comparable to that reported by those who lost a partner or close family member, and PTSD symptoms were lower among those who lost a partner or family member compared with a comrade. This is particularly important considering that nearly 1 in 5 participants reported losing a comrade to suicide, and that degree of closeness was, curiously, inversely related to suicidality. Stated differently, SI was lower among service members who reported any degree of closeness to the decedent compared with those who were not close.

These findings could reflect access to or willingness to seek out resources following suicide exposure. Compared with service members who lose someone in the periphery of their social circle, those who lose an immediate family member, partner, or a "battle buddy" may receive more support from others, including requirements to engage in postvention. Alternatively, the closer an individual is to a

TABLE 5 Associations between characteristics of suicide exposure and suicidality, psychological health symptoms, and interpersonal factors

Variable	Suicidality <sup>a</sup>		PTSD symptoms		Anxiety symptoms		Insomnia symptoms		Alcohol misuse		Thwarted belongingness	
	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE
Impact of exposure												
Low/short-term impact (Ref.)	–	–	–	–	–	–	–	–	–	–	–	–
High/long-term impact	.94	0.26**	2.32	0.77**	1.39	0.50**	.96	0.39*	–.17	0.27	–.40	.13**
Degree of closeness												
1 ( <i>not close</i> ) (Ref.)	–	–	–	–	–	–	–	–	–	–	–	–
2	–.67	0.33*	2.21	1.00*	.58	0.65	.17	0.51	–.09	0.35	–.10	0.17
3 ( <i>somewhat close</i> )	–.73	0.33*	1.31	0.98	–.02	0.63	.70	0.50	.19	0.34	–.23	0.17
4	–.85	0.35*	0.76	1.08	–.38	0.69	.42	0.55	–.12	0.38	.01	0.19
5 ( <i>very close</i> )	–.89	0.39*	1.12	1.19	–.72	0.77	.85	0.61	–.07	0.42	–.00	0.21
Relationship to the deceased												
Comrade (Ref.)	–	–	–	–	–	–	–	–	–	–	–	–
Spouse/partner/close family	–.37	0.31	–3.48	0.95**	–.93	0.61	–.49	0.48	–.20	0.33	.13	0.17
Close friend	–.65	0.29*	–2.97	0.87**	–1.44	0.56*	–.74	0.44	–.25	0.30	.38	0.15*
Other/unspecified	–.83	0.35*	–3.13	1.06*	–1.85	0.68**	–.52	0.54	–.27	0.37	.29	0.19
Prior suicide attempts	.19	0.08*	.71	0.24**	.49	0.15**	.37	0.122**	.01	0.08	–.07	0.04
Male gender	–.27	0.25	1.52	0.76*	1.30	0.49**	.31	0.38	–.84	0.26**	.04	0.13
Age (years)	–.04	0.02*	0.33	0.06***	.10	0.49***	–.002	0.03	0.03	0.02	.02	0.01*
Race/ethnicity												
Non-Hispanic White (Ref.)	–	–	–	–	–	–	–	–	–	–	–	–
Biracial, Asian, Pacific Islander, Native American, or Alaskan	–.61	0.33	2.95	0.98**	–.11	0.63	.93	0.50	–.36	0.34	.13	0.17

(Continues)

TABLE 5 (Continued)

Variable	Suicidality <sup>a</sup>		PTSD symptoms		Anxiety symptoms		Insomnia symptoms		Alcohol misuse		Thwarted belongingness	
	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE	$\beta$	SE
Hispanic/Latinx	-.61	0.28*	1.08	0.84	-.19	0.54	.01	0.43	-.31	0.29	.03	0.15
Non-Hispanic Black	-.63	0.29*	1.05	0.90	-.29	0.58	-.40	0.45	-.64	0.31*	-.07	0.16
Educational attainment												
High school diploma/equivalent	-	-	-	-	-	-	-	-	-	-	-	-
Some college	0.06	0.23	1.25	0.68	.52	0.44	.62	0.35	.01	0.24	-.05	0.12
College degree or higher	0.49	0.41	1.91	1.24	-.80	0.79	.38	0.63	-.55	0.43	-.09	0.22
Relationship status												
Married/cohabitating (Ref.)	-	-	-	-	-	-	-	-	-	-	-	-
Divorced/separated	.33	0.29	.18	0.87	.20	0.56	.25	0.44	.69	0.31*	-.28	0.15
Single	.23	0.24	.01	0.72	.28	0.47	-.59	0.37	.93	0.25**	.09	0.13
Model statistics	$R^2 = .05,$ $p < .001$		$R^2 = .13,$ $p < .001$		$R^2 = .05,$ $p < .001$		$R^2 = .05,$ $p < .001$		$R^2 = .01,$ $p = .007$		$R^2 = .03,$ $p = .018$	

Note:  $n = 985$ . PTSD = posttraumatic stress disorder; Ref. = reference category.

<sup>a</sup>Each column represents a multivariable linear regression model.

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

suicide decedent, the more aware they are of the impact of suicide on surviving friends and loved ones and may wish to avoid the same outcome. Lastly, it could be an issue of measurement; individuals exposed to suicide may be more likely to attempt suicide but not necessarily engage in ideation (Hom et al., 2017). More research is needed to elucidate these findings. Ultimately, the fact that the death of a comrade could be comparable to that of a close family member shows the devastating and far-reaching effects of military suicide. In addition to continuing to implement military-wide suicide prevention programs, it would benefit the DoD to continue to refine suicide postvention protocols following the death of a service member.

Several study limitations must be considered. This study used a cross-sectional design, and the date of the suicide exposure was unavailable, which precludes causal inference. Further, data were obtained from the MSRC CDE database, which primarily contains data from clinical samples (e.g., treatment-seeking service members, military personnel with more severe symptoms); as a result, the sample was entirely composed of clinical participants and may not represent the broader military population. Study data were also derived exclusively via self-report measures, which can be subject to recall and social desirability bias. The use of other validated assessment tools in future research, such as clinician-administered diagnostic assessments, is needed. This study did not allow for a granular examination of suicide exposures, including whether participants were exposed multiple times, when the death or deaths occurred, or whether their exposure was direct or indirect. Given that research suggests the psychological impact of exposure rises with the number of exposures (Bryan et al., 2017; Ursano et al., 2017), collecting more specific exposure data could provide valuable information that can help inform postvention efforts. Finally, comparisons could not be made by each ethnoracial group represented within the sample due to small cell sizes; to reduce ethnoracial disparities in suicide, it is critical that researchers make concerted efforts to enroll participants from historically underserved and minoritized communities.

There are also several strengths of this research that contribute to the literature. The sample exclusively focused on active duty service members, a population affected by high rates of suicide and, in turn, suicide exposure. Findings from the current study provide a more nuanced understanding of the associations among variables related to SI within this unique group. Additionally, data from the CDE provide a relatively robust clinical sample of individuals from multiple service branches. Although the data were self-reported, the measures used have been validated, are commonly employed, and assess a range of constructs pertinent to suicide research.

The findings indicate that nearly two thirds of service members lost someone to suicide—a striking finding considering that most participants were younger than 25 years old. These results not only illustrate the magnitude of the issue within the military but also highlight the need for continued consideration of suicide exposure as a potential risk factor for adverse psychological outcomes, including SI. Efforts should be made to ensure all service members receive appropriate support following suicide exposure regardless of their relationship to the deceased. Additionally, suicide exposure experiences should be assessed in clinical settings as part of trauma history and suicide risk screening procedures. Lastly, as these results suggest, service members may experience various psychological symptoms in response to suicide exposure, and symptoms may differ based on personal characteristics. Thus, individuals who provide postvention support, military leaders, and even service members themselves should be educated on the various ways suicide exposure may affect those who are exposed.


## OPEN PRACTICES STATEMENT

We analyzed archival data that are not under our direct control; requests to access the data should be submitted through the Military Suicide Research Consortium Common Data Elements request processes. Our complete analysis scripts and codebook is available from the corresponding author upon request.

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