



Research paper

Risk and protective correlates of suicidality in the military health and well-being project[☆]Katherine Musacchio Schafer^{a,b,*}, Ruth Melia^{c,d}, Thomas Joiner^c^a Tennessee Valley Healthcare System, United States of America^b Vanderbilt University Medical Center, United States of America^c Florida State University, United States of America^d University of Limerick, United States of America

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ABSTRACT

Suicidality disproportionately affects Veterans, and in 2020 the Military Health and Well-Being Project was conducted in part to study the link between risk and protective constructs with suicidality among Veterans. In the present study, we investigate the relative contribution of risk (i.e., military self-stigma, daily stress, combat exposure, substance use, traumatic brain injury, and moral injury) and protective constructs (i.e., social integration, social contribution, public service motivation, purpose and meaning, and help-seeking) with suicidality. Using cross-sectional Pearson correlation and linear regression models, we studied the independent and relative contribution of risk and protective correlates in a sample of 1469 Veterans (male: $n = 985$, 67.1 %; female: $n = 476$, 32.4 %; transgender, non-binary, prefer not to say: $n = 8$, 0.5 %). When we investigated protective constructs individually as well as simultaneously, social contribution ($\beta = -0.39$, $t = -15.59$, $p < 0.001$) was the strongest protective construct against suicidality. Social integration ($\beta = -0.13$, $t = -4.88$, $p < 0.001$) additionally accounted for significant reduction in suicidality when all protective constructs were considered together. When we investigated the contribution of risk constructs towards suicidality, moral injury was most strongly associated with suicidality ($r = 0.519$, $p < 0.001$), yet when studied simultaneously for their relative contribution none of the constructs accounted for a significant amount of the variance in suicidality ($|t|s \leq 1.98$, $ps \geq 0.07$). These findings suggest that among Veterans it is possible that social contribution is protective against suicidality and could be a possible treatment target for the prevention or reduction of suicidality among Veterans.

1. Introduction

The concept of suicidality is broad, encompassing many suicide-related outcomes including suicidal ideation, suicide attempts, and suicide death. Suicidality among Veterans is an area of significant concern. Veterans as compared to non-Veterans are more than twice as likely to endorse suicidal ideation (VA.gov). Further, in 2020, on average 16.8 American Veterans died by suicide per day (VA.gov). Given the impact of suicidality on Veterans and their communities, multiple stakeholders across policy, research, and clinical practice have

advocated for increased efforts to address this problem (Centers for Disease Control and Prevention [CDC], 2017; Los Angeles Times, 2022; New York Times, 2019; US Department of Veterans Affairs, 2021; Washington Post, 2022).

1.1. Risk factors for suicidality in Veterans

Indeed, there has been significant investigation into suicidality among Veterans, with most of this work studying risk factors. For example, previous work demonstrated that self-stigma particularly

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against the military identity (Wastler et al., 2020), traumatic brain injury (TBI; Brenner et al., 2011), daily stress (Serpa et al., 2014), substance use (Bohnert et al., 2017), moral injury (Kelley et al., 2019), and combat exposure (Dillon et al., 2018) are associated with at least a two-fold increase in suicidality among Veterans. Likewise, a recent meta-analysis of longitudinal risk factors for suicidal ideation, suicide attempts, and suicide deaths among Service Members and Veterans (Schafer et al., 2021) indicated that depression, anger, substance use, and alcohol use disorders, as well as access to lethal means significantly increased the risk for suicidality among Veterans. Indeed, these constructs increased risk for suicidality by at least two and a half fold. Together, this work investigating risk factors for suicidality among Veterans was helpful in identifying which risk factors conferred the most risk and which risk factors deserved more attention, but it did not speak to protective factors, which could help inform actionable prevention efforts.

1.2. Protective factors for suicidality in Veterans

Some, albeit much less, research has investigated protective factors in Veterans with the hope that identifying protective factors might better inform suicidality treatment and prevention efforts. For example, a sense of purpose and meaning (Pietrzak et al., 2010), social integration (Elbogen et al., 2020), social contribution (Hoffmire et al., 2023), and help-seeking behaviors (Karras et al., 2021) have been shown to reduce risk of suicidality in Veterans by approximately 30 %. Among these constructs, the greatest reduction in suicidality has been seen with increases in social integration and social contribution (Adams et al., 2017).

1.3. The relative contribution of risk and protective factors

Risk and protective factors are independent constructs that often simultaneously coexist. When conceptualizing these constructs it is important to acknowledge that people can endorse high or low levels of both risk and protective constructs. The Buffering Hypothesis for Suicide (Johnson et al., 2011) speaks directly to this possibility of the simultaneous and perhaps varying experience of risk and protective factors. Risk and protective factors can be conceptualized as continuous variables, each on their own continuum from absence to presence. For an example of a risk factor, substance use lies on a continuum from no substance use to extremely high rates of substance use. Likewise, for an example of a protective factor, social integration also lies on a continuum from absolutely no social integration to extremely strong social integration. These two continua can be conceptualized as intersecting with one another in a perpendicular fashion to form a coordinate plane wherein there are four quadrants (high risk and high protective; low risk and low protective; high risk and low protective; low risk and high protective). Conceptually, the lowest level of risk for suicidality would be experienced by individuals with low levels of risk factors and high levels of protective factors. Conversely, the highest risk of suicidality would come about among those with low levels of protective factors and high levels of risk factors. The way that risk and protective factors coexist may indeed have profound impacts on the development of suicidality.

Together, previous studies have demonstrated that a wide array of risk and protective factors can be related to suicidality in Veterans. For example, when investigating the simultaneous experience of risk and protective constructs with regards to suicidality, previous work generally showed that psychiatric conditions including depression and substance use are risk factors for suicidality. Further, self-esteem and resilience have been shown to be protective against suicidality. However, these findings generally result from work that has been conducting using community-based adults, middle school students, young adults, and adolescent community members samples, respectively (Holman and Williams, 2022; Marraccini et al., 2022; Pereira et al., 2018; Taliaferro

and Muehlenkamp, 2014). Much of this body of literature does not study the relative contribution of risk and protective factors within US military Veterans, a demographic group at relatively high risk of suicidality. This is important as there either may be unique factors (such as military-specific constructs including combat exposure) or factors that are not necessarily military-specific but increase the strength in association with suicidality more among Veterans than in non-military samples (e.g., daily stress or substance use). Further, previous work does not fully inform the efforts to create interventions specifically for Veterans with suicidality. By examining risk and protective constructs together within a Veteran sample, we can gain insights into how suicidality may come about within this specific high risk population.

1.4. The present study

In 2020, a large, diverse sample of Veterans was assessed across risk (i.e., military self-stigma, TBI, daily stress, substance use, moral injury, and combat exposure) and protective constructs (i.e., purpose and meaning, public service, social integration, social contribution, and help-seeking behaviors) for suicidality. These data comprise the Military Health and Well-Being Project (Desmarais and Cacace, 2020). The Military Health and Well-Being Project is broad and is composed of data from Veterans nationwide, representing all branches of the military and a wide age range. This study was conducted in the hope of collecting information regarding psychosocial correlates of health and wellness, including military identity, military self-stigma, daily stress, combat exposure, purpose and meaning, substance use, TBI, moral injury, suicide risk, social integration, and contribution with emotional wellness.

These constructs were chosen to be measured and investigated as they provided a broad understanding of Veteran experience. Many of the risk factors were chosen as they reflect either military-specific constructs (e.g., combat exposure) or constructs that are experienced at a higher rate among military-service members (e.g., TBI, moral injury, substance use). Protective factors were chosen based on qualification that they were potentially modifiable treatment targets (e.g., social integration, social contribution). That is, if findings were to suggest that Veterans with higher social integration and/or social contribution were less likely to develop suicidality, this could be fodder for interventionists who are working to develop and tailor suicide prevention programming for Veterans. Indeed, the goal of the Military Health and Well-Being Project was not to explicitly investigate, test, or evaluate any theoretical framework. It was instead conducted with the goal of understanding military-relevant risk factors and potentially modifiable treatment targets.

Previous work has been completed with data from the Military Health and Well-Being Project. Cacace et al. (2022) published the first paper using these data and documented that military self-stigma mediates the link between military identity and suicide risk in this sample. Further, in a dissertation not published in a peer-reviewed outlet, Reyna (2023) found that combat exposure and suicidal thinking were positively and significantly correlated. Further, social support (specifically that coming primarily from friends) and suicidal thinking were negatively and significantly correlated.

1.5. Research question and hypotheses

Using data from the Military Health and Well-Being Project, we conducted the present study. The protective constructs studied in this dataset are social integration, social contribution, public service motivation, purpose and meaning, and help-seeking behaviors. Likewise, with regards to risk factors, we investigated military self-stigma, daily stress, combat exposure, substance use, traumatic brain injury, and moral injury as they relate with suicidality. We investigated (1) the association between risk and protective constructs with suicidality and (2) the relative contribution of protective and risk constructs with suicidality. Our guiding research question were: (1) what is the association of

Table 1
Descriptive statistics.

Construct		<i>n</i>	%
Branch	Air Force/Air Force Reserve	366	24.50 %
	Air National Guard	36	2.40 %
	Army/Army Reserve	491	32.80 %
	Army National Guard	115	7.70 %
	Coast guard/Coast Guard Reserve	42	2.80 %
	Marine Corps/Marine Corps Reserve	122	8.20 %
	Navy/Navy Reserve	323	21.60 %
Race	White	1129	75.50 %
	Black or African American	215	14.40 %
	Asian	42	2.80 %
	American Indian or Alaskan Native	13	0.90 %
	Native Hawaiian or Other Pacific Islander	10	0.70 %

		<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Age		18	86	50.08	13.37
Protective factors	Social integration	1	6	3.77	0.94
	Social contribution	1	7	5.11	1.33
	Public service	1	5	3.98	0.67
	Purpose and meaning	1	5	4.04	0.63
Risk factors	Help-seeking	1	7	4.31	1.43
	Self-stigma	1	7	2.21	1.28
	Stress	15	28	21.78	3.84
	Combat exposure	1	5	1.61	0.99
	Substance use	0	4	0.86	1.32
	Traumatic brain injury	0	1	0.17	0.38
	Moral injury	11	98	40.25	15.32
	Suicidality	3	22	5.31	3.71

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risk and protective factors with suicidality among US military Veterans and (2) when taking all a variety of risk and protective factors into consideration at the same time, which constructs account for the greatest variability in suicidality? Consistent with previous literature, we hypothesized that social integration and social contribution would provide the greatest protection towards suicidality. With regard to risk factors, we hypothesized that military-specific constructs such as combat exposure would have the strongest association with suicidality. With regards to the simultaneous investigation of risk and protective factors

towards suicidality, we were agnostic to which one (s) would account for the greatest variability in suicidality, opting for an exploratory approach.

1.6. Selection of risk and protective constructs

In this project, we employed nearly every risk and protective construct measured in the Military Health and Well-Being Project. We took this approach as we wanted to understand, using all the data

Table 2
Pearson correlations between all study variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Social integration	1											
2. Social contribution	0.12**	1										
3. Public service motivation	0.06*	0.25**	1									
4. Purpose and meaning	0.09**	0.29**	0.58**	1								
5. Help-seeking	0.41**	0.29**	0.28**	0.29**	1							
6. Military self-stigma	0.06*	−0.29**	−0.26**	−0.21**	0.01	1						
7. Stress	0.18	−0.24	0.49*	0.45	0.29	0.15	1					
8. Combat exposure	0.09**	−0.07**	0.08**	0.02	0.12**	0.23**	0.53*	1				
9. Substance use	−0.06*	−0.25**	0.01	−0.01	−0.01	0.22**	0.16	0.22**	1			
10. TBI	−0.08**	−0.10**	0.02	0.01	−0.04	0.10**	0.43	0.18**	0.13**	1		
11. Moral injury	−0.15**	−0.55**	−0.13**	−0.18**	−0.13**	0.45**	0.39	0.29**	0.42**	0.18**	1	
12. Suicidality	−0.16**	−0.39**	−0.02	−0.08**	−0.12**	0.21**	0.48*	0.21**	0.41**	0.21**	0.52**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 3
Linear regression among protective factors towards suicidality.

	Unstandardized coefficients		Standardized coefficients Beta	<i>t</i>	<i>p</i>	Collinearity tolerance statistics
	<i>B</i>	<i>SE</i>				
(Constant)	2.86	0.30		9.24	<0.001	
Gender	1.32	0.19	0.17	6.77	<0.001	
Race	0.47	0.10	0.11	4.34	<0.001	
(Constant)	8.64	0.73		11.72	<0.001	
Gender	1.23	0.17	0.16	6.91	<0.001	
Race	0.42	0.09	0.10	4.35	<0.001	0.99
Social integration	−0.48	0.10	−0.12	−4.88	<0.001	0.99
Social contribution	−1.09	0.07	−0.39	−15.59	<0.001	0.99
Public service motivation	0.51	0.16	0.09	3.19	0.001	0.99
Purpose and meaning	−0.10	0.17	−0.01	−0.62	0.54	0.99
Help-seeking	0.04	0.07	0.01	0.62	0.53	0.99

available, which constructs accounted for the most variability (both in protection and in risk) in the development of suicidality. This approach represents a shift from the top down model of theoretical understanding, and demonstrates a bottom up approach of allowing the data to guide our insights and understandings. This approach is strongly consistent with biomedical, computer science, and large language models investigating suicide risk and has been widely reflected in the literature (Boudreaux et al., 2021; Linthicum et al., 2019; Schafer et al., 2021; Su et al., 2020; Walsh et al., 2017). Indeed, we used nearly every risk and protective factor measured within this data set, moving to a more practical, application-based, translational approach to understanding the development of suicide.

A project such as this one utilizing a large, diverse dataset with the measurement of Veterans on a myriad of psychosocial correlates of health and wellness could have implications for the broader Veteran population. Indeed, finding malleable treatment targets to promote (i.e., protective factors) or prevent (i.e., risk factors) suicidality in this population could provide fodder for future suicide prevention efforts in US Veterans.

2. Methods

The Military Health and Well-Being Project (Desmarais and Cacace, 2020) is an online survey. It was conducted through Qualtrics Panels and United States military Veterans were recruited between May 2020 through June 2020. The purpose of the study was to collect information regarding psychosocial correlates of health and wellness. The psychosocial correlates include military identity, military self-stigma, daily stress, combat exposure, purpose and meaning, substance use, traumatic brain injury, moral injury, suicide risk, social integration and contribution, and social, emotional, spiritual, intellectual, physical, and environmental well-being.

2.1. Study design and procedure

Study design and procedures for the Military Health and Well-Being Project are described in full on the Inter-university Consortium for Political and Social Research (ICPSR) website (<https://www.icpsr.umich.edu/web/ICPSR/studies/38304>). Briefly, data were collected from a sample of United States military Veterans who served in post-Vietnam war eras. Participants were recruited via Qualtrics Panels which is a services provided by Qualtrics that recruits participants and connects those who meet inclusion/exclusion criteria to the researcher's survey link. As a part of this service, Qualtrics develops samples for research studies that corresponds to researchers' inclusion and exclusions criteria. Data cleaning and participant compensation are also managed by Qualtrics. This process ensures the reliability of responses (e.g., monitoring durations for survey completion matching within one standard deviation of the estimated average, linear responding, and attention checks). Notably, participants were able to submit surveys even with missing responses. Participants who did not complete items related to this study were excluded from the sample.

Following recruitment, participants were then screened to ensure that they met the inclusion criteria which were military service, included age range, service era, and United States residence. Individuals who met all inclusion criteria were permitted to complete the survey. Women Veterans are the fastest growing group of Veterans, and Black Veterans are the largest racial group of Veterans outside of White Veterans (VA.gov). These groups have been historically under-represented in the scientific Veteran literature (Schafer et al., 2021). In order to amplify their perspective and better understand the roles that race and gender play in the link between risk and protective factors with suicidality, these demographic groups were oversampled. Specifically, Black military Veterans and women Veterans were sampled at elevated rates to enhance representation of more minoritized identities in military

Table 4

Linear regression among risk factors towards suicidality.

	Unstandardized coefficients		Standardized coefficients Beta	<i>t</i>	<i>p</i>	Collinearity tolerance statistics
	<i>B</i>	<i>SE</i>				
(Constant)	2.45	4.12		0.59	0.56	
Gender	5.06	2.46	0.46	2.05	0.06	
Race	0.22	1.13	0.04	0.19	0.84	
(Constant)	−13.28	8.09		−1.64	0.13	
Gender	2.64	2.33	0.24	1.13	0.28	
Race	−0.09	1.47	−0.01	−0.06	0.95	
Military self-stigma	−0.75	0.88	−0.21	−0.85	0.41	0.96
Stress	0.01	0.48	0.01	0.03	0.97	0.78
Combat exposure	2.60	1.31	0.54	1.98	0.07	0.89
Substance use	0.15	1.05	0.03	0.14	0.88	0.97
TBI	−2.87	3.10	−0.25	−0.92	0.37	0.82
Moral injury	0.25	0.14	0.58	1.74	0.11	0.75

Veterans.

Participation was completely anonymous through a panel company (Qualtrics Panels); informed consent was obtained by all participants electronically at the start of the survey, and the study protocol was considered “exempt” due to anonymous data collection by the University IRB (North Carolina State University). Participants were compensated \$10 for their participation. More info about protocol can be found here [Cacace et al. \(2022\)](#).

A total of 1863 responses were collected. Qualtrics labeled 1522 of these responses as “Good Completes,” which included individuals who answered all questions as well as fell into the required inclusion category (Veterans who served post-Vietnam), and who completed the survey within a reasonable time limit (i.e., 3 standard deviations of the average time to complete). Of these “Good Completes,” 1495 respondents included their age, and were retained for all further analyses. Finally, of the 1495 “Good Completes,” 1469 completed the measures of interest and were included in the analyses in the present project. Data were collected entirely using Qualtrics online survey software.

2.2. Measures

2.2.1. Public service

The short form of the Public Service Motivation Metric ([Perry, 1996](#)) was used to measure motivation for public service. This questionnaire is comprised of five items each scored on a Likert scale from one (*Strongly disagree*) to five (*Strongly agree*). Some items that are included in this metric are as follows: “Meaningful public service was very important to me”, “I was often reminded by daily events about how dependent we were on one another”, and “Making a difference in society meant more

to me than personal achievements”. Investigations into convergent validity ([Liu et al., 2015](#)) showed that this measure of public service motivation is moderately related to other similar experiences. For example, the relationship between public service motivation and job satisfaction ($r = 0.74$) and the relationship between public service motivation and community citizenship behavior ($r = 0.69$) were positively and significantly correlated. This indicates Reliability within this sample was good ($\alpha = 0.81$).

2.2.2. Meaning

The Purpose and Meaning Short Form ([Salsman et al., 2020](#)) was used to measure purpose and meaning. This scale is comprised of five items with each scored on a Likert scale of one (*Strongly disagree*) to five (*Strongly agree*). Items included the following: “I believe strongly in humanity and the power of people”, “the greatest moral decision is doing the greatest good for human beings”, and “human value and respect should be the greatest social value”. Internal consistency reliability estimates ranged from $\alpha = 0.90$ (4-item short form) to $\alpha = 0.98$ (37-item bank). In its psychometric manuscript, Purpose and Meaning Short Form ([Salsman et al., 2020](#)) was correlated with meaning in life ($r = 0.89$) and life engagement ($r = 0.79$). Internal consistency was acceptable ($\alpha = 0.78$).

2.2.3. Social Integration

The Social Integration Subscale of the Social Well-Being Questionnaire ([Keyes, 1998](#)) was used to measure social contribution. This questionnaire was made up of three items with each scored on a Likert scale from one (*Strongly disagree*) to seven (*Strongly agree*). The items are as follows: “I don’t feel I belong to anything I’d call a community”, “I feel

Table 5

Linear regression among risk and protective factors towards suicidality.

	Unstandardized coefficients		Standardized coefficients Beta	<i>t</i>	<i>p</i>	Collinearity tolerance statistics
	<i>B</i>	<i>SE</i>				
(Constant)	2.45	4.12		0.59	0.56	
Gender	5.06	2.46	0.46	2.05	0.06	
Race	0.22	1.13	0.04	0.19	0.84	
(Constant)	−7.74	12.62		−0.61	0.57	
Gender	0.48	2.74	0.05	0.17	0.86	
Race	−1.57	2.24	−0.31	−0.7	0.52	
Military self-stigma	−1.69	1.14	−0.49	−1.48	0.21	0.97
Daily stress	−0.16	0.44	−0.11	−0.36	0.73	0.78
Combat exposure	1.83	1.47	0.38	1.24	0.28	0.90
Substance use	1.08	0.88	0.24	1.22	0.28	0.97
TBI	−1.44	3.63	−0.12	−0.39	0.71	0.82
Moral injury	0.40	0.28	0.93	1.40	0.23	0.75
Social integration	2.68	1.86	0.40	1.44	0.22	0.91
Social contribution	0.09	1.92	0.02	0.06	0.96	0.97
Public service motivation	5.70	2.79	0.81	2.04	0.11	0.96
Purpose and meaning	−6.24	3.90	−0.65	−1.6	0.18	0.93
Help-seeking	−2.15	1.41	−0.60	−1.52	0.20	0.99

close to other people in my community”, “my community is a source of comfort”. Item 1 was reverse coded. Validity has been shown to be strong with a total of five components in the structure (Li et al., 2015). The values of fit index indicate strong validity as follows: χ^2 (80) = 248.92, $p < 0.01$, RMSEA = 0.06. Reliability was acceptable ($\alpha = 0.78$).

2.2.4. Social contribution

The Social Contribution Subscale of the Social Well-Being Questionnaire (Keyes, 1998) was also used to measure social integration. The questionnaire is comprised of three items each scored on a Likert scale from one (*Strongly disagree*) to seven (*Strongly agree*). The items are as follows: “I have something valuable to give to the world”, “my daily activities do not produce anything worthwhile for my community”, and “I have nothing important to contribute to society”. Social contributions has been found to be significantly and positive correlated with recent community service ($r = 0.46$), community action ($r = 0.22$), and global life satisfaction ($r = 0.27$; Keyes, 1998). Items two and three were reverse coded. Reliability was acceptable ($\alpha = 0.79$).

2.2.5. Help-seeking

Help-seeking was measured via three items scored on a Likert scale from one (*Strongly disagree*) to seven (*Strongly agree*) called the Help-Seeking Behaviors Scale (Bowen et al., 2016). Items are as follows: I can go to (1) “people in my community for help and assistance”, (2) “leaders in my current (or former) unit for help and assistance”, and (3) “support agencies and organizations for help and assistance”. Validity has been shown to be strong (Jensen and Bowen, 2020) with this scale being strongly related to sense of community, career stigma, and unit-based stigma as well as the intention to seek mental health services. Reliability within this sample was acceptable ($\alpha = 0.77$).

2.2.6. Military self-stigma

Military self-stigma was measured via four questions used in prior literature (Quinn and Chaudoir, 2009; Paul et al., 2014). Participants responded to each item via a Likert scale from one (*Strongly disagree*) to seven (*Strongly agree*). The three items are as follows: “my life would be better if I were not a Service Member/Veteran”, “I would not want to date someone who is also a Service Member/Veteran”, “most of the negative things people think about Service Members/Veterans are true”, and “I don’t blame people for wanting to keep their distance from me when they find out that I am a Veteran”. These items have been shown to be related to military identity as well as suicide risk (Skopp et al., 2012). Indeed, in a study of 1038 active duty servicemen (Skopp et al., 2012) respondents who had seen a mental health provider reported lower military self-stigma than those who had not. Reliability within the sample was good ($\alpha = 0.84$).

2.2.7. Stress

Stress was measured via the Daily Inventory of Stressful Events (Almeida et al., 2002). The Daily Inventory of Stressful Events is a semi-structured survey in which participants report whether any of a series of stressful events had occurred within the past 24 h. This measure consists of a brief set of stem and conditional questions that can be administered via smartphones. An example stem question is “Did you have an argument or disagreement with anyone in the past 24 hours?” An example follow-up questions is “How stressful was this?” “How much control did you have over the situation?” Validity investigations indicated that this measure is a good measure of daily stressors. In a study of over a thousand Americans (Almeida et al., 2002), interpersonal tension was the most common cause of stress followed by work-related stressors for men and network stressors (events that occur to close others) for women. Analyses using regression models showed that interpersonal tensions and network stressors were unique predictors of physical and mental health outcomes. Reliability among this sample was acceptable ($\alpha = 0.72$).

2.2.8. Moral injury

The Moral Injury Symptom Scale - Military Version Short Form (Koenig et al., 2018) was used to measure moral injury in this sample. This is a ten item measure wherein higher scores correspond to greater experience of moral injury. For items one through nine (e.g., “I feel guilt over failing to save the life of someone in war”), respondents indicate their level of agreement with each statement on a 10-point Likert scale that ranges from one = strongly disagree to ten = strongly agree. For item ten (i.e., measure of religious faith) Veterans responded on a ten-point Likert scale that ranged from one = strengthened a lot to ten = weakened a lot. Items one through four and eight and nine were negatively worded, whereas items five through seven and ten were positively worded. Psychometric investigation has evidenced convergent validity with other theoretically related constructs including PTSD and struggles with morality and ultimate meaning (Currier et al., 2020). Reliability in this sample was good ($\alpha = 0.83$).

2.2.9. Combat exposure

The Combat Exposure Scale (CES; Keane et al., 1989) was used to measure combat exposure. The CES assesses wartime stressors experienced by combatants, and is a seven-item, self-report scale with each item scored on a Likert scale from one to five. Items are rated on a 5-point frequency (1 = “no” or “never” to 5 = “26+ times” or “51+ times”), 5-point duration (1 = “never” to 5 = “7+ months”), or 5-point degree of loss (1 = “none” to 5 = “76% or more”) scale. The total exposure to combat score can be categorized according to the following scale: 1 = 0–8 light, 2 = 9–16 light – moderate, 3 = 17–24 moderate, 4 = 25–32 moderate – heavy, and 5 = 33–41 heavy. CES has good validity with strong associations with military service, PTSD, and depression in wartime Veterans (Bartone and Homish, 2020). Reliability among this sample was excellent ($\alpha = 0.91$).

2.2.10. Substance use

The CAGE Adapted to Include Drugs (CAGE-AID; Brown and Rounds, 1995) Questionnaire is an adaptation of the CAGE for the purpose of conjointly screening for alcohol and drug problems. The CAGE-AID focuses on lifetime substance use and is answered in four yes/no items. Participants are instructed to consider drug use including illegal drug use and the use of prescription drug use other than prescribed, while answering the following questions: (1) Have you ever felt that you ought to Cut down on your drinking or drug use? (2) Have people Annoyed you by criticizing your drinking or drug use? (3) Have you ever felt bad or Guilty about your drinking or drug use? (4) Have you ever had a drink or used drugs first thing in the morning to steady your nerves or to get rid of a hangover (Eye opener)? Previous work (Leonardson et al., 2005) indicates that validity of CAGE-AID is good, indicated by moderate correlations with the General Well-being Schedule ($r = -0.39$), the Family-Adaptation, Partnership, Growth, Affection, & Resolve ($r = -0.47$), and the Beck Depression Inventory-II ($r = 0.36$). Reliability among this sample was good ($\alpha = 0.82$).

2.2.11. Traumatic brain injury

History of TBI was assessed via a single-item question: “Have you ever been diagnosed with a traumatic brain injury or concussion?” Responses were coded as 0 = No, 1 = Yes. Single items have been used in the literature with good reliability and validity (see Lu et al. (2020), Richard-Denis et al. (2018) and Wasserman et al. (2008)).

2.2.12. Suicidal Behavior Questionnaire – Revised (SBQ-R; Osman et al., 2001)

The SBQ-R is a four-item self-report questionnaire that measures four dimensions of suicidality: suicidal ideation, suicide attempt, threat of suicide attempt and self-assessed likelihood of future suicidal behavior. The first item was “Have you ever thought about or attempted to kill yourself?” with answers scored on a six-point Likert scale from one (*Never*) to six (*I have attempted to kill myself, and really hoped to die*). The

second item was “How often have you thought about killing yourself in the past year” with responses ranging from one (*Never*) to five (*Very often*). The third item was “Have you ever told someone that you were going to [die by] suicide or that you might try to kill yourself?” with possible responses rated from one (*No*) to five (*Yes, more than once, and really wanted to do it*). The final question was “How likely is it that you will attempt suicide someday?”, with responses ranging from zero (*Never*) to six (*Very likely*). A total score was calculated across the four items, with higher scores indicating more intense suicidality. The SBQ-R has been validated (Rueda-Jaimes et al., 2017) showing a positive correlation with the Beck Hopelessness Scale ($r = 0.48$) and suicide risk assessed by clinicians ($r = 0.36$). Further the SBQ-R has been shown to be negatively correlated with the Reasons for Living inventory ($r = -0.48$). Within this sample, Cronbach’s $\alpha = 0.89$, reflecting excellent internal consistency.

2.3. Data analytic plan

Analyses began by conducting descriptive statistics on all study variables. Within analyses, measures were used in their continuous state. Then, analyses proceeded to investigate the link between protective constructs (i.e., social integration, social contribution, public service motivation, purpose and meaning, and help-seeking), risk constructs (i.e., military self-stigma, daily stress, combat exposure, substance use, TBI, and moral injury), and suicidality via Pearson correlation coefficients. This determined the relation between singular constructs with suicidality. The strength of each of these associations was then compared via z-score testing. Then, to investigate the relative contribution of each protective factor with suicidality when studied simultaneously, a linear regression was conducted with social integration, social contribution, public service motivation, purpose and meaning, and help-seeking, all entered in the same step with suicidality as the outcome. To investigate the relative contribution of each risk construct towards suicidality, a second linear regression was conducted. Military self-stigma, daily stress, combat exposure, substance use, TBI, and moral injury were entered on a single line with suicidality as the outcome variable. Rates of suicidality vary based on gender and age (CDC, 2023), thus in both linear regression models, gender and age were controlled for by adding them into the model on the first step. Finally, in order to investigate the relative contribution of risk and protective factors together, a linear regression model was conducted wherein all risk and protective constructs were added into the same step.

Nearly every measure included in the Military Health and Well-Being Project was included in the present analyses. This type of exploratory analysis is often known as a “bottom-up approach” and we opted for this approach as we wanted to glean insights from the participants. That is, we wanted to let the data guide our understanding of the link between risk and protective constructs with suicidality, thus it was best to include many relevant risk and protective constructs.

3. Results

3.1. Descriptive statistics

Of the 1469 participants included in the study, 985 (67.1 %) identified as male, 476 (32.4 %) identified as female, and 8 (0.5 %) identified as transgender or non-binary or preferred not to say. Most participants were married ($n = 864$, 58.8 %) with the remainder of the sample being single ($n = 279$, 19.0 %), divorced ($n = 210$, 14.3 %), in a domestic partnership ($n = 73$, 5.0 %), or widowed ($n = 43$, 2.9 %). The mean number of years spent in the Armed Forces was 9.59 ($SD = 8.15$, $min = 0.03$, $max = 40.00$). Other descriptive statistics are depicted in Table 1, which reflects a diverse sample with regards to age, race, and military branch of service.

3.2. Correlations

Pearson correlation coefficients are displayed in Table 2. With regards to protective constructs, all variables are negatively and significantly correlated with suicidality ($|r|$'s > 0.07 , $ps < 0.01$). There is one exception to this. The relation between public service motivation and suicidality was not statistically significant ($r = -0.02$, $p = 0.21$). With regards to risk constructs, all relations with suicidality were statistically significant and in the positive direction ($rs > 0.20$, $ps < 0.05$).

3.2.1. Relative strength of protective constructs

Social contribution was the strongest and most negative correlate of suicidality ($r = -0.39$, $p < 0.001$), with the next strongest construct being social integration ($r = -0.16$, $p < 0.001$). Social contribution was significantly stronger than all other constructs with associating with suicidality ($z = 6.91$, $p < 0.001$).

3.2.2. Relative strength of risk constructs

Moral injury ($r = 0.52$, $p < 0.001$) was the strongest and most positive risk correlate of suicidality. The next strongest and most positive risk correlate was stress ($r = 0.48$, $p < 0.001$). When comparing the strength of these, ($z = 0.35$, $p < 0.001$), moral injury was a significantly stronger risk correlate of suicidality than all other risk constructs ($ps < 0.05$, $|r|$'s > 0.20).

3.3. Linear regressions

To investigate the relative contribution of protective constructs cross-sectionally towards suicidality, a linear regression was conducted. For every linear regression model, age and gender were entered on the first step, controlling for their effects. All protective constructs (i.e., social integration, social contribution, public service motivation, purpose and meaning, and help-seeking) were entered simultaneously on the second step. The outcome variable was suicidality. Complete results are depicted in Table 3. Results indicated that social contribution provided the greatest protection from suicidality ($t = -15.59$, $p < 0.001$), followed by social integrations ($t = -4.88$, $p < 0.001$). Purpose and meaning ($t = -0.62$, $p = 0.54$) and help-seeking ($t = 0.62$, $p = 0.53$) did not account for a significant amount of the variance in suicidality.

The link between risk constructs with suicidality was also investigated. Again, age and gender were entered on the first step, to control for them. Risk constructs were then all added simultaneously on the second step. Complete results are displayed in Table 4. Notably, when all risk factors were included in the regression model, to investigate the relative contribution of risk factors towards suicidality when studied simultaneously, none of the risk factors were significant contributors towards suicidality ($|t|$'s < 2.00 , $ps > 0.07$).

We then conducted a linear regression model with all constructs (both protective and risk) into a single line. Results are depicted in Table 5. Findings indicate that when all factors were entered on the same line, none of the risk or protective constructs accounted for any of the variance in suicidality. Given that risk factors did not account for significant variance in suicidality, we probed the data for collinearity. That is, it was possible that two or more of the variables were highly correlated with themselves and with suicidality which could have falsely rendered these associations statistically non-significant. To investigate the data for collinearity, we examined the collinearity tolerance statistics in the output of the regression models. Tolerance is a measure of interrelation within independent variables and ranges from zero to one, with lower scores indicating higher levels of collinearity. Previous research (Allison, 1999) notes that there is not a strict cut off for tolerance, but suggests a tolerance statistic of below 0.40 is cause for concern. Alternatively, other research (Weisburd and Britt, 2014) states that a tolerance statistic under 0.20 suggests serious collinearity within a regression model. Within the present study however, all independent variables have collinearity tolerance statistics which are equal to or

>0.75, far exceeding any cutoff for concern. This indicates that within our model, collinearity is well above a threshold for concern.

4. Discussion

In 2020, the Military Health and Well-Being Project was conducted and collected measures of psychosocial well-being among 1469 Veterans. The purpose of that project was to collect data regarding the link between psychosocial correlates of health and wellness and suicidality. In the present study, we investigated the link between risk and protective constructs with suicidality, a phenomenon that disproportionately affects Veterans.

4.1. Protective factors

Among this sample, protective factors included social integration, social contribution, public service motivation, purpose and meaning, and help-seeking. When we examined the bivariate relationship between each protective construct and suicidality, each protective construct was associated with suicidality. That is, as these protective constructs increased in intensity, the intensity of suicidality decreased. Among these bivariate correlations between protective constructs and suicidality, findings indicated that social contribution and social integration were the strongest protective constructs. This is consistent with our hypothesis that social contribution and social would be the strongest protective factors against suicidality. We then combined all protective factors in a single linear regression towards suicidality, and found that social contribution accounted for the greatest share of the variance in suicidality with social integration and public service also accounted for less but still significant variance in suicidality. Notably, help-seeking, public service motivation, purpose, and value were not significant protective constructs with suicidality.

Together this work shows that these bivariate relationships are easily interpretable and these relationships clearly demonstrate that within this sample, protective factors are generally associated with decreases in the experience of suicidality. They also demonstrate that when protective factors are all grouped together, the set is associated with decreases in suicidality. But when we look at construct-specific effect sizes in these larger models, their effect sizes become small and uninterpretable. It appears that the simultaneous investigation into these protective factors muddies the waters in a sense, and the shared variance between these protective factors is actually what is driving the effects in suicidality.

4.2. Risk factors

With regards to risk factors, we investigated military self-stigma, daily stress, combat exposure, substance use, TBI, and moral injury as they relate with suicidality. At the bivariate level, each risk factor was associated with a significant increase in suicidality. That is, as the presence of risk factors increased, so did the experience of suicidality. Specifically, we found that out of all risk constructs, moral injury had the strongest risk correlation with suicidality. However, when all risk constructs were studied simultaneously via linear regression, none of the constructs accounted for a significant variance in suicidality. This presentation wherein bivariate correlations between risk factors and the outcome of interest are significant and strong while the effects within the combined regression model have become not significant is consistent with previous literature and points to shared variance between these risk factors (Moradian et al., 2023; O'Reilly et al., 2022; Tsai and Klonsky, 2023). Indeed, on their own, the risk factors studied here were all associated with suicidality, and their effect as a set were also predictive of suicidality. However, individual level effects in the regression models failed to achieve statistical significance. This is likely due to covariance between the risk factors with suicidality. Indeed, common variance between the risk factors appeared to be the driver of the effects, and the constructs on their own assume little variance in the model.

4.3. Combining risk and protective constructs

Similar findings were evident when we investigated risk and protective constructs simultaneously. When we combined risk and protective constructs into one linear regression model, the model as a whole was significant, yet none of the constructs accounted for variance in suicidality. Indeed, this is likely due to the shared variance between risk and protective constructs with suicidality. Independently in the zero order correlation matrix, risk and protective factors were generally associated with suicidality. Further, the entire set of independent variables accounted for variance in the outcome of interest. However, the construct level effects in the model were not statistically significant. Indeed, this pattern of results likely points to the shared variance between these factors as being the main contributors towards suicidality. With the increasing number of predictors in the model, the covariance accounted for more variance while the individual level effects became no longer statistically significant.

Our work also demonstrates that the measures presented within the Military Health and Well-Being Project alone were not sufficient in bottom-up modeling of variance in suicidality risk. That is, the bottom-up approach of gleaning insights from patterns in data was found to be not sufficient in identifying constructs that accounted for suicidality in this sample. More powerful models (including those developed and deployed within the Veterans Health Administration, [Kessler et al., 2017], Vanderbilt University Medical Center [Walsh et al., 2021], University of Pennsylvania [Brown et al., 2020], Western Psychiatric Institute and Clinic [Mann et al., 2008], and Kaiser Permanente [Simon et al., 2018]) have been successful at training models with millions of patients using dozens of predictors at classifying patients at risk for suicidality. In our case, with this sample, the models did not identify predictors that accounted for variance in suicidality, and this could likely be improved by drastically increasing the size of the sample.

4.4. Clinical implications

Findings from the present project could have implications for treatment and intervention work. Indeed, when investigating bivariate correlations as well as the linear regression model testing the simultaneous experience of protective constructs, social integration had the strongest associations with suicidality. These findings highlight the potent nature of social contribution in the experience of suicidality among Veterans. This is consistent with previous literature which demonstrated that social contribution is protective against suicidality (Adams et al., 2019; Elbogen et al., 2020; Pietrzak et al., 2010). As such, social contribution may comprise important an element in routine assessment, formulation and collaborative treatment planning with Veterans experiencing suicidal thoughts and behaviors. However, it should be noted that when all risk and protective factors were considered simultaneous, none of the factors accounted for significant variability in suicidality, meaning that sources of risk and protection maybe highly heterogenous and vary both within and between participants.

These findings could also support the use of treatments. For example, the Veterans Health Administration (VHA) is a leading provider in mental healthcare for Veterans. Presently, provide guidelines for suicide prevention in Veterans that include, but are not limited to, Cognitive Behavioral Therapy. Safety Planning Intervention, Problem Solving Therapy, and Dialectical Behavioral Therapy. Further, the VHA recommends that Veterans build networks of support that strengthen protective factors. This includes providing Veterans with self-help portal to work on problem-solving skills, ways to manage their anger, and improve their parenting skills and relationship with families. Based on the results from our findings we suggest two things. (1) We suggest that among the host of protective factors that the VHA tries to build in Veterans, they begin with social contribution. Our findings show that among all the protective factors studied, social contribution may account for the largest variance in suicidality. (2) Further, we recommend

that the suicide prevention efforts within VHA focus on a person-centered, nuanced approach to risk and protective factors. Specifically, it is possible that important risk and protective factors change over time, and the interventions that the VHA should account for that risk/protection will need to be flexible and person-centered.

Similar clinical applications can be used among non-military-related samples. For example, the Stanley-Brown Safety Plan (Stanley et al., 2008) is a suicide prevention tool widely-used in hospital settings and outpatient settings alike. One of the reasons that Stanley-Brown is both widely-used and effective is because it is tailored to each individual patient and their needs and preferences (Rogers et al., 2022). Our work here shows that social contribution may be a protective factor, and that has implications for the use of the Stanley-Brown Safety Plan. Specifically, Steps 3 and 4 of the Stanley-Brown Safety Plan suggest that patients contact friends and family to help in a suicidal crisis. Our work suggests that not only can patients connect with friends and family, but perhaps engaging social contribution with these loved ones may amplify the effects of suicide prevention. Indeed, contributing words of kindness or engaging in acts of service towards other people may compound with the effects of connecting with loved ones to further reduce feelings of suicidality.

4.5. Limitations

This study has many strengths. It employs data from a sample that is quite large sample and diverse with regards to age, race, and gender, increasing the generalizability of findings. Nevertheless, findings from this study should be interpreted in light of some important limitations. First, although diverse, this sample was comprised only of military Veterans from the US. It is possible that research investigating these constructs in Veteran samples derived from locations outside of the US would yield different results than our own. Additionally, these data are cross-sectional. The cross-sectional nature of these data removed the ability to investigate temporal antecedents between protective and risk constructs with suicidality. Thus, it is possible that the directionality between suicidality and protective and risk factors is reversed such that low levels of suicidality confer greater social contribution, integration, and help-seeking behaviors. It is also possible that the relationships between protective and risk constructs and suicidality are bi-directional influencing each other over time. Indeed, the cross-sectional nature of the study did not allow for the investigation of these types of relationships. Future research, incorporating data collection methods suited to understanding temporal antecedents such as Ecological Momentary Assessment (Parrish et al., 2021) and analytic techniques such as nonlinear dynamic systems modeling (Rogers and Joiner, 2019) may prove useful in advancing our understanding of trajectories of suicidal thoughts and behaviors.

There are participant characteristics that should be considered with regard to the diverse associations with suicidality. For example, although linked by the common experience of previous military service, the sample was widely heterogeneous with regards to age and service era. These heterogeneous features of demographics could point to disparate risk factors that contributed to the development of suicidality. For example, Veterans hailing from the Operation Enduring Freedom and Operation Iraqi Freedom eras encompassing conflicts in Afghanistan and Iraq, beginning in 2001 might be more susceptible to TBI leading to suicidality as Veterans in this service era were particularly victim to TBI through improvised explosive devices, mortars, and artillery fire. Regardless of the particular aspect, the heterogeneous nature of the sample may reduce the link between particular risk factors and suicidality as the experiences of Veterans between service eras were vast and varied.

Additionally, the self-report nature of the data contributed to further limitations. Self-report measures require that participants rely on their memory and recall to respond to items. This is problematic in that memory and recall may be subject to hindsight bias and thus exhibit

limited accuracy. Further, studies relying upon self-report data are vulnerable to demand characteristics wherein participants are aware of what the researchers are attempting to study, thus they endorse distorted rates of constructs in question. For both these reasons, we recommend that future studies employ more object measures of constructs to ensure accuracy.

The nature of the Qualtrics Panel as the primary recruitment source of recruitment is an additional limitation as well. Qualtrics Panel (as well as other online portals such as Amazon Mechanical Turk) is vulnerable to bot infiltration and fake participants that can potentially impact study results. Future research should recruit participants from Veterans whose status has been verified for example through the Veterans Health Administration. Finally, these data were also collected during the height of the COVID-19 pandemic and the initial phases of lockdowns to slow the spread of the virus. Thus, the interpretations of these results may not be generalizable into an environment without those added stressors which was associated with elevated rates of anxiety, depression, and suicidality (Schafer et al., 2022a, 2022b).

5. Conclusions

Suicidality disproportionately affects Veterans. In a sample of 1469 Veterans from multiple service eras and multiple branches of the military we studied the link between risk and protective constructs with suicidality. When we investigated protective constructs individually as well as simultaneously, social contribution was the strongest protective construct against suicidality. Likewise, when we investigated risk factors all were associated with significant increase in the experience of suicidality. However, when risk constructs were studied simultaneously, the entire set of risk factors (i.e., the regression model) was statistically significant, yet none of the constructs accounted for a significant amount of the variance in suicidality. Similar results were evident when all risk and protective constructs were investigated simultaneously, such that the entire model was significant yet none of the factors accounted for significant variance in suicidality. Together, findings from this project suggest that the common variance among risk factors and common variance among protective factors are likely the drivers of suicidality in these models while the item level variance was reduced to statistical non-significance. Indeed, this work demonstrates large models can be useful in the prediction of suicidality, yet within these models, item level analyses of independent variables often lose their interpretability.

CRediT authorship contribution statement

Katherine Musacchio Schafer: Writing – review & editing, Writing – original draft, Software, Funding acquisition, Formal analysis, Conceptualization. **Ruth Melia:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Thomas Joiner:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

There are no competing interests to disclose.

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