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Suicidal ideation, suicide attempts, and suicide death among Veterans and service members: A comprehensive meta-analysis of risk factors

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ABSTRACT

Suicide is the tenth leading cause of death in America. Particularly at risk, Veterans are 1.5 times more likely to die by suicide than non-Veterans, and the suicide rate among service members has risen over the last decade. In the present study, we (1) assessed risk factors for suicidal ideation, suicide attempts, and suicide death within and between Veterans and service members, (2) identified the most commonly studied and (3) the strongest risk factors for suicide-related outcomes among Veterans and service members, and (4) compared overall and risk factor-specific meta-analytic prediction of suicide-related outcomes in Veterans and service members, as determined in the present meta-analysis, to that of the general population. Authors harvested longitudinal effects predicting suicidal ideation, suicide attempts, or suicide deaths in Veterans or service members until May 1, 2020. Traumatic Brain Injury, substance/alcohol use disorders, prior Self-Injurious Thoughts and Behavior, PTSD, and depressive symptoms were among the most commonly studied risk factors. Anger/aggression was particularly strong risk factors, providing a source for future study and intervention efforts. When combined, risk factors conferred similar risk for suicide attempts and suicide death among Veterans, service members, and the general population. However, when analyzing *p*-values, factors conferred significantly more risk of suicidal ideation among Veterans and service members as compared to the general population. That is, *p*-values for risk factors were lower in an absolute sense but not necessarily to a statistically significant degree.

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What is the public significance of this article?— Veterans and service members exhibit elevated rates of suicide deaths as compared to the broader general population. Our comprehensive meta-analysis of risk factors for suicide-related outcomes in Veterans and service members indicated that anger/aggression, depressive symptoms, substance use disorder, and alcohol use disorder were significantly predictive of suicide-related outcomes in Veterans and service members. Further, these risk factors generally conferred more risk for suicide-related outcomes as compared to in the general population. Although these risk factors should not be used to predict future suicide-related outcomes, they could provide a source for targeted intervention.

The suicide rate in America rose many years over the past decade[1] (Centers for Disease Control and Prevention [CDC], 2018), during which period Veterans and service members – two groups within the general population – experienced increased risk. The suicide rate among United States military Veterans consistently exceeded the national average (Hedegaard, Curtin, & Warner, 2020; Veterans Affairs Report [VA Report], 2020), and veterans comprised a disproportionate number of suicide deaths. Although Veterans make up only 8% of the American population, they comprise 12% of suicides in America (VA Report, 2020). Further, among active duty service members, the suicide rate rose over recent years[2] (Department of Defense, 2020). Notably, when adjusted for gender and race, rates of suicide among service members, who are primarily Caucasian males, are consistent with other groups within this demographic (Watkins et al., 2018). Researchers, policy-makers, and public health officials responded to elevated suicide rate among Veterans and service members by calling for increased investigation into risk factors for suicidal ideation, suicide attempts, and suicide deaths within these groups.

Individual studies have informed efforts to identify and quantify risk factors for suicide-related outcomes in the Veteran and service member populations (Elbogen et al., 2018; Teo et al., 2018; Tucker et al., 2018). However, a comprehensive meta-analysis determining the strength of risk factors for suicidal ideation, suicide attempts, and suicide death among Veterans and service members does not yet exist, to our knowledge.[3] This gap is critical, in that

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previous meta-analyses in general samples may be too broad to usefully articulate risk factors for suicide within Veteran and service member populations. Further, while some published literature does exist that compares rates of suicide-related outcomes between Veterans/service members and the general population (Goodin et al., 2019; Hoyt & Holtz, 2020; Pruitt et al., 2018; Reger, Pruitt, & Smolenski, 2018; Reger et al., 2016) nuances in the relationship are yet to be meta-analyzed. Knowledge gained from such work could aid researchers in prioritizing potentially higher-yield and/or under-investigated factors, in hopes of developing widespread suicide prevention efforts for Veterans and service members.

The extant literature has examined risk factors for suicidal ideation, suicide attempts, and suicide death in the general population, and researchers have comprehensively meta-analyzed these investigations (see Franklin et al., 2017; Ribeiro et al., 2016, 2018; Witte, Gauthier, Huang, Ribeiro, & Franklin, 2018). These meta-analyses indicated that risk factors generally had similar predictive power (approximate odds ratio of 1.5) and that suicide-related outcomes (i.e., suicidal ideation, suicide attempts, and suicide death) were predicted with approximately equal strength. For example, among the general population, prior suicidal ideation, hopelessness, depressive symptoms, abuse history, and anxiety symptoms were similarly statistically significant risk factors for suicidal ideation (Franklin et al., 2017). Likewise, prior non-suicidal self-injury, prior suicide attempts, Axis II diagnosis, and prior psychiatric hospitalization predicted suicide attempts with similar accuracy (Franklin et al., 2017). Finally, prior psychiatric hospitalization, prior suicide attempt, prior suicidal ideation, lower socio-economic status, and stressful life events conferred similar risk for suicide death (Franklin et al., 2017). Collectively, the literature indicated many risk factors for suicide-related outcomes, but none have excelled as optimal predictors of suicide-related outcomes in the general population or within service members or Veterans (Franklin et al., 2017). That is, in the general population, no risk factors emerged as highly accurate predictors of any suicide-related outcomes (e.g., with odds ratios in the hundreds).

Within literature investigating suicide-related outcomes among Veterans and service members, a number of risk factors have been identified. For example, insomnia (Bryan et al., 2015), alcohol abuse (Skopp, Luxton, Bush, & Sirotin, 2011), and depressive disorders (Brignone et al., 2017) have been shown to increase the risk of future suicidal ideation among Veterans and service members by more than two-fold. Suicidal ideation, suicide attempts prior to military service (Bryan et al., 2014), posttraumatic stress disorder (PTSD), and depression (Lee et al., 2017) have been shown to triple the risk of future suicide attempts in Veterans and service members. Finally, prior inpatient hospitalization (Zivin et al., 2007) and substance use disorder (Chapman & Wu, 2015) have been identified as risk factors for suicide death among Veterans and service members, increasing the risk of suicide death by 2.5 times. However, the lack of meta-analytic investigation in these populations limits knowledge of the robustness of identified risk factors as they predict suicide-related outcomes among Veterans and service members, a group who experience elevated rates of suicide.

In addition to these broad risk factors, Veterans and service members experience specific stressors and environments related to their military service (e.g., combat, branch of service, war era, military sexual trauma) that may increase risk (Lemaire & Graham, 2011). For example, many Veterans and service members encounter deployment, separation from family while on deployment, combat, becoming wounded or seeing wounded comrades while deployed, military sexual trauma, and post-service separation from the military. Indeed, Schoenbaum et al. (2014) studied deployment as a risk factor for suicide and found that service members who were deployed were significantly more likely to die by suicide as compared to those who had not been deployed. However, other studies have not found a longitudinal association between deployment and suicide-related outcomes (Kang et al., 2015; LeardMann et al., 2013; Reger et al., 2015). While certain segments of the general population may experience similar stressors (e.g., first responders), these factors are overrepresented in Veterans and service members, thus potentially contributing to their increased risk for suicide-related outcomes. However, it remains unknown if the increased rate of suicide in Veterans and service members over recent years is due to Veteran- and service member-specific risk factors (e.g., deployment, combat) or if more general risk factors (e.g., prior attempts, psychiatric hospitalizations) confer greater risk of suicide-related outcomes as compared to the general population. Alternatively, it is possible that simply, as a function of demographic features (i.e., Caucasian males), military service members and Veterans may experience risk for suicide-related outcomes that would be expected of this demographic group.

Importantly, in order for a factor to be considered a risk factor, among other things, it has to show temporal precedence as related to the outcome variable. Therefore, while researchers have investigated the causes of suicide-related behaviors with myriad research

designs, many investigations have documented cross-sectional relations. Cross-sectional studies are missing key design features, with researchers often unsure if a putative cause preceded an effect (Shadish, Cook, & Campbell, 2002). Researchers need to examine temporal antecedence of risk factors with regard to suicide-related behaviors, which cannot be inferred from cross-sectional designs. Thus, in an effort to investigate the temporal relation between risk factors and suicide-related outcomes, the present study excluded cross-sectional investigations into posited risk factors and suicide-related outcomes, and it included only studies with longitudinal designs.

Objectives

The overall objective of the present study was to summarize extant literature longitudinally predicting suicidal ideation, suicide attempts, and/or suicide death in the Veteran and service member populations. We are seeking to identify specific risk factors for Veteran and service member populations. With this in mind, the project had four main goals: (1) to estimate risk for suicidal ideation, suicide attempts, and suicide death among the Veteran and service member populations, as conferred by previously studied risk factors, (2) to identify and investigate the most commonly studied and (3) the strongest risk factors for suicide-related outcomes among Veterans and service members, and (4) to compare meta-analytic predictive power for suicide-related outcomes within Veterans and service members, as determined in this study, to predictive power for suicide-related outcomes among the general population, as determined by preexisting meta-analyses. Beyond these four aims, we conducted exploratory moderator analyses to determine the role of gender, age, and race on suicidal ideation, suicide attempts, and suicide deaths within the Veteran and service member samples.

It is possible that general risk factors confer substantially more risk for suicidal ideation, suicide attempts, and/or suicide death in the Veteran and service member populations as compared to the general population. That is, although, when adjusted for race and gender, service members experience rates of suicide similar to those of the general population, it is unstudied thus unclear if constructs confer variable risk for suicide-related among military-related groups as compared to the general population (Watkins et al., 2018). This possibility would be of note in that previous meta-analyses in the general population indicated that risk factors predict suicidal ideation, suicide attempts, and suicide death with roughly equivalent strength between demographic groups (Huang, Ribeiro, Musacchio, & Franklin, 2017). Notably, Veteran and service member populations are comprised primarily of Caucasian males. This demographic pattern is not present within the general population. Alone, Caucasian males are at elevated risk of suicide death; thus, we would expect Veterans and service members to experience elevated rates of suicide as compared to the more heterogeneous general population. It is also possible that Veteran- and service member-specific risk factors would be especially strong predictors of suicide-related outcomes. This would also be notable because these risk factors would likely be particularly apt constructs in suicide-risk assessments in Veteran and service member populations. Either of these possible outcomes would contribute to suicide prevention efforts among Veteran and service member populations.

Methods

Searches and sources

The meta-analysis was performed in accord with Meta-Analysis Reporting Standards (MARS) reporting guidelines. Authors searched PsycINFO, PubMed, and Google Scholar from inception until May 1, 2020, using the following search terms: (soldier OR Veteran OR military OR active duty OR reserve OR national guard OR coast guard OR marine OR air force OR army OR navy) AND (longitudinal OR prospective) AND suicid*. Articles that were not readily available upon searches of databases were requested via the institutions Interlibrary Loan Service and then assessed for inclusion. The Department of Defense and Veterans Affairs official data reports were not included in the present analysis as the study was conducted to reflect the whole of longitudinal risk factors within Veterans and service members published in peer-reviewed journals.

Inclusion and exclusion criteria

We included articles that were peer-reviewed publications in English, comprised an American Veteran or service member sample, and contained at least one effect size longitudinally relating a risk factor to a discrete outcome of suicidal ideation, suicide attempts, or suicide death. We excluded articles if they reported results as hazards ratios, did not report longitudinal analyses, or combined suicide-related outcomes. Without absolute values of outcomes (i.e., confusion matrix), hazards ratios cannot be converted to odds ratios (Borenstein, Hedges, Higgins, & Rothstein, 2011). Based on our searches, we identified 634 papers. Based on reading of the abstracts, 108 papers likely met inclusion criteria as

they were in English, applied to American Veteran and service member samples, and measured risk of suicide-related outcomes. After careful reading of each of these papers, 70 of those papers did not meet full inclusion criteria as they were either cross-sectional, combined outcome variables, or contained other methodological issues (e.g., case studies, treatment studies, or combined Veterans/service members with members of the general population). We retained 36 papers, containing within them 410 effect sizes estimating the longitudinal relation between risk factors and discrete suicide-related outcomes. Interrater reliability was calculated and found to be good (interclass correlation coefficient = .78).

Statistical analyses

We performed meta-analyses in Comprehensive Meta-Analysis, Version 3.29. Odds ratios (ORs) were used as the primary coefficient metric. Effect sizes that were not provided as ORs, were calculated based on 2 × 2 contingency. I^2 was used to quantify between-study heterogeneity. We found an elevated I-squared value (I^2 = 99.005), indicating significant evidence of between-study heterogeneity and the measurement of multiple underlying effects, thus we employed random effects consistent with previous meta-analyses (Chu et al., 2017; Franklin et al., 2017). We quantified publication bias using Egger's regression test, Classic fail-safe N, and Duval and Tweedie's Trim, and Fill. All confidence intervals are 95%.

Data extraction and coding

Every effect size was coded based on author, year, independent variable (e.g., race, age, substance/alcohol use disorder, PTSD [symptom severity], depressive symptoms, prior self-injurious thoughts and behaviors, anxiety symptoms, traumatic brain injuries [symptom impairment], access to means, mania/bipolar/psychosis, combat, marital status, and military sexual trauma), and outcome variable (i.e., suicidal ideation, suicide attempts, or suicide death). Research assistants with Bachelor of Science degrees initially entered codes, which were checked by the first author, a doctoral candidate, to ensure accuracy. Any discrepancies were reviewed and resolved by discussion. The first author then entered all data into Comprehensive Meta-Analysis, Version 3.29.

Comparing Veterans and service members to general samples

One goal of the present meta-analysis was to compare the predictive ability of risk factors in Veteran and service member populations to that in the general population found in the extant literature. This was accomplished by referencing comprehensive meta-analyses from the published literature. These weighted ORs from meta-analyses in the general population were then compared to weighted ORs from the present meta-analysis of suicide-related outcomes in Veteran and service member samples. Meta-analytic predictive values for the general population were gleaned from Fralick et al. (2019), Franklin et al. (2017), Ribeiro et al. (2016, 2018), and Witte et al. (2018).

Results

Descriptive summary of extant literature

Articles meeting inclusion criteria are outlined in Figure 1. Specifically, searches produced 634 possibly meeting inclusion criteria. However, after initial reviews by the lead author and subsequent investigations/checks by coauthors, 36 papers were included in the present meta-analysis. Publication dates range from 1995 to 2019. Investigations into Veteran- and service member-specific suicide-related risk factors increased over time, especially within the past 10 years. Table 1 lists all independent variables employed in the present manuscript. The data that support the findings of this study are available from the corresponding author, KMS, upon reasonable request.

Prediction of suicidal ideation

The primary aim of the present meta-analysis was to assess risk for suicidal ideation, suicide attempts, and suicide death among the Veteran and service member populations conferred by risk factors in the extant literature. When pooled together, among Veterans and service members, all independent variables evidenced combined significant prediction of suicidal ideation (k = 54, wOR = 1.86 [1.65– 2.11]). There was some evidence of publication bias in the extant literature on suicidal ideation (Classic Failsafe n = 68,811, Egger's Regression Test B_0 = .57 [−2.81, 3.96] p = .73; Duval and Tweedie's trim and fill adjusted wOR = 1.70 [1.51– 1.91]). Among Veteran samples, all independent variables predicted suicidal ideation (k = 9, wOR = 1.61 [1.25– 2.08]). Among service members samples, all risk factors predicted suicidal ideation (k = 54, wOR = 1.86 [1.65– 2.11]).

Prediction of suicide attempts

Risk factors in the extant literature predicted suicide attempts (k = 234, wOR = 1.40 [1.27–1.55]) with statistical significance among Veterans and service members combined. There was evidence of publication bias in prediction of suicide attempts (Classic Failsafe N = 3,440, Egger's

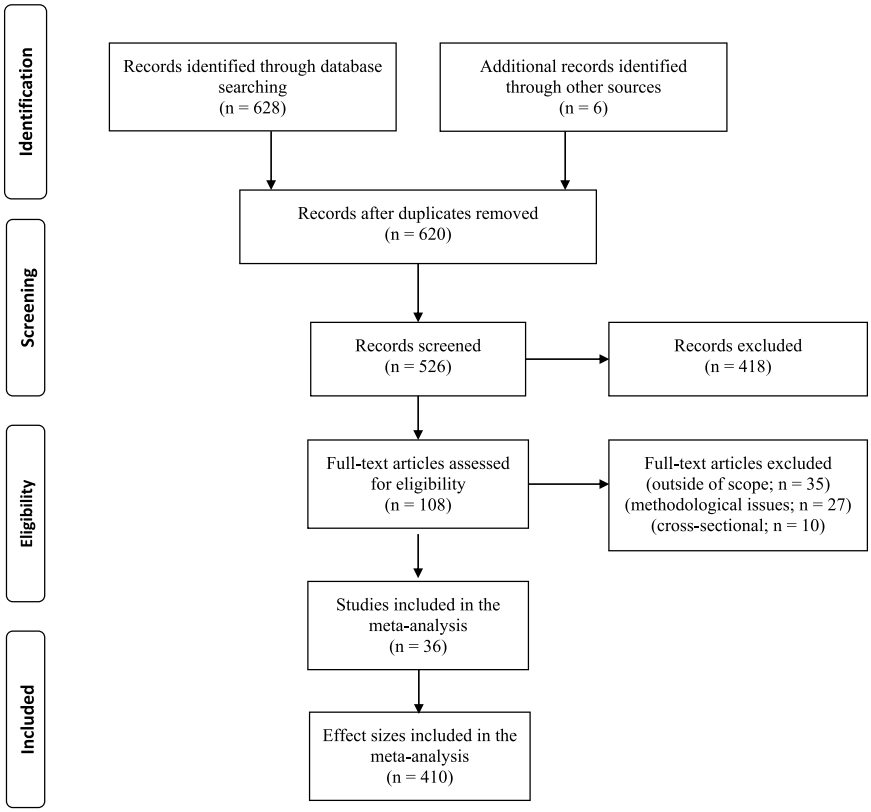

Figure 1. PRISMA flowchart of included studies.

Regression Test $B_0 = -.43$ [−2.06, 1.19], $p = .603$, Duval and Tweedie's trim and fill adjusted *w*OR = 1.24 [1.12, 1.36]). Among Veteran samples, effects for all combined risk factors were lower and nonsignificant risk factors of suicide attempts ($k = 46$, *w*OR = 1.13 [1.00– 1.28]). When analyzing only service members samples, all risk factors predicted suicide attempts ($k = 188$, *w*OR = 1.59 [1.68– 2.24]).

Prediction of suicide death

Risk factors were statistically significant predictors of suicide death ($k = 126$, *w*OR = 1.56 [1.33–1.84]) among Veterans and service members. There was evidence of publication bias with regard to suicide death as an outcome (Classic Failsafe N = 1,004, Egger's Regression Test $B_0 = .86$ [−.76– 2.48], $p = .29$, Duval and Tweedie's trim and fill adjusted *w*OR = .73 [.59 – .92]). Among solely Veterans, all risk factors predicted suicide death ($k = 10$, *w*OR = 1.54 [1.17–2.01]). When analyzing service members alone, all risk factors predicted suicide death ($k = 116$, *w*OR = 1.57 [1.32– 1.87]) with statistical significance.

Most common and most predictive risk-factor category analyses

The second and third study aims were to identify most commonly studied and most accurate risk factors for all suicide-related outcomes in Veterans and service members. There were more than 50 independent variables employed, and the vast majority were investigated in fewer than five studies. For example, difficulties with morality ($k = 1$), pain ($k = 4$), and military unit cohesion ($k = 2$) were studied with relative infrequency.

We identified the five most commonly investigated risk factors, each measured continuously in terms of symptom severity unless otherwise specified, in Veterans and service members. Among studies in which the outcome variable was suicidal ideation, prior self-injurious thoughts and behaviors (prior SITBs; $k = 6$, *w*OR = 1.71 [1.19– 2.44]), depression ($k = 5$, *w*OR = 6.51 [3.20–13.24]), anger/aggression ($k = 5$, *w*OR = 4.59 [3.08–6.85]), substance/alcohol use disorders ($k = 4$, *w*OR = 3.13 [1.01– 9.64]), and financial and legal problems ($k = 3$, *w*OR = 1.23 [1.05– 1.45]) were the most commonly studied risk factors. For studies investigating suicide attempts, TBI ($k = 20$, *w*OR = 1.01 [0.85– 1.20]), PTSD ($k = 12$, *w*OR = 1.25 [.96– 1.64]), combat (discrete number of combat events, $k = 9$, *w*OR = 1.06 [.88– 1.27]), deployment (discrete number of deployments, $k = 7$, *w*OR = 1.47 [1.088– 1.98]), and substance/alcohol use disorders ($k = 7$, *w*OR = 1.19 [1.01– 1.41]) were the most commonly studied. Finally, studies wherein the outcome variable was suicide death, substance/alcohol use disorders ($k = 8$, *w*OR = 3.63 [1.89– 6.98]), prior SITBs ($k = 4$, *w*OR = 7.48 [3.24– 17.26]), deployment ($k = 4$, *w*OR = 0.912 [.67– 1.24]), financial and legal problems

Table 1. List of independent variables.

Access to Guns	General Distress	Never Married	Substance Abuse Symptoms
Aggression	General Family Member Problems	Occupational Problems	Time in Service before First Deployment
Alcohol Abuse	Graduated From Recruit Training	Outpatient Mental Health History	Time Since Mental Health Diagnosis
Anger	Grief	Pain	Tobacco Use
Anxiety Symptoms	High Vitamin D	Panic	Traumatic Brain Injury
Article 15	Homicidal Thoughts	Posttraumatic Stress Disorder Symptoms	Unbearability
Bipolar	Hospitalization Considered for Psych Symptoms	Prescription Drug Misuse	Unit Cohesion
Childhood Emotional Neglect	Housing Problems	Previous Mental Health Diagnosis	VA Substance Abuse Treatment
Chronic Illness or Pain	Impulsivity	Previously Married	Violent Intent
Combat Trauma	Increased Recruit Training Stress	Prior Self Injurious Thoughts and Behaviors	
Combat Arms	Inpatient Mental Health History	Psychiatric Assessments	
Combat Medic	Insomnia	Psychiatric Diagnosis ever Recorded	
Combat Support	Intermittent Explosive Disorder	Psychotic Disorder	
Contact With Mental Health Professional During Military Service	Interpersonal Violence	Rank Below Expectation	
Court Martial	Isolation	Referral To Imaging Studies	
Currently Married	Job or School Problems	Referral to Laboratory Tests	
Death of Family Member	Legal Problems	Religion	
Demoted in The Past Year	Length of service	Risk Taking	
Deployed	Mania or Manic Behavior	Rural	
Depression Symptoms	Marital/Intimate Problems	Saturated Fatty Acids	
Difficulty With Access to Healthcare	Medical Downgrade	Service Connected	
Disciplinary Action Ever Recorded	Military Disciplinary Problems	Short Dwelling Time	
Education	Military Psychiatric Evaluation Ever	Sick Leave Within Service Time	
Enlisted	Military Sexual Harassment	Social Environment Problems	
Failed Relationship	Monosaturated Fatty Acids	Somatic Symptoms	
Functional Decline	Mood Disorder Diagnosis	Special Forces	

(k = 3, wOR = 3.35 [.52– 21.44]), and access to lethal means (k = 3, wOR = 3.88 [1.54– 9.77]) were the most commonly studied. These values are displayed in Table 2.

We compared these values to analogous wOR of substance and alcohol use disorders (SUDs and AUDs), prior SITBs, depressive symptoms, and TBI in the general population from Witte et al. (2018), Ribeiro et al. (2016, 2018), Fralick et al. (2019) respectively. See Figure 2 for wOR by independent variable and outcome type. Generally, depressive symptoms and substance use disorder/alcohol use disorder were stronger risk factors for suicide-related outcomes among Veterans and service members (depressive symptoms, wOR = 6.51, SUD/AUD, wOR = 3.13) as compared to the general population (depressive symptoms, wOR = 1.57, SUD, wOR = 1.18, AUD, wOR = 1.57).

Prior SITBs and TBI conferred similar risk for suicide-related outcomes between the general population and combined service members and Veterans. Further, although PTSD represented a frequently studied risk factor for suicide, it was not meta-analyzed in the general population with similar inclusion criteria. For example, Panagioti, Gooding, and Tarrier (2012) investigated the association of PTSD with suicide-related outcomes. However, that study combined effects from longitudinal and cross-sectional studies. Given that the present study excluded all cross-sectional studies, Panagioti et al. (2012) was not an analogous investigation. Elevated risk demonstrated among Veterans and service members could reflect the concentrated nature of other predictors of suicide-related outcomes, Caucasian race and male gender. These predictors are elevated in Veterans and service members as compared to the general population and could alone be responsible for the increased risk.

We then identified the five strongest risk factors for suicidal ideation, suicide attempts, and suicide deaths in Veterans and service members. Among Veterans and service members, the strongest risk factors for suicidal ideation were depression (k = 5, wOR = 6.51 [3.20–13.24]), anger/aggression (k = 5, wOR = 4.59 [3.08–6.85]), substance/alcohol use disorders (k = 4, wOR = 3.13 [1.01– 9.64]), PTSD (k = 2, wOR = 2.51 [1.29– 4.89]), and prior SITBs; k = 6, wOR = 1.71 [1.19–2.44]). Likewise, the strongest risk factors for suicide attempts were financial and legal problems (k = 1, wOR = 6.90 [4.38– 10.86]), interpersonal difficulties (k = 4, wOR = 3.65 [1.79– 7.48]), military sexual trauma (k = 2, wOR = 1.73 [.92– 3.26]), prior SITBs (k = 6, wOR = 1.45 [1.02– 2.05]), and mania/bipolar/psychosis (k = 4, wOR = 1.25 [.94– 1.68]). Finally, studies that investigated risk factors of suicide death found the

Table 2. Prediction of suicide-related outcomes in general, Veteran, and service member populations.

	Suicidal Ideation			Suicide Attempts			Suicide Deaths		
	k	*w*OR	95% CI	*k*	*w*OR	95% CI	*k*	*w*OR	95% CI
Depressive Symptoms									
General Population	34	1.57	1.45– 1.70	61	1.30	1.23–1.37	43	1.28	1.14–1.41
Veterans	-	-	-	1	3.74	3.20–4.37	1	2.68	1.45–4.93
Service Members	5	6.51	3.20–13.23	5	1.23	.95–1.59	1	2.40	1.42–4.06
Prior SITBs									
General Population	66	1.96	1.81–2.13	166	1.63	1.55–1.72	116	133	1.18–1.49
Veterans	4	1.06	.95– 1.17	-	-	-	-	-	-
Service Members	2	6.20	3.64–10.56	6	1.49	1.02–2.05	4	7.48	3.24–17.26
AUD/SUD									
General Population(AUD)	16	1.18	1.03–1.35	21	1.42	1.20–1.67	15	1.68	.84–3.33
General Population(SUD)	8	1.57	1.16–2.12	4	1.51	.95–2.40	-		
Veterans	-	-	-	3	1.18	.99–1.40	1	2.30	1.35–3.91
Service Members	4	3.13	1.02–9.64	4	1.09	.59–2.03	7	3.99	1.89–8.41
Anger/Aggression									
General Population (Anger)	6	1.40	1.14–1.71	3	1.23	.93–1.62	-	-	-
General Population (Aggression)	6	1.07	.88–1.31	10	1.39	1.14–1.69	5	2.21	.69–7.12
Veterans	-			-			-	-	-
Service Members	5	4.59	3.08–6.85	1	1.40	1.09–1.79	3	18.95	0.83–430.43
PTSD									
General Population	-			-			-	-	-
Veterans	-	-	-	3	1.27	.5–3.25	-	-	-
Service Members	2	2.52	1.29–4.89	9	1.07	.99–1.11	-	-	-
Access to Means									
General Population	-	-	-	-	-	-	-	-	-
Veterans	-	-	-	-	-	-	-	-	-
Service Members	-	-	-	-	-	-	3	3.88	1.54– 9.77
Mania/Bipolar/Psychosis		-	-		-	-			
General Population	-	-	-	-	-	-	-	-	-
Veterans	-	-	-	4	1.25	.94–1.68	1	7.38	2.13–25.59
Service Members	-	-	-	-	-	-	2	3.33	2.02–5.47
TBI									
General Population	-	-	-	-	-	-	6	2.03	1.47–2.80
Veterans	-	-	-	-	-	-	3	1.48	1.27–1.72
Service Members	-	-	-	20	1.01	0.89–1.20	-	-	-

Depressive symptoms, prior Self-Injurious Thoughts and Behaviors (SITBs), Substance Use Disorders and Alcohol Use Disorders (SUDs and AUDs), and TBI in the general population were extracted from Ribeiro et al., (2016, 2018), Witte et al. (2018), and Fralick et al. (2019) respectively.

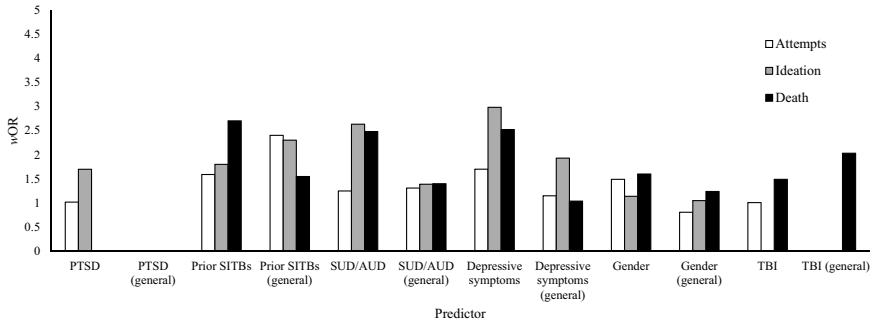

Figure 2. Most commonly studied risk factors for suicidal ideation, suicide attempts, and suicide death in combined Veteran and service members samples as compared to the general populations. (General): Reported *w*ORs for general population; without specification is ORs for combined Veterans and service members samples. PTSD: Post Traumatic Stress Disorder, SUD/AUD: Substance Use Disorder/ Alcohol Use Disorder, TBI: Traumatic Brain Injury. Categories with general in parentheses indicate weighted odds ratios from the general population. Otherwise, categories represent weighted odds ratios from combined Veteran and service member populations.

greatest risk was conferred by anger/aggression (k = 3, wOR = 18.95 [.83– 34.43]), access to lethal means (k = 3, wOR = 3.88 [1.54– 9.77]), mania/bipolar/psychosis (k = 3, wOR = 3.73 [2.29– 6.07]), substance/alcohol use disorders (k = 8, wOR = 3.63 [1.89– 6.98]), and prior SITBs (k = 4, wOR = 7.48 [3.24– 17.26]).

We then analyzed Veterans and service members as disparate groups (see Table 2). Results from Aim 3 identified specific constructs that conferred disparate risk for suicide-related outcomes between Veterans and service members. TBI conferred significant risk of suicide-related outcomes in Veterans, but not among

service members. Likewise, prior SITBs significantly predicted suicide-related outcomes in service members yet not among Veterans. Notably, depressive symptoms were predictive of suicide-related outcomes in both service members and Veterans. Finally, anger, aggression, and access to means demonstrated potent predictive abilities, yet these risk factors were *only* studied in service members.

Comparison of prediction in Veterans and service members versus the general population

Aim 4 of the meta-analysis was to determine predictive power for suicidal ideation, suicide attempts, and suicide death in Veterans and service members as compared to the general population.[4] It is important to note, however, that studies of the general population include Veterans and service members. Thus, within these analyses we are investigating subgroups within the general population, not groups distinct from the general population. First, in Aim 1, we used all risk factors to calculate the weighted odds ratio for suicidal ideation (k = 102, wOR = 1.81 [1.65– 1.98]), suicide attempts (k = 234, wOR = 1.40 [1.27–1.55]), and suicide death (k = 116, wOR = 1.57 [1.32– 1.87]) among Veterans and service members. Then, we harvested respective values from larger meta-analyses of risk factors for suicidal ideation (k = 572, wOR = 1.50 [1.47– 1.54]), suicide attempts (k = 1,281, wOR = 1.51 [1.49– 1.54]), and suicide death (k = 912, wOR = 1.50 [1.46– 1.56]) among the general population (Franklin et al., 2017). See Figure 3 for the risk conferred for suicidal ideation, suicide attempts, and suicide death in the general population and among Veterans and service members. This figure demonstrates that risk factors, when combined, were stronger predictors of suicidal ideation for Veterans and service members than the general population. Prediction of suicide attempts and suicide death did not vary between Veterans and service members as compared the general population.

Comparison of specific risk factors in Veterans, service members, and the general population

See Table 2 for the most commonly studied and the most predictive risk factors (and their corresponding wOR and confidence intervals) identified among Veterans and service members. The analogous wORs within the general population are also displayed in Table 2. Table 2 demonstrates that anger/aggression, prior SITBs, and mania/bipolar/psychosis are relatively strong risk factors of suicide-related outcomes in Veterans and service members. However, it indicates that these constructs are relatively rarely studied in the Veteran and service member population. Further, PTSD, access to means, and mania/bipolar/psychosis were not meta-analyzed in a similar fashion in the extant literature among the general population. That is, no study to our knowledge conducted a meta-analysis with similar inclusion and exclusion criteria (i.e., longitudinal studies predicting discrete suicide outcomes) using PTSD, access to means, mania, bipolar, or psychosis. Thus, these values are missing from Table 2.

Moderation analyses via meta-regression

Gender. We investigated if the risk of suicide-related outcomes varied substantially by gender. Gender was coded as the percentage of the sample that identified as male. Using meta-regression, we found no significant effect of gender on suicide-related outcomes when all studies (β = −0.0013 [−0.0043– 0.0017] p = .392), solely Veterans (β = −.0022, [−0.0053 – .0009] p = .1629), or solely service members

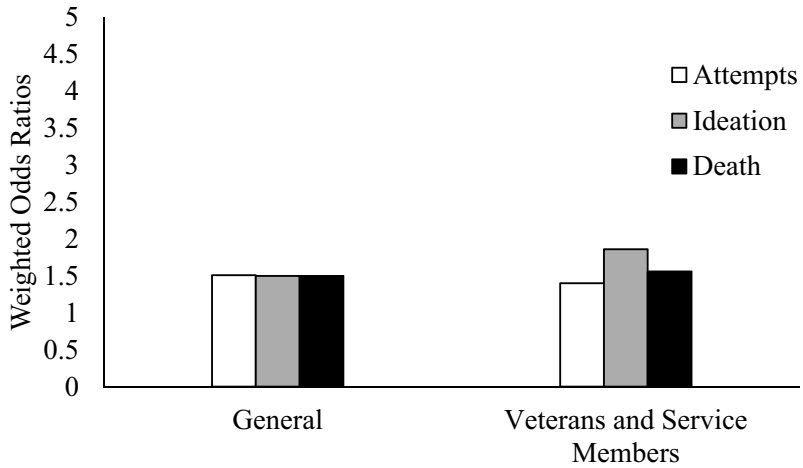

Figure 3. Risk conferred for suicidal ideation, suicide attempts, and suicide death in general population and among Veterans, all risk factors combined.

(β = −.0043 [−0.0112– 0.0026] p = .2207) were analyzed. Based on these findings, there appeared to be no gender-based differences in the risk of suicide-related outcomes.

Age. We next investigated if the risk of suicide-related outcome varied substantially by age. We found that when all studies were analyzed together (β = 0.0098 [.0039 – .0157] p = .0012) as well as when Veterans (β = −0.0257 [−0.0454 – −0.0060] p = .0104) and service members (β = .0117 [.0051 – .0184] p = .0005) were analyzed separately, age was a significant moderator between risk factors and suicide-related outcomes. Findings indicated that as participants advanced in age, the relationship between risk factors and suicide-related outcomes weakened. This held true among the entire sample, as well as when Veterans and service members where analyzed separately.

Sample size. We then investigated the role of sample size on the relationship between risk factors and suicide-related outcomes. When all studies were analyzed together (β < 0.001 [0.001– 0.002] p = .0003) and when service members were analyzed separately (β < .001 [0.001– 0.0111] p = .0014) there was a significant relationship between sample size and risk for suicide-related outcomes. As sample size increased so did the relationship between risk factors and suicide-related outcomes. However, when Veteran samples were analyzed on their own, there was not a significant link between sample size and suicide-related outcomes (β < .001 [0.000– 0.000] p = .3476).

Race. Finally, we employed meta-regression to test if risk of suicide-related outcomes varied by race. Race was coded as a percentage of the sample that identified as Caucasian. When all studies were analyzed together (β = 0.0076 [−.0029 – .0019] p = .0094) and when service members (β = 0.059 [−0.0002 – .0119] p = .0056) were analyzed separately, there was not a relationship between race and risk of suicide-related outcomes. However, among Veteran samples, there was a significant link between race and suicide-related outcomes (β = .0405 [.0126 – .0684] p = .0045) such that risk of suicide-related outcomes increased as did the percentage of Caucasian participants.

Discussion

The suicide rate in America rose most years over the past decade (CDC, 2018). During that time, two groups within the general population, Veterans, and service members, witnessed an increase in suicide deaths (Department of Defense, 2020; VA Report, 2020). Individual studies have investigated risk factors for suicidal ideation, suicide attempts, and suicide death among Veterans and service members, but it was unclear which, if any, risk factors conferred substantial risk that accounted for the increased risk of suicide among these populations.

Our comprehensive meta-analysis indicated that several risk factors in the extant literature were significant predictors of suicide-related outcomes in Veterans and service members. That is, relevant risk factors in the literature were generally moderate predictors of suicidal ideation, suicide attempt, and suicide death. This particular finding among Veterans and service members is consistent with broader findings within the general suicidology literature, indicating that single risk factors, on their own, cannot be used to accurately predict suicide-related outcomes (see Belsher et al., 2019). Further, when compared to meta-analytic prediction of suicide-related outcomes among the general population (see Franklin et al., 2017; Fralick et al., 2019; Ribeiro et al., 2016, 2018; Witte et al., 2018), risk factors conferred similar levels of prediction. Thus, despite the increased rates of suicide in Veterans and service members, risk factors conferred no more risk among Veteran and service member than in the general population. Importantly, this finding indicated that across the whole, at the time of data collection, the literature reflected neither optimal prediction of suicide-related outcomes among Veterans and service members, nor substantially more accurate prediction of suicide-related outcomes than in the general population. This indicates that in the Veteran and service member populations (as is the case in the general population) single risk factors are likely not entirely accurate predictors of future suicide-related outcomes. Single risk factors should then not be used in the classification or identification of suicide-related outcomes within Veterans/service members. However, risk factors in our study were statistically and clinically, significant predictors of future suicide-related outcomes, accounting for much of the variance. This significance indicates that risk factors are temporally important in the development of suicide-related outcomes, with some potentially contributing toward these outcomes. The competing goals between the classification of patients with suicide-related outcomes versus understanding the causal mechanisms of suicide-related outcomes are discussed at length in Schafer et al. (2021).

Nonetheless, with regard to individual risk factors, our findings identified many potentially important risk factors among Veterans and service members. Depressive symptoms, substance use disorder, and alcohol use disorder emerged as particularly strong predictors of suicide-related outcomes in Veterans and service members, as they demonstrated highest *w*ORs among risk factors included in the meta-analysis. Further, depressive symptoms, substance use disorder, and alcohol use disorder generally conferred more risk for suicide-related outcomes

as compared to in the general population. One possible explanation for this discrepancy, at least in part, is that Veterans and service members may be less likely to seek psychological services and the lack of psychological services may allow for depressive symptoms, substance use disorders, and alcohol use disorders to maintain or promote suicide-related outcomes. Indeed, difficulties with treatment engagement in military-related populations is a well-documented phenomenon. For example, among active duty service members, Hoge et al. (2004) found only 23–40% of members who screened positive for a mental illness sought care. Further, of Veterans who do seek care, there is a median lag time of close to 7.5 years between initial mental health treatment session and initiating minimally adequate care (Maguen, Madden, Cohen, Bertenthal, & Seal, 2012). Experience of Criterion A traumas among Veterans and service members could be responsible for this delay in care. Indeed, research from civilian populations indicates that treatment among trauma survivors can be delayed for up to 12 years following the traumatic event (Wang, Pincus, Pincus, Wells, & Kessler, 2005). Thus, Veterans and service members, individuals who experience increased rates of Criterion A traumas, may delay care not due to military service specifically, but instead the experience of traumatic events, a phenomenon mirrored in the general population. Alternatively, the demographic makeup of Veterans and service members may account for the elevated link between suicide-related outcomes with depressive symptoms, substance use disorder, and alcohol use disorder. That is, these subpopulations are more likely than the general population to be male and Caucasian, all demographic groups that experience elevated suicide-related outcomes. This increase in a typically low-base rate phenomenon may account for the statically elevated link between risk factors and suicide-related outcomes.

Our findings also indicated disparate risk between Veterans and service members. For example, TBIs emerged as potentially important risk factors of suicide-related outcomes among the general population and Veterans. However, they were not significantly predictive of suicide-related outcomes in service members. This discrepancy could indicate that TBIs, which have been found to lead to a worsening and prolonging of PTSD symptoms in Veterans (Brenner et al., 2009), could lead to impairment which excludes otherwise healthy service members from service, thus ushering them into separation from military service (i.e. transitioning into life as a Veteran). Consistent with this, other studies found that, among Veterans, repeated mild TBIs and PTSD were associated with poorer outcomes, including postconcussive symptoms (Brenner et al., 2010) and suicide-related outcomes (Brenner, Ignacio, & Blow, 2011).

In contrast to this discrepancy, prior SITBs were a strong risk factor of suicide-related outcomes among service members but not among Veterans. This could be due to the younger nature of service members as compared to Veterans. Indeed, our findings indicated that as service members and Veterans aged, risk factors conferred less risk for suicide-related outcomes. It is also possible that among studies of service members, there were shorter follow-up times between prior SITBs measured at baseline and the follow-up measure of suicide-related outcomes. This smaller window between baseline SITBs and follow-up suicide-related outcomes could be emblematic of one underlying disorder, symptoms, or external stressor. Given that some constructs conferred risk within Veterans, yet not service members, and vice versa, it may be that different aspects of service or civilian life buffer or exacerbate risk. The disparate risk conferred between Veterans and service members should be a source of future study.

Suicide rates among Veterans and service members increased over the last fifteen years (Department of Defense, 2020; VA Report, 2020); as such, we were particularly interested in Veteran- and service member-specific risk factors of suicide-related outcomes – e.g., combat, separation from military service, branch of military service. However, many Veteran- and service member-specific risk factors were generally understudied in the longitudinal prediction of suicide-related outcomes. These military-relevant risk factors have been studied cross-sectionally in Army STARRS (Army Study to Assess Risk and Resilience in Service Members) data, and there is a substantial, ongoing effort to conduct longitudinal follow-up of Army STARRS participants ([Army Study to Assess Risk and Resilience in Service Members – Longitudinal Studies]). However, at the time of data collection of the present study, to our knowledge, few papers used these or similar data to compare the longitudinal prediction of suicide-related outcomes based on the presence or absence of military-relevant risk factors (e.g., comparing suicide-related outcomes in service members who had versus had never been deployed).

More broadly, few articles have investigated Veteran or service member identity as a risk factor in itself. Indeed, both subgroups of the general population represent demographic groups with elevated rates of suicide-related outcomes (i.e., comprised primarily of Caucasian males). At the time of data collection, the literature

largely investigated risk factors *within* Veteran and service members, but it did not investigate the risk of suicide-related outcomes *between* Veterans or service members and non-Veteran, non-service members in the general population. There are also military-relevant (not necessarily military-specific) risk factors that could contribute to the development of suicide-related outcomes. For instance, few studies investigated PTSD as a risk factor for suicide-related outcomes, and studies that did investigate PTSD as a risk factor for suicide-related outcomes reflect a substantial amount of heterogeneity. For example, a recent systematic review of studies of PTSD as a risk factor for suicide-related outcome (Holliday et al., 2020) indicated that PTSD was linked with reduced risk for suicide death, elevated risk for suicide attempt, and mixed risk (i.e, some studies indicated increased and others indicated decreased risk) for suicidal ideation. Thus, the mechanism through which PTSD contributes to suicide-related outcomes is unclear. Further, there were also few investigations into the link between self-sacrificial attitudes and values, loss of community, reentry into civilian life, personality development and perception of negative attitudes among members of the general population toward military service as risk factors suicide-related outcomes. The average age for joining the United States Army is 20 years and is similar in other branches, a pivotal point in the developmental lifespan. It is likely that the commitment and oaths taken during enlistment or commissioning (Swann, Jetten, Gómez, Whitehouse, & Bastian, 2012), plus the long-term nature of this commitment, influence the developing sense of self. Thus, the eventual separation from a community formed at a pivotal time could contribute to suicide-related outcomes. In all, although it is likely that Veteran- and service member-specific risk factors contribute to the development of suicide-related outcomes, the literature did not address this relation sufficiently (i.e., from a rigorous meta-analytic perspective). It is further notable that, although more than fifty variables were used to predict suicide-related outcomes over time within Veteran and service member populations, most of these were employed in fewer than five studies. This demonstrates a substantial amount of heterogeneity in the field of suicidology regarding research on Veterans and service members, with diverging views on important risk factors that could contribute to the development and maintenance of suicide-related outcomes in Veterans and service members

In exploratory analyses, we investigated the roles of gender, age, sample size, and race on prediction of suicide-related outcomes. When rates of suicide-related outcomes among service members are adjusted for race and gender, these outcomes do not diverge from those within the general population (Watkins et al., 2018). Our findings build upon this previous work, and indicate that the prediction of suicide-related outcomes did not vary based on gender, but did vary based on age, sample size, and, among Veterans, race. As participants advanced in age, the relationship between risk factors and suicide-related outcomes *weakened*. However, with increasing sample size, the link between risk factors and suicide-related outcomes *strengthened*. Finally, among Veterans, as the percent of the sample that identified as "Caucasian" increased, so did the strength of the relationship between risk factors and outcomes. These exploratory analyses indicate that risk factors likely do not confer identical risk across Veterans and service members, and protective factors could play an important role in the risk of suicide-related outcomes. Particularly with regard to the finding that risk factors are closely linked in younger Veterans and service members, efforts should be made to identify those particularly at risk and treatment options should be available, or even incentivized.

Within the context of these exploratory analyses, it is also important to consider the veracity of the labels of each subgroup. Research within these groups was conducted including only portions of service members and Veterans, such that the groups as they are labeled now may not accurately reflect the broader group makeup. For example, the group labeled as "service members" may represent those individuals who engage in early suicide-related behavior and/or experience symptoms of personality disorders that are exacerbated by or identified by military service. Likewise, "Veterans" may be individuals who experience suicide-related outcomes as a result of the military-related service, were ushered out of military service (and into Veteran status), and then these experiences follow them the rest of their lives. Thus, the categorization of Veterans and service members may be an over-simplification and misrepresentation of these heterogeneous groups

Limitations

As with any meta-analysis, the conclusions drawn in our study were limited to the scope of the available literature. Among Veterans and service members, PTSD was not investigated across all suicide-related outcomes.[5] This was a major limitation, as PTSD is widely considered to contribute to elevated suicide risk in service members and Veterans. In order to fully understand the role of PTSD in suicide-related outcomes, researchers must continue to longitudinally assess the temporal precedence of PTSD in relation to suicidal ideation, suicide attempts, and suicide deaths. One notable exception to this was

a treatment study of 290 Veterans seeking psychological services for PTSD (Roberge, Harris, Weinstein, & Rozek, 2021). Findings indicated that suicidal ideation decreased (with no known suicide deaths) upon treating PTSD with Cognitive Processing Therapy, indicating perhaps that PTSD is a contributing maintaining factor in suicidal ideation. Studies like this one lend insight into the temporal relation between PTSD and suicide-related outcomes. Additionally, the field lacks a meta-analysis in the general population that quantifies PTSD-conferred, longitudinal risk for suicide-related outcomes (cf. Panagioti et al., 2012, who combined cross-sectional and longitudinal effects). Such a meta-analysis would assist the field in understanding how the risk of suicide-related outcomes conferred by PTSD varies by population (i.e., Veterans and service members versus general population). There was also an extremely elevated value for between-study heterogeneity, perhaps indicating that many of these risk factors might be too disparate to compare within the same analyses. Future consideration should be given to investigate if some risk factors cluster together, achieving particularly accurate prediction of suicide-related outcomes.

We found limitations as they relate to both Veteran and service member populations. Specifically, while most Veterans studies were conducted within the VA healthcare system, two-thirds of the Veterans that die by suicide never engaged with VA healthcare systems. Thus, the majority of the Veteran population are omitted in VA research samples. The Veterans who do engage with VA healthcare systems self-select for these services (https://www.va.gov/health-care/how-to-apply/), and based on self-selection alone this group likely represents a different one than Veterans who elect to not use the VA (Heckman, 1990). Further, Veterans who served fewer than twenty-four continuous months or the less than the full period for which they were called to active duty or received a discharge status other than "honorable" are generally not eligible for VA services and by extension VA research samples.

Likewise, self-selection may have been prevalent with service member samples, many of which were studied in the context of the Military Health System. For example, service members may chose not to seek care or disclose psychopathology for fear of repercussions and implications to their career. In compliance with DoDI 6490.08, when service members endorse psychopathology (e.g., SUD/AUD, depression, suicidal ideation, anxiety, PTSD, etc.) that impairs their ability to complete service-related duties, they are deemed not fit for full duty. Their command is then notified and, in some cases, service members receive discharge status and separate from the military. In essence, the disclosure of impairing psychopathology, even if in the context of treatment seeking efforts, can jeopardize the careers of service members. While the military is working hard to decrease stigma in this regard, service members are understandably wary of seeking care and disclosing the full nature of their symptoms. Thus, the service members studied in many of these prior studies are likely self-selected, such that a number of service members with clinically significant psychopathology elected to forgo either treatment of psychopathology or full disclosure of their symptoms. Studies that sample the broader Veteran and service member populations are needed to more fully understand the role of risk factors of suicide-related outcomes in these heterogeneous populations.

Anger and aggression emerged as relatively strong predictors of suicide-related outcomes. However, this is only within service members in the present literature. This significant risk may not be entirely surprising to researchers and clinicians. A substantial body of literature across sample ages (e.g., adolescent and adult), demographics (e.g., nationalities), and participant severity (e.g., outpatients, and inpatients) within the general population implicated anger and aggression as predictors of suicide-related outcomes (Daniel, Goldston, Erkanli, Franklin, & Mayfield, 2009; Goldney, Winefield, Saebel, Winefield, & Tiggeman, 1997). Further, inspired in part by the Interpersonal Theory of Suicide (Joiner, 2005; Van Orden et al., 2010), research has shown that stoicism (Witte, Gordon, Smith, & Van Orden, 2012) and stereotypically masculine traits (including anger and aggression; Murray et al., 2008) could be important predictors of suicide-related outcomes. Importantly, although our findings documented a strong temporal link between anger and aggression with suicide-related outcomes, these risk factors were not among the most commonly studied risk factors. Thus, the significant risk of suicide-related outcomes conferred by anger and aggression provides an important area of focus, and future research should investigate factors that amplify or buffer the link between anger and aggression with suicide-related outcomes.

Risk factors that could be particularly salient, given the cultural climate, were infrequently studied among Veterans and service members. For example, although not characteristic of the broader military landscape (Kimerling, Gima, Smith, Street, & Frayne, 2007), military sexual assault may be especially salient given widespread attention to recently reported incidents, as well as to sexual harassment in the military. Notably, we found only two effect size estimates in the literature that met inclusion criteria predicting suicide-related outcomes

from military sexual trauma. Thus, this did not allow for a robust measure of the relation between military sexual trauma and suicide-related outcomes. It is possible that the true risk for suicide-related outcomes conferred by military sexual trauma is much higher or lower than these two effect sizes indicated. One way that the field can elucidate the true longitudinal effect between military sexual trauma and suicide-related outcomes is to increase the number of published studies on this topic (Kimerling, Makin-Byrd, Louzon, Ignacio, & McCarthy, 2016).

Other culturally relevant phenomena (e.g., divisiveness within the political landscape, awareness of and outrage against sexual harassment in the workplace, etc.) could have also contributed to the notable increase in suicidality in service members and Veterans. Indeed, political affiliation has been found to impact military decision-making (Millonig, 2006), and the increasing divisiveness within political landscape (Pew Research Center, 2021) could have downstream implications on suicide-related outcomes (perhaps by way of interpersonal conflict). However, extant literature did not investigate the role of relevant risk factors such as these. Future research should include longitudinal investigations into culturally relevant risk factors as they relate to suicide-related outcomes in service members and Veterans.

The lack of investigation into risk factors proposed within well-known theories of suicide-related outcomes was surprising in that extensive literature documented the proposed etiology of suicide within the general population. For example, we could not investigate the accuracy of theories of suicidal behavior (e.g., Interpersonal Theory, Van Orden et al., 2010, Joiner, 2005; Motivational-Volitional Theory, O'Connor, 2011; Hopelessness Theory, Beck, 1976; BioSocial Theory, Linehan, 2018; Biological Theory, Oquendo, Halberstam, & Mann, 2003, p. 3 Step Theory, Klonsky & May, 2015) among these samples. Despite a large body of work in this area, these theories were left largely untested in longitudinal work on suicide-related outcomes among Veterans and service members, a relatively high-risk portion of the population. Given the low number of studies based upon common theories of suicidality, we were unable to meta-analyze their effects, and it was unclear if these theories are accurate among Veterans and service members. Notably, Chu et al. (2017) meta-analyzed the cross-sectional relation between Interpersonal Theory of Suicide constructs and suicide-related outcomes. They found that many studies included either thwarted belongingness *or* perceived burdensomeness. They also found that more than 75% of studies examining perceived burdensomeness and suicidal thoughts and behaviors reported significant relations between Interpersonal Theory of Suicide constructs and suicide-related outcomes. However, consistent with our findings, theirs indicated a lack of longitudinal investigation of Interpersonal Theory of Suicide in Veterans and service members. Future research should longitudinally investigate suicide-related outcomes in Veterans and service members as proposed by popular theories of suicidal behavior, with cautious, careful, and intentional efforts made toward their scrutiny. That is, future research should investigate the intricate, nuanced, and specific predictions of theories under conditions that allow for reasonably precise tests. The complicated nature and difficulty in studying these predictions are noteworthy. Importantly, the field, as it stood at the time of data collection, did not test the underlying assumptions and fundamental features of these theories in service members and Veterans.

Further, our findings mirror those from Franklin et al. (2017) indicating that risk prediction is elusive for low-base rate events, including suicide-related outcomes. This held true in Veteran and service member samples. We strongly urge the field of suicidology to investigate *combinations of constructs* as they were proposed by theories in Veterans and service members (e.g., related to the Interpersonal Theory of Suicide researchers should investigate the simultaneous experience of thwarted belongingness, perceived burdensomeness, and hopelessness about these states as they relate to suicidal ideation simultaneously at both the explicit [Van Orden et al., 2010] and implicit [Olson et al., 2021] levels). It is possible that when constructs are investigated in the specific constellations in which theories propose, they provide more accurate prediction of suicidal ideation, suicide attempts, and suicide deaths among Veterans and service members.

Also limiting the scope of our project, we encountered significant evidence of publication bias within the extant literature on Veterans and service members. It is likely that efforts to obtain adequately powered samples with low base rate phenomena resulted in the oversampling of certain demographics. For example, in order to obtain numbers of Veterans and service members likely to exhibit suicide-related outcomes, it is possible that samples oversampled for high-risk individuals. This artificial elevation in the risk for suicide-related outcomes in participants may have skewed the effects of constructs, including (for example) prior SUDs/AUDs, thus possibly over-stating the role of SUDs/AUDs in suicide-related outcomes. If this is the case, investigators may omit some effects from the literature by not submitting them for publication in the first place, based on lack of significance or lack of consistency with published effects. Future

investigations into Veterans and service members should consider sampling in ways consistent with prevalence rates. For example, literature indicated that, among Veterans, suicide deaths were not evenly distributed by such factors as age (VA Report, 2020). Veteran suicide deaths were distributed across the developmental lifespan as follows: age 18–34 (14.07%), age 35–54 (27.82%), age 55–74 (37.78%), and age 75+ (20.31%). Future research on suicide death may thus benefit from collection of samples of Veterans that reflect this age distribution.

Finally, there were a relatively few number of effect sizes related to suicidal ideation and death in the extant literature. Many effect sizes within the present project were drawn from studies using data from electronic health records. Given that electronic health records relatively rarely documented suicidal ideation, it was not entirely surprising that suicide attempt cases greatly outnumbered suicidal ideation cases. Further, the number of effect sizes related to suicide attempts outnumbered those related to suicide death. Again, this was likely due to the large number of studies using electronic health records and the relatively large crude number of suicide attempt cases compared to that of suicide death cases. Beyond this, suicide-related outcomes are relatively low base-rate phenomena. Due to the costly and often time- and labor-intensive nature of studies needed to investigate these outcomes, longitudinal studies documenting such phenomena are rare. In the place of these low base-rate suicide-related outcomes, proxy variables are often used, and this practice contributes to the dearth of studies measuring suicidal ideation, suicide attempts, and suicide death.

Conclusions

Overall, the extant literature did not demonstrate optimal prediction of suicide-related outcomes in Veterans and service members. Further, the literature did not reflect knowledge of risk factors that accounted for elevated suicide risk in Veterans and service members. That is, Veterans and service members exhibit elevated rates of suicide-related outcomes as compared to the general population, yet our review of the literature on Veterans and service members did not identify risk factors that accounted for this increased rate. Further, although individual risk factors were generally suboptimal predictors of suicide-related outcomes, anger, aggression, depressive symptoms, and substance and alcohol use disorders emerged as promising, relatively strong risk factors that warrant further investigation. Veteran- and service member-specific risk factors (e.g., military sexual trauma, combat, deployment) were largely understudied in the literature and should be longitudinally investigated as predictors of suicide-related outcomes. Similarly, to fully understand the unique role of PTSD in Veteran and service member populations, the literature should investigate the longitudinal relation between PTSD and all suicide-related outcomes in these populations.

Notes

1. However, the global suicide rate during this same time period has diverged from this pattern, decreasing substantially (World Health Organization, 2021).
2. The rate of military suicide deaths nearly doubled between the years 2005 to 2012. However, since that time the suicide rate among this group plateaued at a level that is no different from that of the general US population. (Department of Defense, 2020).
3. Notably, a comprehensive meta-analysis of risk factors for suicidal ideation, suicide attempts, and suicide deaths published over the course of the last fifty years does exist in the Franklin et al. (2017). However, this meta-analysis did not specifically investigate risk factors as they behave in Veterans and service members.
4. Of note, deployment, military sexual trauma, and combat, although commonly studied risk factors, were not included in Table 2, as they are military-relevant and do not have an analogous construct within the general population. Likewise, financial, legal, and interpersonal difficulties were not included as they have not yet been meta-analyzed in the general population.
5. Based on the senior author's experience as Director of the DoD-funded Military Suicide Research Consortium (www.msrc.fsu), this may in part be related to distinct research program silos within the DoD on suicidality and PTSD, respectively.

Data availability statement

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

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References

Asterisks indicate papers used for quantitative analyses.

*Alexander, C. L., Reger, M. A., Smolenski, D. J., & Fullerton, N. R. (2014). Comparing U.S. Army suicide cases to a control sample: Initial data and methodological lessons. *Military Medicine*, *179*(10), 1062–1066. doi:10.7205/milmed-d-13-00574

*Ashrafioun, L., Kane, C., Stephens, B., Britton, P. C., & Conner, K. R. (2016). Suicide attempts among alcohol-dependent pain patients before and after an inpatient hospitalization. *Drug and Alcohol Dependence*, *163*, 209–215. doi:10.1016/j.drugalcdep.2016.04.024

Beck, A. T., Kovacs, M., & Weissman, A. (1975). Hopelessness and suicidal behavior: An overview. *Jama, 234*(11), 1146–1149. doi:10.1001/jama.1975.03260240050026

Belsher, B. E., Smolenski, D. J., Pruitt, L. D., Bush, N. E., Beech, E. H., Workman, D. E., Morgan, R. L., Skopp, N. A. (2019). Prediction Models for Suicide Attempts and Deaths: A Systematic Review and Simulation. *JAMA Psychiatry*, *76*(6), 642–651. doi:10.1001/jamapsychiatry.2019.0174.

*Bernet, A. C. (2015). Postdischarge behavioral health treatment and 6-month reattempt rate for Veterans hospitalized for suicide attempt. *Journal of the American Psychiatric Nurses Association*, *21*(3), 212–222. doi:10.1177/1078390315592130

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2011). *Introduction to Meta-Analysis*. Hoboken, NJ: Wiley

Brenner, L. A., Homaifar, B. Y., Adler, L. E., Wolfman, J. H., & Kemp, J. (2009). Suicidality and Veterans with a history of traumatic brain injury: Precipitating events, protective factors, and prevention strategies. *Rehabilitation Psychology*, *54*(4), 390.

*Brenner, L. A., Ignacio, R. V., & Blow, F. C. (2011). Suicide and traumatic brain injury among individuals seeking Veterans Health Administration services. *Journal of Head Trauma Rehabilitation*, *26*(4), 257–264. doi:10.1097/HTR.0b013e31821fdb6e

Brenner, L. A., Ivins, B. J., Schwab, K., Warden, D., Nelson, L. A., Jaffee, M., & Terrio, H. (2010). Traumatic brain injury, posttraumatic stress disorder, and postconcussive symptom reporting among troops returning from Iraq. *The Journal of head trauma rehabilitation*, *25*(5), 307–312.

*Brignone, E., Fargo, J. D., Blais, R. K., Carter, M. E., Samore, M. H., & Gundlapalli, A. V. (2017). Non-routine discharge from military service: Mental illness, substance use disorders, and suicidality. *American Journal of Preventive Medicine*, *52*(5), 557–565. doi:10.1016/j.amepre.2016.11.015

Bryan, C. J., & Bryan, A. (2014). Nonsuicidal self-injury among a sample of United States military personnel and Veterans enrolled in college classes. *Journal of Clinical Psychology*, *70*(9), 874–885. doi:10.1002/jclp.22075

*Bryan, C. J., David Rudd, M., Wertenberger, E., Etienne, N., Ray-Sannerud, B. N., Morrow, C. E., … Young-Mccaughon, S. (2014). Improving the detection and prediction of suicidal behavior among military personnel by measuring suicidal beliefs: An evaluation of the Suicide Cognitions Scale. *Journal of Affective Disorders*, *159*, 15–22. doi:10.1016/j.jad.2014.02.021

*Bryan, C. J., Gonzales, J., Rudd, M. D., Bryan, A. O., Clemans, T. A., Ray-Sannerud, B., … Etienne, N. (2015). Depression mediates the relation of insomnia severity with suicide risk in three clinical samples of U.S. military personnel. *Depression and Anxiety*, *32*(9), 647–655. doi:10.1002/da.22383

*Campbell-Sills, L., Stein, M. B., Liu, H., Agtarap, S., Heeringa, S. G., Nock, M. K., … Kessler, R. C. (2020). Associations of lifetime traumatic brain injury characteristics with prospective suicide attempt among deployed US Army soldiers. *Journal of Head Trauma Rehabilitation*, *35*(1), 14–26. doi:10.1097/HTR.0000000000000516

Centers for Disease Control and Prevention. (2018). *Suicide rising across the US More than a mental health concern*. Retrieved November 13, 2019 from https://www.cdc.gov/vitalsigns/suicide/index.html

Chapman, S. L. C., & Wu, L. T. (2015). Associations between cigarette smoking and pain among Veterans. *Epidemiologic reviews*, *37*(1), 86–102.

Chu, C., Buchman-Schmitt, J. M., Stanley, I. H., Hom, M. A., Tucker, R. P., Hagan, C. R., … Joiner, T. E. (2017). The interpersonal theory of suicide: A systematic review and meta-analysis of a decade of cross-national research. *Psychological Bulletin*, *143*(12), 1313–1345. doi:10.1037/bul0000123

*Cigrang, J. A., Balderrama-Durbin, C., Snyder, D. K., Talcott, G. W., Tatum, J., Baker, M., … Heyman, R. E. (2015). Predictors of suicidal ideation across deployment: A prospective study. *Journal of Clinical Psychology*, *71*(9), 828–842. doi:10.1002/jclp.22192

Cox, K. S., Mouilso, E. R., Venners, M. R., Defever, M. E., Duvivier, L., Rauch, S. A. M., … Tuerk, P. W. (2016). Reducing suicidal ideation through evidence- based treatment for posttraumatic stress disorder. *Journal of Psychiatric Research*, *80*, 59–63. doi:10.1016/j.jpsychires.2016.05.011

*Currier, J. M., McDermott, R. C., McCormick, W. H., Churchwell, M. C., & Milkeris, L. (2018). Exploring cross-lagged associations between spiritual struggles and risk for suicidal behavior in a community sample of military Veterans. *Journal of Affective Disorders*, *230*, 93–100. doi:10.1016/j.jad.2018.01.009

Daniel, S. S., Goldston, D. B., Erkanli, A., Franklin, J. C., & Mayfield, A. M. (2009). Trait anger, anger expression, and suicide attempts among adolescents and young adults: A prospective study. *Journal of Clinical Child & Adolescent Psychology*, *38*(5), 661–671. doi:10.1080/15374410903103494

Dean, P. J. A., & Sterr, A. (2013). Long-term effects of mild traumatic brain injury on cognitive performance. *Frontiers in Human Neuroscience*, *7*, 30. doi:10.3389/fnhum.2013.00030

Department of Defense. (2020). *DoDSER department of defense suicide event report calendar year 2018 annual report*. Retrieved April 2021 from https://www.pdhealth.mil/sites/default/files/images/docs/TAB_B_DoDSER_CY_2017_Annual_Report_508_071619.pdf

*Dobscha, S. K., Denneson, L. M., Kovas, A. E., Teo, A., Forsberg, C. W., Kaplan, M. S., … McFarland, B. H. (2014). Correlates of suicide among Veterans treated in

primary care: Case–control study of a nationally representative sample. *Journal of General Internal Medicine*, *29*(4), 853–860. doi:10.1007/s11606-014-3028-1

Elbogen, E. B., Wagner, H. R., Kimbrel, N. A., Brancu, M., Naylor, J., Graziano, R., & Crawford, E. (2018). Risk factors for concurrent suicidal ideation and violent impulses in military Veterans. *Psychological assessment*, *30*(4), 425.

Fralick, M., Sy, E., Hassan, A., Burke, M. J., Mostofsky, E., & Karsies, T. (2019). Association of concussion with the risk of suicide: A systematic review and meta-analysis. *JAMA Neurology*, *76*(2), 144–151. doi:10.1001/jamaneurol.2018.3487

Franklin, J. C., Ribeiro, J. D., Fox, K. R., Bentley, K. H., Kleiman, E. M., Huang, X., … Nock, M. K. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. *Psychological Bulletin*, *143*(2), 187–232. doi:10.1037/bul0000084

Goldney, R., Winefield, A., Saebel, J., Winefield, H., & Tiggeman, M. (1997). Anger, suicidal ideation, and attempted suicide: A prospective study. *Comprehensive Psychiatry*, *38*(5), 264–268. doi:10.1016/S0010-440X(97)90058-4

Goodin, C. A., Prendergast, D. M., Pruitt, L. D., Smolenski, D. J., Wilson, N. Y., Skopp, N., & Hoyt, T. (2019). Financial hardship and risk of suicide among U.S. Army personnel. *Psychological Services*, *16*(2), 286–292. doi:10.1037/ser0000201

*Goodwin, R. D., Prescott, M. R., Tamburrino, M., Calabrese, J. R., Liberzon, I., & Galea, S. (2013). Cigarette smoking and subsequent risk of suicidal ideation among National Guard soldiers. *Journal of Affective Disorders*, *145* (1), 111–114. doi:10.1016/j.jad.2012.05.003

*Gradus, J. L., Shipherd, J. C., Suvak, M. K., Giasson, H. L., & Miller, M. (2013). Suicide attempts and suicide among Marines: A decade of follow-up. *Suicide and Life-Threatening Behavior*, *43*(1), 39–49. doi:10.1111/j.1943-278X.2012.00126.x

*Hazlett, E. A., Blair, N. J., Fernandez, N., Mascitelli, K., Perez-Rodriguez, M. M., New, A. S., … Goodman, M. (2016). Startle amplitude during unpleasant pictures is greater in Veterans with a history of multiple-suicide attempts and predicts a future suicide attempt. *Psychophysiology*, *53*(10), 1524–1534. doi:10.1111/psyp.12698

Heckman, J. J. (1990). Selection bias and self-selection. In *Econometrics* (pp. 201–224). London, UK: Palgrave.

Hedegaard, H., Curtin, S. C., & Warner, M. (2020). *Increase in suicide mortality in the United States,* 1999–*2018.*

*Hochman, E., Shelef, L., Mann, J. J., Portugese, S., Krivoy, A., Shoval, G., … Fruchter, E. (2014). Primary health care utilization prior to suicide: A retrospective case-control study among active-duty military personnel. *Journal of Clinical Psychiatry*, *75*(8), e817–e823. doi:10.4088/JCP.13m08823

Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New England Journal of Medicine*, *351*(1), 13–22. doi:10.1056/NEJMoa040603

Holliday, R., Borges, L. M., Stearns-Yoder, K. A., Hoffberg, A. S., Brenner, L. A., & Monteith, L. L. (2020). Posttraumatic stress disorder, suicidal ideation, and suicidal self-directed violence among US military personnel and Veterans: a systematic review of the literature from 2010 to 2018. *Frontiers in psychology, 11*, 1998.

*Horwitz, A. G., Miron, L., & Maieritsch, K. P. (2019). Prospective associations between DSM-5 PTSD symptom clusters and suicidal ideation in treatment-seeking Veterans. *Psychological Services*, *16*(2), 321–328. doi:10.1037/ser0000215

Hoyt, T., & Holtz, P. M. (2020). Challenging prevailing models of U.S. Army suicide. *Parameters: The U.S. Army War College Quarterly*, *50*(4), 7–19.

Huang, X., Ribeiro, J. D., Musacchio, K. M., & Franklin, J. C. (2017). Demographics as predictors of suicidal thoughts and behaviors: A meta-analysis. *PloS One*, *12*(7). doi:10.1371/journal.pone.0180793

*Ireland, R. R., Kress, A. M., & Frost, L. Z. (2012). Association between mental health conditions diagnosed during initial eligibility for military health care benefits and subsequent deployment, attrition, and death by suicide among active duty service members. *Military Medicine*, *177*(10), 1149–1156. doi:10.7205/milmed-d-12-00051

Joiner, T. E. (2005). *Why people die by suicide*. Cambridge, MA: Harvard University Press.

Kang, H. K., Bullman, T. A., Smolenski, D. J., Skopp, N. A., Gahm, G. A., & Reger, M. A. (2015). Suicide risk among 1.3 million Veterans who were on active duty during the Iraq and Afghanistan wars. *Annals of Epidemiology*, *25*(2), 96–100. doi:10.1016/j.annepidem.2014.11.020

*Kim, H. M., Smith, E. G., Ganoczy, D., Walters, H., Stano, C. M., Ilgen, M. A., … Valenstein, M. (2012). Predictors of suicide in patient charts among patients with depression in the Veterans Health Administration health system: Importance of prescription drug and alcohol abuse. *Journal of Clinical Psychiatry*, *73* (10), e1269–e1275. doi:10.4088/JCP.12m07658

Kimerling, R., Gima, K., Smith, M. W., Street, A., & Frayne, S. (2007). The Veterans Health Administration and military sexual trauma. *American Journal of Public Health*, *97*(12), 2160–2166. doi:10.2105/AJPH.2006.092999

Kimerling, R., Makin-Byrd, K., Louzon, S., Ignacio, R. V., & McCarthy, J. F. (2016). Military sexual trauma and suicide mortality. *American Journal of Preventive Medicine*, *50*(6), 684–691. doi:10.1016/j.amepre.2015.10.019

King, L. A., King, D. W., Vogt, D. S., Knight, J., & Samper, R. E. (2006). Deployment Risk and Resilience Inventory: A collection of measures for studying deployment-related experiences of military personnel and Veterans. *Military Psychology*, *18*(2), 89–120. doi:10.1207/s15327876mp1802_1

Klonsky, E. D., & May, A. M. (2015). The three-step theory (3ST): A new theory of suicide rooted in the "ideation-to-action" framework. *International Journal of Cognitive Therapy*, *8*(2), 114–129. doi:10.1521/ijct.2015.8.2.114

*LeardMann, C. A., Powell, T. M., Smith, T. C., Bell, M. R., Smith, B., Boyko, E. J., … Hoge, C. W. (2013). Risk factors associated with suicide in current and former US military personnel. *JAMA - Journal of the American Medical Association*, *310*(5), 496–506. doi:10.1001/jama.2013.65164

Lee, S. U., Oh, I. H., Jeon, H. J., & Roh, S. (2017). Suicide rates across income levels: retrospective cohort data on 1 million participants collected between 2003 and 2013 in South Korea. *Journal of epidemiology*, *27*(6), 258–264.

Lemaire, C. M., & Graham, D. P. (2011). Factors associated with suicidal ideation in OEF/OIF Veterans. *Journal of Affective Disorders*, *130*(1–2), 231–238. doi:10.1016/j.jad.2010.10.021

*Lewis, M. D., Hibbeln, J. R., Johnson, J. E., Lin, Y. H., Hyun, D. Y., & Loewke, J. D. (2011). Suicide deaths of active-duty US military and omega-3 fatty-acid status: A case-control comparison. *Journal of Clinical Psychiatry*, *72* (12), 1585–1590. doi:10.4088/JCP.11m06879

Linehan, M. M. (2018). *Cognitive-behavioral treatment of borderline personality disorder*. New York, NY: Guilford Publications.

Maguen, S., Madden, E., Cohen, B. E., Bertenthal, D., & Seal, K. H. (2012). Time to treatment among Veterans of conflicts in Iraq and Afghanistan with psychiatric diagnoses. *Psychiatric Services*, *63*(12), 1206–1212. doi:10.1176/appi.ps.201200051

*Mahon, M. J., Tobin, J. P., Cusack, D. A., Kelleher, C., & Malone, K. M. (2005). Suicide among regular-duty military personnel: A retrospective case-control study of occupation-specific risk factors for workplace suicide. *American Journal of Psychiatry*, *162*(9), 1688–1696. doi:10.1176/appi.ajp.162.9.1688

Merritt, V. C., Lange, R. T., & French, L. M. (2015). Resilience and symptom reporting following mild traumatic brain injury in military service members. *Brain Injury*, *29*(11), 1325–1336. doi:10.3109/02699052.2015.1043948

Millonig, W. (2006). *The impact of religious and political affiliation on strategic military decisions and policy recommendations*. Carlisle Barracks, PA: Army War Coll Carlisle Barracks PA.

Murray, G., Judd, F., Jackson, H., Fraser, C., Komiti, A., Pattison, P., … Robins, G. (2008). Big boys don't cry: An investigation of stoicism and its mental health outcomes. *Personality and Individual Differences*, *44*(6), 1369–1381. doi:10.1016/j.paid.2007.12.005

*Naifeh, J. A., Nock, M. K., Ursano, R. J., Vegella, P. L., Aliaga, P. A., Fullerton, C. S., … Cox, K. (2017). Neurocognitive function and suicide in U.S. Army soldiers. *Suicide and Life-Threatening Behavior*, *47*(5), 589–602. doi:10.1111/sltb.12307

*Naifeh, J. A., Ursano, R. J., Kessler, R. C., Gonzalez, O. I., Fullerton, C. S., Herberman Mash, H. B., … Stein, M. B. (2019). Suicide attempts among activated soldiers in the U.S. Army reserve components. *BMC Psychiatry*, *19*(31). doi:10.1186/s12888-018-1978-2

*Naifeh, J. A., Ursano, R. J., Kessler, R. C., Zaslavsky, A. M., Nock, M. K., Dempsey, C. L., … Stein, M. B. (2019). Transition to suicide attempt from recent suicide ideation in U.S. Army soldiers: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Depression and Anxiety*, *36*(5), 412–422. doi:10.1002/da.22870

*Nock, M. K., Millner, A. J., Joiner, T. E., Gutierrez, P. M., Han, G., Hwang, I., … Gelernter, J. (2018). Risk factors for the transition from suicide ideation to suicide attempt: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *Journal of Abnormal Psychology*, *127*(2), 139–149. doi:10.1037/abn0000317

O'Connor, R. C. (2011). *The integrated motivational-volitional model of suicidal behavior*. doi:10.1027/0227-5910/a000120

Olson, M. A., McNulty, J. K., March, D. S., Joiner, T. E., Rogers, M. L., & Hicks, L. L. (2021). Automatic and controlled antecedents of suicidal ideation and action: A dual-process conceptualization of suicidality. *Psychological review*.

Oquendo, M. A., Halberstam, B., & Mann, J. J. (2003). Risk factors for suicidal behavior. *Standardized Evaluation in Clinical Practice*, *22*, 103–129.

Panagioti, M., Gooding, P. A., & Tarrier, N. (2012). A meta-analysis of the association between posttraumatic stress disorder and suicidality: The role of comorbid depression. *Comprehensive Psychiatry*, *53*(7), 915–930. doi:10.1016/j.comppsych.2012.02.009

Pew Research Center, Washington, D.C. (2021). *Republicans and democrats move further apart*. Retrieved from https://www.pewresearch.org/politics/2021/04/22/republicans-and-democrats-move-further-apart-in-views-of-voting-access/

Pruitt, L. D., Smolenski, D. J., Bush, N. E., Tucker, J., Issa, F., Hoyt, T. V., & Reger, M. A. (2018). Suicide in the military: Understanding rates and risk factors across the United States' Armed Forces. *Military Medicine*, 1–6. doi:10.1093/milmed/usy296

Reger, M. A., Pruitt, L. D., & Smolenski, D. J. (2018). Lessons from the latest US military suicide surveillance data. *Journal of Clinical Psychiatry*, *79*(1), 17l11790. doi:10.4088/JCP.17l11790

Reger, M. A., Reger, G. M., Krieg, C., Pruitt, L. D., Smolenski, D. J., Skopp, N. A., & Bush, N. (2016). What's changed? A comparison of army suicide surveillance data to cases from 1975-1982. *Suicide and Life-Threatening Behavior*, 1–10. doi:10.1111/sltb.12322

Reger, M. A., Smolenski, D. J., Skopp, N. A., Metzger-Abamukang, M. J., Kang, H. K., Bullman, T. A., … Gahm, G. A. (2015). Risk of suicide among US military service members following Operation Enduring Freedom OR Operation Iraqi Freedom deployment and separation from the US military. *JAMA Psychiatry*, *72*(6), 561. doi:10.1001/jamapsychiatry.2014.3195

Ribeiro, J. D., Franklin, J. C., Fox, K. R., Bentley, K. H., Kleiman, E. M., Chang, B. P., & Nock, M. K. (2016). Self-injurious thoughts and behaviors as risk factors for future suicide ideation, attempts, and death: A meta-analysis of longitudinal studies. *Psychological Medicine*, *46*(2), 225–236. doi:10.1017/S0033291715001804

Ribeiro, J. D., Huang, X., Fox, K. R., & Franklin, J. C. (2018). Depression and hopelessness as risk factors for suicide ideation, attempts and death: meta-analysis of longitudinal studies. *The British Journal of Psychiatry*, *212*(5), 279–286

Roberge, E. M., Harris, J. A., Weinstein, H. R., & Rozek, D. C. (2021). Treating Veterans at risk for suicide: An examination of the safety, tolerability, and outcomes of cognitive processing therapy. *Journal of Traumatic Stress*. doi:10.1002/jts.22662

Schafer, K. M., Kennedy, G., Gallyer, A., & Resnik, P. (2021). A direct comparison of theory-driven and machine learning prediction of suicide: A meta-analysis. *PloS one*, *16*(4), e0249833.

Schoenbaum, M., Kessler, R. C., Gilman, S. E., Colpe, L. J., Heeringa, S. G., Stein, M. B., … Cox, K. L. (2014). Predictors of suicide and accident death in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS): Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry*, *71*(5), 493–503. doi:10.1001/jamapsychiatry.2013.4417

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton Mifflin.

Sharp, M. L., Fear, N. T., Rona, R. J., Wessely, S., Greenberg, N., Jones, N., & Goodwin, L. (2015). Stigma as a barrier to seeking health care among military personnel with mental health problems. *Epidemiologic Reviews*, *37*(1), 144–162. doi:10.1093/epirev/mxu012

Shultz, S. R., Bao, F., Omana, V., Chiu, C., Brown, A., & Cain, D. P. (2012). Repeated mild lateral fluid percussion brain injury in the rat causes cumulative long-term behavioral impairments, neuroinflammation, and cortical loss in an animal model of repeated concussion. *Journal of Neurotrauma*, *29*(2), 281–294. doi:10.1089/neu.2011.2123

*Skopp, N. A., Luxton, D. D., Bush, N., & Sirotin, A. (2011). Childhood adversity and suicidal ideation in a clinical military sample: Military unit cohesion and intimate relationships as protective factors. *Journal of Social and Clinical Psychology*, *30*(4), 361–377. doi:10.1521/jscp.2011.30.4.361

*Skopp, N. A., Zhang, Y., Smolenski, D. J., & Reger, M. A. (2016). Risk factors for self-directed violence in US soldiers: A case-control study. *Psychiatry Research*, *245*, 194–199. doi:10.1016/j.psychres.2016.08.031

*Stanley, I. H., Rogers, M. L., Hanson, J. E., Gutierrez, P. M., & Joiner, T. E. (2019). PTSD symptom clusters and suicide attempts among high-risk military service members: A three-month prospective investigation. *Journal of Consulting and Clinical Psychology*, *87*(1), 67–78. doi:10.1037/ccp0000350

*Start, A. R., Allard, Y., Adler, A., & Toblin, R. (2019). Predicting suicide ideation in the military: The independent role of aggression. *Suicide and Life-Threatening Behavior*, *49*(2), 444–454. doi:10.1111/sltb.12445

*Stefanovics, E. A., & Rosenheck, R. A. (2019). Predictors of post-discharge suicide attempt among Veterans receiving specialized intensive treatment for posttraumatic stress disorder. *Journal of Clinical Psychiatry*, *80*(5). doi:10.4088/JCP.19m12745

*Stein, M. B., Kessler, R. C., Heeringa, S. G., Jain, S., Campbell-Sills, L., Colpe, L. J., … Ursano, R. J. (2015). Prospective longitudinal evaluation of the effect of deployment-acquired traumatic brain injury on posttraumatic stress and related disorders: Results from the Army Study to Assess Risk and Resilience in Servicemembers (army STARRS). *American Journal of Psychiatry*, *172*(11), 1101–1111. doi:10.1176/appi.ajp.2015.14121572

Swann, W. B., Jr, Jetten, J., Gómez, Á., Whitehouse, H., & Bastian, B. (2012). When group membership gets personal: A theory of identity fusion. *Psychological Review*, *119*(3), 441. doi:10.1037/a0028589

Teo, A. R., Marsh, H. E., Forsberg, C. W., Nicolaidis, C., Chen, J. I., Newsom, J., & Dobscha, S. K. (2018). Loneliness is closely associated with depression outcomes and suicidal ideation among military Veterans in primary care. *Journal of affective disorders, 230*, 42–49.

Tucker, R. P., Testa, R. J., Simpson, T. L., Shipherd, J. C., Blosnich, J. R., & Lehavot, K. (2018). Hormone therapy, gender affirmation surgery, and their association with recent suicidal ideation and depression symptoms in transgender Veterans. *Psychological medicine*, *48*(14), 2329–2336.

*Umhau, J. C., George, D. T., Heaney, R. P., Lewis, M. D., Ursano, R. J., Heilig, M., … Schwandt, M. L. (2013). Low vitamin d status and suicide: A case-control study of active duty military service members. *Plos One*, *8*(1). doi:10.1371/journal.pone.0051543

*Ursano, R. J., Kessler, R. C., Naifeh, J. A., Herberman Mash, H. B., Nock, M. K., Aliaga, P. A., … Stein, M. B. (2018). Risk factors associated with attempted suicide among US Army soldiers without a history of mental health diagnosis. *JAMA Psychiatry*, *75*(10), 1022. doi:10.1001/jamapsychiatry.2018.2069

*Ursano, R. J., Kessler, R. C., Naifeh, J. A., Mash, H. H., Fullerton, C. S., Aliaga, P. A., … Stein, M. B. (2018). Associations of time-related deployment variables with risk of suicide attempt among soldiers: Results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry*, *75*(6), 596–604. doi:10.1001/jamapsychiatry.2018.0296

*Ursano, R. J., Kessler, R. C., Naifeh, J. A., Mash, H. H., Fullerton, C. S., Ng, T. H. H., … Nock, M. K. (2017). Suicide attempts in U.S. Army combat arms, special forces and combat medics. *BMC Psychiatry*, *17*(1). doi:10.1186/s12888-017-1350-y

*Ursano, R. J., Kessler, R. C., Stein, M. B., Naifeh, J. A., Aliaga, P. A., Fullerton, C. S., … Zhang, B. G. (2015). Suicide attempts in the US Army during the wars in Afghanistan and Iraq, 2004 to 2009. *JAMA Psychiatry*, *72*(9), 917–926. doi:10.1001/jamapsychiatry.2015.0987

VA Report. (2020). National Veteran Suicide Prevention Annual Report. Retrieved from https://www.mentalhealth.va.gov/docs/data-sheets/2019/2020_National_Veteran_Suicide_Prevention_Annual_Report_508.pdf

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E., Jr. (2010). The interpersonal theory of suicide. *Psychological Review*, *117*(2), 575. doi:10.1037/a0018697

Wang, P. B., Pincus, H. A., Pincus, H. A., Wells, K. B., & Kessler, R. C. (2005). Failure and delay initial treatment contact after first onset of mental disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 603–613. doi:10.1001/archpsyc.62.6.603

Watkins, E. Y., Spiess, A., Abdul-Rahman, I., Hill, C., Gibson, N., Nichols, J., … Cox, K. (2018). Adjusting suicide rates in a military population: Methods to determine the appropriate standard population. *American Journal of Public Health*, *108*(6), 769–776. doi:10.2105/AJPH.2018.304410

Witte, T. K., Gauthier, J. M., Huang, X., Ribeiro, J. D., & Franklin, J. C. (2018). Is externalizing psychopathology a robust risk factor for suicidal thoughts and behaviors? A meta- analysis of longitudinal studies. *Journal of Clinical Psychology*, *74*(9), 1607–1625. doi:10.1002/jclp.22625

Witte, T. K., Gordon, K. H., Smith, P. N., & Van Orden, K. A. (2012). Stoicism and sensation seeking: Male vulnerabilities for the acquired capability for suicide. *Journal of Research in Personality*, *46*(4), 384–392. doi:10.1016/j.jrp.2012.03.004

Zivin, K., Kim, H. M., McCarthy, J. F., Austin, K. L., Hoggatt, K. J., Walters, H., & Valenstein, M. (2007). Suicide mortality among individuals receiving treatment for depression in the Veterans Affairs health system: Associations with patient and treatment setting characteristics. *American Journal of Public Health*, *97*(12), 2193–2198. doi:10.2105/AJPH.2007.115477