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Suicide and Life-Threatening BEHAVIOR

ORIGINAL ARTICLE

Association of emotion reactivity and distress intolerance with suicide attempts in U.S. Army soldiers

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Abstract

Introduction: Emotion reactivity (ER) and distress intolerance (DI) may be associated with increased suicide attempt (SA) risk among U.S. Army soldiers.

Method: In this case–control study, 74 soldiers recently hospitalized for SA (cases) were compared with 133 control soldiers from the same Army installations selected based on either propensity score matching (n = 103) or reported 12-month suicide ideation (SI) (n = 30). Controls were weighted to represent the total Army population at the study sites and the subpopulation of 12-month ideators. Participants completed questionnaires assessing ER, DI, and other psychosocial variables. Logistic regression analyses examined whether ER and DI differentiated SA cases from the general population and from 12-month ideators before and after controlling for additional important risk factors (sociodemographic characteristics, stressors, mental disorders).

Results: In univariate analyses, ER differentiated SA cases from both the general population (OR = 2.5[95%CI = 1.7–3.6]) and soldiers with 12-month SI (OR = 2.5[95%CI = 1.3–4.6]). DI also differentiated cases from the general population (OR = 2.9[95%CI = 2.0–4.1]) and 12-month ideators (OR = 1.9[95%CI = 1.1–3.5]). These associations persisted after controlling for sociodemographic variables, stressors, and mental disorders.

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Conclusion: Findings provide evidence that higher ER and DI are associated with increased risk of SA among soldiers, even after adjusting for known risk factors. Prospective research with larger samples is needed.

KEYWORDS
military, suicide attempt

INTRODUCTION

The ability to predict suicidal behavior is limited (Franklin et al., 2017), even when including an individual's history of self-injurious thoughts and behaviors (Ribeiro et al., 2016). Only a small proportion of the people with suicide ideation (SI) makes a suicide attempt (SA) (Nock, Borges, et al., 2008). Identifying which individuals with SI are at risk of a SA is an important clinical challenge. The predictors of SA in the general population rarely predict SA in the subset of the population with SI (Nock et al., 2016). Similar challenges in predicting SA among those with SI have been found in Army population surveys (Millner et al., 2018, 2019). Rates of suicidal behavior in soldiers rapidly increased during wars in the Iraq and Afghanistan and remain elevated (Gibson et al., 2017; Psychological Health Center for Excellence, 2017; Schoenbaum et al., 2014; Ursano et al., 2015). Mental disorders found to differentiate soldiers with SA versus those with SI who did not attempt are generally characterized by anxiety, agitation, or difficulties with impulse control (Millner et al., 2019; Nock et al., 2014, 2015, 2018), similar to findings from the United States and cross-national general population surveys (Kessler et al., 1999; Nock, Borges, et al., 2008; Nock et al., 2009, 2010). Given the range of disorders associated with SA, it may be that SA and SI risk are better differentiated by transdiagnostic affective dimensions.

With the publication of DSM-5 (American Psychiatric Association, 2013) and National Institute of Mental Health's Research Domain Criteria (RDoC) initiative (Insel et al., 2010), there has been a growing emphasis on dimensional psychological constructs, particularly those that may be more closely linked to the neurobiology underlying diverse psychiatric phenotypes (Cuthbert, 2014). Emotion reactivity and distress tolerance are two affective dimensions that may be common to the anxiety-, agitation-, and impulse control-related disorders found to differentiate SA and SI. Emotion reactivity (ER) has been defined as the degree to which an individual's emotional responses tend to be intense, prolonged, and elicited by a broad range of stimuli (Nock, Wedig, et al., 2008). Distress tolerance has been defined as the ability or willingness to tolerate negative emotional states (Simons & Gaher, 2005). Here, we use the term distress intolerance (DI) to refer to low levels of distress tolerance (McHugh et al., 2011).

ER and DI, which have been measured in various ways (Anestis et al., 2012; Becerra & Campitelli, 2013; Bylsma et al., 2008; Glenn et al., 2011; Leyro et al., 2010; McHugh et al., 2011; Stanley et al., 2018; Zelkowitz & Cole, 2016), have been implicated in risk for self-injurious thoughts and behaviors (Anestis et al., 2013; Bartlett et al., 2018, 2020; DeCou & Lynch, 2019; Dour et al., 2011; Najmi et al., 2007; Nezu et al., 2017; Nock & Mendes, 2008; Nock, Wedig, et al., 2008; Polanco-Roman et al., 2018; Stanley et al., 2018), but few studies have examined their associations with SA in military populations. Additionally, while ER, DI, and other constructs related to emotion regulation are associated with a wide range of psychopathology, including some of the disorders associated with SI-to-SA transition (e.g., anxiety disorders, posttraumatic stress disorder [PTSD], and substance use disorder [SUD]) (Aldao et al., 2016; Bylsma et al., 2008; Heleniak et al., 2016; Holliday et al., 2016; Lass & Winer, 2020; Leyro et al., 2010; Michel et al., 2016; Nock, Wedig, et al., 2008; Simons et al., 2020), more research is needed to understand the extent to which ER and DI may differentiate attempters and ideators. The findings of such studies may inform transdiagnostic interventions aimed at preventing suicidal behavior.

We used data from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS; www.starrs-ls.org) (Ursano et al., 2014) Soldier Health Outcomes Study-A (SHOS-A), a case–control study of recent suicide attempters, to examine whether ER and DI can differentiate soldiers who were recently hospitalized for SA from a representative sample of non-hospitalized soldiers from the same Army installations who participated in an Army STARRS survey. We included two control groups: one selected and weighted to represent the Army general population at our study sites; and one selected to represent the subset of soldiers who reported 12-month SI. ER and DI were compared between soldiers with recent SA and both control groups in univariate models and in models that used multivariate risk scores to adjust for other variables (sociodemographic characteristics, mental disorders, and history of self-injurious thoughts and behaviors) previously found to be associated with SA in the same population (Naifeh et al., 2019, 2020).

METHODS

Sample

SA cases

SHOS-A is a case–control study of active-duty U.S. Army soldiers hospitalized for a recent SA. Cases were recruited from inpatient psychiatric units at hospitals located at four large U.S. Army installations. Data collection occurred from Q4 (October) 2011 through Q4 (November) 2013. Study personnel coordinated with attending psychiatrists to identify soldiers currently hospitalized due to SA. Potential participants were provided with a study description and informed that participation was voluntary. Following written informed consent, cases completed two self-administered questionnaires (SAQ-1 and SAQ-2) as part of a larger assessment battery. SAQ-1 was the same questionnaire used in the Army STARRS All Army Study (AAS), a broad-based survey of risk and protective factors for suicidality that was administered to a representative sample of active-duty soldiers serving inside and outside the continental U.S. exclusive of those in Basic Combat Training or deployed to a combat theater (Heeringa et al., 2013; Kessler et al., 2013). SAQ-2 was a supplemental questionnaire that assessed additional risk and protective factors not included in SAQ-1. Responses from both SAQs were used in the current study. Prior to data analysis, we excluded the small number of cases who were not characteristic of the population at our study sites, including those who had less than 6 months of Army service, were in the Army National Guard or Army Reserve, or were deployed at the time of their SA. We also excluded soldiers who did not consent to linkage of their SAQ responses and Army/DoD administrative records. Of the remaining 132 SA cases, all of whom completed SAQ-1, 74 also completed SAQ-2 and were included in the current study. The primary reason for cases not completing both SAQs was insufficient time prior to discharge.

General population controls and SI controls

Two groups of controls were selected from among AAS respondents who completed SAQ-1 and agreed to administrative data linkage: (1) a group based on propensity score matching (Rosenbaum & Rubin, 1983) according to known SA risk factors; and (2) a group based on self-reported suicide ideation in the past 12 months (see Appendix S1 for additional information on control selection). Among more than 10,000 AAS respondents who completed SAQ-1 at one of the SHOS-A installations, 954 were selected for recruitment. We reached 642 of the selected soldiers by telephone and invited them to complete the SAQ-2 by mail. Of the 483 who agreed, 188 returned an SAQ-2. After limiting the sample to those we confirmed were still living at a SHOS-A study site and applying the same inclusion/exclusion criteria we applied to SA cases, the final analytic control sample consisted of 133 soldiers, 30 of whom were selected based on 12-month ideation. Study procedures were approved by the Humans Subjects Committees of all collaborating organizations.

Weighting procedures

We weighted cases and controls to be representative of their respective populations: SA cases were weighted to represent soldiers with a medically documented SA at one of the four study sites; controls were weighted to represent the general population of soldiers at the same four sites. The subset of controls with 12-month SI were weighted to represent 12-month ideators at four sites (see Appendix S1 for further details).

Measures

Assessment of ER and DI was prefaced with these instructions: *The following asks different questions about how you experience emotions. When you are asked about being "emotional," this may refer to being angry, sad, excited, or some other emotion. Please rate the following statements.* Response options for all items ranged from 0 (*Not at all like me*) to 4 (*Exactly like me*).

Emotion reactivity

Items assessing ER were adapted from the original 21-item Emotion Reactivity Scale (Nock, Wedig, et al., 2008). The SAQ included 4 of these items: *I am often bothered by things that other people don't react to*; *I am easily agitated*; *I often get so upset it's hard for me to think straight*; *When I feel emotional, it's hard for me to imagine feeling any other way*. Items were summed, with higher scores indicating higher ER. Psychometric analyses of the original measure support a unitary factor structure and provide evidence of reliability and validity in clinical and non-clinical populations (Byrne et al., 2019; Nock, Wedig, et al., 2008). Internal consistency in the current sample was good (Cronbach's $\alpha = 0.87$).

Distress intolerance

Items assessing DI were adapted from the original 15-item Distress Tolerance Scale (Simons & Gaher, 2005).

The SAQ included 4 of these items: *I can't handle feeling distressed or upset* (Tolerance); *My feelings of distress or being upset scare me* (Appraisal); *My feelings of distress are so intense that they completely take over* (Absorption); *I'll do anything to stop feeling distressed or upset* (Regulation). Items were summed, with higher scores indicating higher DI. Research supports the reliability and validity of the original measure, including a single, higher-order factor with good internal consistency (Leyro et al., 2011; Simons & Gaher, 2005). In the current sample, these items had excellent internal consistency (Cronbach's $\alpha = 0.91$).

Multivariate risk scores

In order to sustain statistical power with the small sample size, we used the parent case–control sample to develop a series of multivariate risk scores, each of which allowed us to control for a set of important risk factors using a single continuous variable (i.e., the predicted probability of SA based on a logistic regression model). Multivariate risk score 1 (RS-1) includes sociodemographic variables (gender, age, race, education, marital status). Covariate selection for the remaining three risk scores was based on previously published findings (Naifeh et al., 2019, 2020) in which we systematically identified SAQ-based risk factors associated with SA in the parent sample. Multivariate risk score 2 (RS-2) differentiated SA from the general population (Naifeh et al., 2019) and includes sociodemographic, stressful event, and mental disorder variables. Multivariate risk scores 3 (RS-3) and 4 (RS-4) were shown to differentiate attempters from ideators. RS-3 includes gender, education, PTSD, and intermittent explosive disorder (IED) (Naifeh et al., 2019). RS-4 expanded the RS-3 model by adding to it previous self-injurious thoughts/behaviors: history of suicide plan/intention, controllability of worst-week suicide ideation, and frequency of nonsuicidal self-injury (Naifeh et al., 2020) (see Supplemental Materials for more details about the risk scores).

Statistical analysis

Analyses were conducted using SAS version 9.4 (SAS Institute Inc., 2013). Less than 7% of respondents had item-level missing data on the ER and DI items, which were imputed to the corresponding case or control median for a given item. Sample weights were used for all analyses. ER and DI scores were standardized to have a mean of 0 and standard deviation (SD) of 1 based on the total population (i.e., weighted case–control sample). Logistic regression analyses examined the univariate and multivariate associations of standardized ER and DI scores with SAs in the general population (the combined, weighted samples of propensity controls, and 12-month ideation controls) and among 12-month ideators. Multivariate models predicting SA in the general population adjusted for RS-1 and RS-2 (i.e., sociodemographics, stressful events, and mental disorders). Multivariate models predicting SA among 12-month ideators adjusted for RS-1, RS-3, and RS-4 (i.e., sociodemographics, stressful events, mental disorders, and history of self-injurious thoughts and behaviors).

Logistic regression coefficients were exponentiated to obtain odds ratios (OR) and 95% confidence intervals (CI). Standard errors were estimated using the Taylor series method to adjust for stratification, weighting, and clustering of the Consolidated AAS survey data. Multivariable significance tests in logistic regression analyses were made using Wald χ^2 tests based on coefficient variance-covariance matrices that were adjusted for design effects using the Taylor series method (Wolter, 1985). Statistical significance was evaluated using two-sided design-based tests and the .05 level of significance.

RESULTS

Sample characteristics

Weighted SA cases were mostly male (74.6%), under 30 years old (75.0%), white (57.2%), high school educated (73.5%), and married (52.1%). The weighted sample of controls was mostly male (93.0%), under 35 years old (71.9%), white (69.0%), high school educated (54.9%), and married (72.2%) (Table 1).

Associations of ER with SA

In univariate models, a one-SD increase in ER was associated with 2.5 times higher odds of SA in the general population (OR = 2.5 [95% CI = 1.7–3.6]) and among 12-month suicide ideators (OR = 2.5 [95% CI = 1.3–4.6]). Adjusting for the sociodemographic variables (RS-1), ER continued to be associated with increased odds of SA in the general population (OR = 2.4 [95% CI = 1.7–3.4]) and also among ideators (OR = 2.4 [95% CI = 1.5–3.9]). ER was associated with 1.7 times greater odds of SA in the general population even after adjusting for RS-2 (sociodemographic, stressor, and mental disorder variables) (OR = 1.7 [95% CI = 1.2–2.6]). Similarly, ER was associated with 1.8 times higher odds of SA among the 12-month ideators (OR = 1.8 [95% CI = 1.0–3.3]) after adjusting for RS-3 (gender, education, PTSD, IED)

TABLE 1 Sociodemographic characteristics of suicide attempt cases, propensity controls, and 12-month suicide ideation controls

	Suicide attempt cases[a] ($n = 74$)		General population controls[b] ($n = 133$)		Suicide ideation controls[c] ($n = 30$)	
	n	Weighted %	*n*	Weighted %	*n*	Weighted %
Gender						
Male	61	74.6	121	93.0	26	72.3
Female	13	25.4	12	7.0	4	27.7
Current age						
≤24	28	49.3	24	12.3	4	8.3
25–29	19	25.7	37	25.6	8	15.1
30–34	13	10.4	36	34.0	12	67.0
35–39	7	6.0	16	14.3	4	8.6
≥ 40	7	8.7	20	13.8	2	1.0
Race/ethnicity						
White	46	57.2	86	69.0	20	84.4
Black	20	32.9	19	14.5	1	3.4
Hispanic	2	4.2	17	6.7	5	7.6
Other	6	5.6	11	9.7	4	4.6
Education						
<High school[d]	9	20.6	12	9.1	1	0.5
High school	57	73.5	82	54.9	19	57.7
≥Some college	8	5.9	39	36.0	10	41.8
Marital status						
Never married	16	39.1	29	16.8	5	5.7
Currently married	48	52.1	92	72.2	22	81.8
Previously married	10	8.9	12	11.0	3	12.4

[a]Suicide attempt cases: Hospitalized soldiers who recently attempted suicide, weighted to represent all hospitalized suicide attempters at the study sites.

[b]General population controls: Non-hospitalized soldiers selected based on either propensity score matching or 12-month suicide ideation, weighted to represent the general population at the study sites.

[c]Suicide ideation controls: Non-hospitalized soldiers who reported 12-month suicide ideation, weighted to represent 12-month suicide ideators in the general population at the study sites.

[d]<High School includes General Educational Development credential (GED), home study diploma, occupational program certificate, correspondence school diploma, high school certificate of attendance, adult education diploma, and other non-traditional high school credentials.

(Table 2). After adjusting for RS-4, which included previous self-injurious thoughts and behaviors, ER was not associated with SA among ideators, although the OR remained at 1.5 (not shown in table) (OR = 1.5 [95% CI = 0.6–4.2]; $\widehat{\beta} = 0.4$ [SE = 0.5]; $t = 0.8$ [$p = 0.424$]).

Associations of DI with SA

In univariate analyses, a one-SD increase in DI was associated with 2.9 times higher odds of SA among both the general population (OR = 2.9 [95% CI = 2.0–4.1]) and 12-month suicide ideators (OR = 1.9 [95% CI = 1.1–3.5]). Adjusting for RS-1 (sociodemographic variables), DI was still associated with 2.9 times greater odds of SA in the general population (OR = 2.9 [95% CI = 2.0–4.1]) and similarly among ideators (OR = 2.0 [95% CI = 1.3–3.0]). After adjusting for RS-2 (the sociodemographic, stressor, and mental disorder variables), DI continued to be associated with 2.3 times higher odds of SA in the general population (OR=2.3 [95% CI = 1.6–3.4]). DI was also associated with 1.8 times greater odds of SA among

TABLE 2 Associations of emotional reactivity with suicide attempts among U.S. Army soldiers

	Suicide attempters[a] among the population[b] ($n = 74$ cases; $n = 133$ controls)						Suicide attempters[a] among ideators[c] ($n = 74$ cases; $n = 30$ controls)					
	Univariate		Adjusted for Sociodemographics[d]		Adjusted for Sociodemographics, Stressors, Mental Disorders[e]		Univariate		Adjusted for Sociodemographics[d]		Adjusted for Sociodemographics, Mental Disorders[f]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Emotional reactivity (standardized)	2.5*	(1.7–3.6)	2.4*	(1.7–3.4)	1.7*	(1.2–2.6)	2.5*	(1.3–4.6)	2.4*	(1.5–3.9)	2.2*	(1.1–4.3)
Point estimate	$\widehat{\beta} = 0.9$ (SE = 0.2)		$\widehat{\beta} = 0.9$ (SE = 0.2)		$\widehat{\beta} = 0.6$ (SE = 0.2)		$\widehat{\beta} = 0.9$ (SE = 0.3)		$\widehat{\beta} = 0.9$ (SE = 0.2)		$\widehat{\beta} = 0.8$ (SE = 0.3)	
Wald test	$t = 4.8$ ($p < 0.001$)		$t = 4.8$ ($p < 0.001$)		$t = 2.8$ ($p = 0.006$)		$t = 2.9$ ($p = 0.004$)		$t = 3.8$ ($p = 0.002$)		$t = 2.3$ ($p = 0.025$)	

Note: *$p < 0.05$.

Abbreviations: OR, odds ratio; CI, confidence interval; $\widehat{\beta}$, beta coefficient; SE, standard error; t, Wald test t-statistic.

[a]Suicide attempt cases: Hospitalized soldiers who recently attempted suicide, weighted to represent all hospitalized suicide attempters at the study sites.

[b]General population controls: Non-hospitalized soldiers selected based on either propensity score matching or 12-month suicide ideation, weighted to represent the general population at the study sites.

[c]Suicide ideation controls: Non-hospitalized soldiers who reported 12-month suicide ideation, weighted to represent 12-month suicide ideators in the general population at the study sites.

[d]Multivariate risk score 1 (RS-1): Predicted probability of suicide attempt based on sociodemographic variables (gender, age, race, education, and marital status).

[e]Multivariate risk score 2 (RS-2): Predicted probability of suicide attempt based on sociodemographic variables (gender, education), stressors (lifetime interpersonal violence exposure, 12-month combat exposure, 12-month relationship problems), and mental disorders (major depressive disorder, posttraumatic stress disorder, substance use disorder, intermittent explosive disorder) previously found to differentiate suicide attempts from the general population in the parent samples from which the current cases and controls were drawn (Naifeh et al., 2019).

[f]Multivariate risk score 3 (RS-3): Predicted probability of suicide attempt based on sociodemographic variables (gender, education) and mental disorders (posttraumatic stress disorder, intermittent explosive disorder) previously found to differentiate suicide attempts from recent suicide ideators in the parent samples from which the current cases and controls were drawn (Naifeh et al., 2019).

12-month ideators after adjusting for RS-3 (gender, education, PTSD, and IED) (OR = 1.8 [95% CI = 1.0–3.3]) (Table 3). Notably, even after adjusting for RS-4 (previous self-injurious thoughts and behaviors), DI was associated with 2.0 times higher odds of SA (OR = 2.0 [95% CI = 1.0–3.9]; $\widehat{\beta} = 0.7$ [SE = 0.3]; $t = 2.1$ [$p = 0.043$]) (not shown in table).

Unique and Joint Associations of ER and DI with SA

In the combined case–control sample, ER and DI were positively correlated ($r = 0.8$, $p < 0.001$) (other bivariate correlations are available in the Appendix S1). When ER and DI were examined together in the same model as predictors of SA in the general population, a one-SD increased in DI was associated with 3.0 times higher odds of SA (OR = 3.0 [95% CI = 1.6–5.6]; $\widehat{\beta} = 1.1$ [SE = 0.3]; $t = 3.5$ [$p = 0.001$]). DI remained significant and largely unchanged after including RS-1 (sociodemographic variables) in the model (OR = 3.1 [95% CI = 1.8–5.3]; $\widehat{\beta} = 1.1$ [SE = 0.3]; $t = 4.2$ [$p < 0.001$]) and even after adjusting for RS-2 (sociodemographic, stressor, and mental disorder variables) (OR = 2.9 [95% CI = 1.5–5.6]; $\widehat{\beta} = 1.1$ [SE = 0.3]; $t = 3.1$ [$p = 0.002$]). Considering SA among the SI population, neither ER nor DI differentiated SA from 12-month ideators when examined simultaneously in any of the models. The interaction between ER and DI was not significantly associated with SA in the general population ($\widehat{\beta} = -0.2$ [SE = 0.1]; $t = -1.2$ [$p = 0.218$]) or among 12-month ideators ($\widehat{\beta} = -0.1$ [SE = 0.3]; $t = -0.2$ [$p = 0.865$]).

DISCUSSION

Using a case–control design and data weighted to be representative, we found that both ER and DI significantly differentiated soldiers with a recent SA from the Army general population and from the subset of soldiers who reported 12-month SI but had not made an attempt. In univariate analyses, a one-SD increase in ER was associated with 2.5 times higher odds of SA in the general population and among 12-month ideators, whereas a one-SD increase in DI was associated with nearly 3 times higher odds of SA in the general population and 2 times higher among ideators. Associations of ER and DI with SA persisted after adjusting for sociodemographic characteristics. Even after adjusting for previously identified risk factors (sociodemographic characteristics, stressors, and mental disorders), ER and DI continued to differentiate attempters from the general population. Similarly, both ER and DI differentiated attempters from 12-month ideators when controlling for sociodemographic characteristics and mental disorders previously found to differentiate SA and SI in the larger case–control sample from which the current sample was recruited. When previous self-injurious thoughts and behaviors were accounted for, DI significantly differentiated attempters from ideators, but ER did not. Neither predictor differentiated SA from SI when examined together in the same model, likely a consequence of the small sample size and high ER-DI correlation. The findings suggest that ER and DI may differentiate suicide attempters from the Army general population and from recent ideators, even above mental disorders known to be associated with risk. Of particular note, the odds ratio for ER was the same whether differentiating SA from the general population or from 12-month SI, indicating it may be one of the rare variables that does not predict ideation but does predict attempts among ideators (i.e., its association with SA is not mediated by SI).

Importantly, statistical power was limited by the small sample size, particularly in models differentiating attempters and ideators. Additional research with larger military samples is needed before conclusions can be drawn, particularly in light of theoretical and empirical work suggesting that the relationship between DI and suicidal behavior may be nuanced. For example, contemporary theoretical models of suicidal behavior, such as the interpersonal-psychological theory (Joiner, 2005), suggest that individuals who act on suicidal desire must have the capability to overcome the fear and distress associated with self-injury. In support of this, a study found that the association between high DI and lifetime SA was mediated by frequency of nonsuicidal self-injury, experiences that may diminish the fear associated with self-injury (Anestis et al., 2013).

The current study assessed self-reported ER and DI, meaning it is a study of the degree to which soldiers perceive they are emotionally reactive and/or have difficulty tolerating distress. While self-perceptions are important, there are other ways to conceptualize and measure ER and DI, including behavioral and psychophysiological assessments (Anestis et al., 2012; Bylsma et al., 2008; Glenn et al., 2011; McHugh et al., 2011). It is not known whether these alternative approaches to measurement would yield similar results in the current case–control sample, but previous studies suggest that their correlation and convergence with self-reported ER and DI is often modest at best (Anestis et al., 2012; Cougle et al., 2013; Marshall-Berenz et al., 2010). One study of behaviorally indexed DI was partially consistent with our results, finding that higher DI was associated with a lifetime history of SA; however, lower DI (i.e., higher distress tolerance) differentiated ideators with vs. without a history of SA (Anestis & Capron, 2016). A comparison of these findings with those of the

TABLE 3 Associations of distress intolerance with suicide attempts among U.S. Army soldiers

	Suicide attempters[a] among the population[b] ($n = 74$ cases; $n = 133$ controls)						Suicide attempters[a] among ideators[c] ($n = 74$ cases; $n = 30$ controls)					
	Univariate		Adjusted for Sociodemographics[d]		Adjusted for Sociodemographics, Stressors, Mental Disorders[e]		Univariate		Adjusted for Sociodemographics[d]		Adjusted for Sociodemographics, Mental Disorders[f]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Distress intolerance (standardized)	2.9*	(2.0–4.1)	2.9*	(2.0–4.1)	2.3*	(1.6–3.4)	1.9*	(1.1–3.5)	2.0*	(1.3–3.0)	1.8*	(1.0–3.3)
Point estimate	$\widehat{\beta} = 1.1$ (SE = 0.2)		$\widehat{\beta} = 1.1$ (SE = 0.2)		$\widehat{\beta} = 0.8$ (SE = 0.2)		$\widehat{\beta} = 0.7$ (SE = 0.3)		$\widehat{\beta} = 0.7$ (SE = 0.2)		$\widehat{\beta} = 0.6$ (SE = 0.3)	
Wald test	$t = 5.7$ ($p < 0.001$)		$t = 5.8$ ($p < 0.001$)		$t = 4.2$ ($p < 0.001$)		$t = 2.3$ ($p = 0.026$)		$t = 3.4$ ($p = 0.001$)		$t = 2.1$ ($p = 0.039$)	

Note: *$p < 0.05$.

Abbreviations: OR, odds ratio; CI, confidence interval; $\widehat{\beta}$, beta coefficient; SE, standard error; t, Wald test t-statistic.

[a]Suicide attempt cases: Hospitalized soldiers who recently attempted suicide, weighted to represent all hospitalized suicide attempters at the study sites.

[b]General population controls: Non-hospitalized soldiers selected based on either propensity score matching or 12-month suicide ideation, weighted to represent the general population at the study sites.

[c]Suicide ideation controls: Non-hospitalized soldiers who reported 12-month suicide ideation, weighted to represent 12-month suicide ideators in the general population at the study sites.

[d]Multivariate risk score 1 (RS-1): Predicted probability of suicide attempt based on sociodemographic variables (gender, age, race, education, and marital status).

[e]Multivariate risk score 2 (RS-2): Predicted probability of suicide attempt based on sociodemographic variables (gender, education), stressors (lifetime interpersonal violence exposure, 12-month combat exposure, 12-month relationship problems), and mental disorders (major depressive disorder, posttraumatic stress disorder, substance use disorder, intermittent explosive disorder) previously found to differentiate suicide attempts from the general population in the parent samples from which the current cases and controls were drawn (Naifeh et al., 2019).

[f]Multivariate risk score 3 (RS-3): Predicted probability of suicide attempt based on sociodemographic variables (gender, education) and mental disorders (posttraumatic stress disorder, intermittent explosive disorder) previously found to differentiate suicide attempts from recent suicide ideators in the parent samples from which the current cases and controls were drawn (Naifeh et al., 2019).

current study is difficult due to differences in samples (civilian vs. military), DI assessment (behavioral vs. self-report), and outcomes (lifetime SA vs. recent SA). There is a need for more studies that incorporate multi-method assessments of DI to clarify its role in both lifetime and imminent SA risk. It is also important to examine whether discrepant findings in military vs. civilian samples may reflect differences in capability for suicide (Selby et al., 2010).

Importantly, ER and DI are only two dimensions of the complex processes involved in emotional functioning and regulation. There is a need for studies examining other transdiagnostic dimensions that may differentiate attempters and ideators and which may even predict the short-term transition from thinking about suicide to acting on those thoughts. Although the extant research is still limited, a recent meta-analysis suggests that RDoC constructs may help improve understanding and prediction of suicidal behaviors (Glenn et al., 2018). To the extent that ER and DI can be mapped onto current or future RDoC constructs related to emotion regulation (Fernandez et al., 2016; Sun et al., 2017), they may inform identification of endophenotypes relevant to suicidal behavior. For example, improved understanding of the association between ER and SA may illuminate how more fundamental processes, such as arousal (an RDoC construct related to ER; Institute and of Mental Health, 2021), influence SI-to-SA transitions.

ER, DI, and other emotion regulatory processes may have a genetic and neurobiological basis (Hare et al., 2008; Hawn et al., 2015; Trafton & Gifford, 2011). For example, DI appears to run in families (Macatee et al., 2020). Adverse early developmental experiences, such as childhood maltreatment, are associated with ER, DI, and other emotion regulation vulnerabilities (Berenz et al., 2018a, 2018b; Heleniak et al., 2016; Lavi et al., 2019). Because of these potential genetic and early developmental influences, it is important to understand the extent to which ER and DI are stable (e.g., trait-like) dimensions of emotional functioning (Cummings et al., 2013; Macatee et al., 2020), or how they may change in different contexts. Larger, longitudinal samples will allow for examination of the stability of ER and DI over time, and whether they are predispositions that are potentiated by life circumstances. It may be, for example, that ER interacts with life stressors to predict the onset and/or persistence of SI, and the progression from ideation to attempt. Similarly, DI may interact with psychological distress to predict the same longitudinal outcomes.

Our findings should be interpreted within certain limitations. First, the current study compared retrospective self-report data from two different cross-sectional samples. Longitudinal research is needed to determine whether ER and DI are prospectively associated with SAs in the Army general population and among ideators. Second, the small sample size limited statistical power and representation of the target populations. Although the ability to weight respondents to their population is a significant and unique strength of Army STARRS, it is difficult to fully represent all important subgroups of the Army population with so few soldiers. Third, the effects of using abbreviated measures of ER and DI are unknown. For example, we do not know if the full instruments would be as highly correlated with each other as our 4-item measures were. Third, given that the current study compared hospitalized suicide attempters to non-hospitalized soldiers in the community, it is possible that higher ER and DI are related to risk for psychiatric hospitalization in general rather than being specific to risk for attempted suicide. Importantly, however, previous research indicates that more than one-third of soldiers who attempt suicide have no prior history of mental health diagnosis (Ursano et al., 2018), and even fewer have had a psychiatric hospitalization. Thus, a substantial proportion of soldiers at risk for suicide attempts would not be represented in a hospitalized controlled group. Community controls are particularly important in a military context because psychiatric hospitalization often results in medical separation from the military (Hoge et al., 2002, 2005), limiting the window of opportunity for prevention. Fourth, the findings may not be generalizable to other military populations, veterans, or civilians.

CONCLUSIONS

Our findings provide support for the role of ER and DI in suicidal behavior. More research is needed to determine the extent to which ER and DI may differentiate risk for SA versus SI, and, most importantly, the extent to which they may prospectively predict SI-to-SA transitions. Ultimately, treatments that target ER, DI, and other transdiagnostic factors involved in emotion regulation, such as dialectical behavior therapy (Linehan, 1993), may help reduce SA risk in soldiers and civilians with recent SI (McCauley et al., 2018). For clinicians treating individuals with SI, a focus on assessing and reducing the specific processes of ER and DI, in addition to treating individual mental disorders, may be an important component of effective SA prevention.

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CONFLICTS OF INTEREST

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Datastat, Inc., Johnson & Johnson Wellness and Prevention, Sage Pharmaceuticals, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Dr. Stein has in the past three years been a consultant for Actelion, Alkermes, Aptinyx, Bionomics, Dart Neuroscience, Healthcare Management Technologies, Janssen, Neurocrine Biosciences, Oxeia Biopharmaceuticals, Pfizer, and Resilience Therapeutics. Dr. Stein has stock options in Oxeia Biopharmaceuticals. The remaining authors report nothing to disclose.

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