Research report

Improving the detection and prediction of suicidal behavior among military personnel by measuring suicidal beliefs: An evaluation of the Suicide Cognitions Scale

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ABSTRACT

Background: Newer approaches for understanding suicidal behavior suggest the assessment of suicide-specific beliefs and cognitions may improve the detection and prediction of suicidal thoughts and behaviors. The Suicide Cognitions Scale (SCS) was developed to measure suicide-specific beliefs, but it has not been tested in a military setting.

Methods: Data were analyzed from two separate studies conducted at three military mental health clinics (one U.S. Army, two U.S. Air Force). Participants included 175 active duty Army personnel with acute suicidal ideation and/or a recent suicide attempt referred for a treatment study (Sample 1) and 151 active duty Air Force personnel receiving routine outpatient mental health care (Sample 2). In both samples, participants completed self-report measures and clinician-administered interviews. Follow-up suicide attempts were assessed via clinician-administered interview for Sample 1. Statistical analyses included confirmatory factor analysis, between-group comparisons by history of suicidality, and generalized regression modeling.

Results: Two latent factors were confirmed for the SCS: Unloveability and Unbearability. Each demonstrated good internal consistency, convergent validity, and divergent validity. Both scales significantly predicted current suicidal ideation (βs > 0.316, ps < 0.002) and significantly differentiated suicide attempts from nonsuicidal self-injury and control groups (F(6, 286) = 9.801, p < 0.001). Both scales significantly predicted future suicide attempts (AORs > 1.07, ps < 0.050) better than other risk factors.

Limitations: Self-report methodology, small sample sizes, predominantly male samples.

Conclusions: The SCS is a reliable and valid measure that predicts suicidal ideation and suicide attempts among military personnel better than other well-established risk factors.

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1. Introduction

Death by suicide has accounted for a rising proportion of all deaths among military personnel since 2005 (Armed Forces Health Surveillance Center, 2012). Research on military suicide has, to date, largely adopted approaches that focus on the relationship of psychiatric disorders and their symptoms (e.g., depression, PTSD) with subsequent suicidal behavior (Department of Defense, 2011; LeardMann et al., 2013; Skopp et al., 2012). However, this syndrome-based approach is limited in light of evidence that the considerable majority of individuals with psychiatric conditions and symptoms will not make suicide attempts or die by suicide (e.g., Goldsmith et al., 2002).

A more contemporary, transdiagnostic approach to understanding suicide risk is fluid vulnerability theory (Rudd, 2006),
which posits that some individuals are more sensitized or “vulnerable” to suicidal behaviors, and this vulnerability persists over time independent of the individual’s specific psychiatric symptom profile. Contributing to this persistent vulnerability is one’s cognitive style or pattern of assumptions about one’s self, others, and the world, which Rudd has termed the “suicidal belief system.” A growing body of research supports the assertion that measuring suicide-specific thought processes independent of psychiatric symptoms and disorders may improve assessment, treatment, and clinical decision-making. For instance, the role of hopelessness is now well established (Brown et al., 2000; Bryan & Rudd, 2006), and more recent empirical work has supported the incremental utility of perceived burdensomeness (e.g., “People would be better off without me”) over psychiatric symptoms (Joiner et al., 2009). This has been confirmed in military samples as well (Bryan et al., 2010, 2012). More rigorous investigation among military personnel of the suicidal belief system, beyond hopelessness and perceived burdensomeness, may therefore yield improvements in the detection, assessment, prediction, and treatment of suicidal thoughts and behaviors in this population.

The Suicide Cognitions Scale (SCS) was recently developed to measure the suicidal belief system (Rudd et al., in press). Items were selected based on observation of common statements and verbalizations by suicidal patients across treatment settings. The SCS is believed to measure two underlying dimensions of the suicidal belief system, Unloveability and Unbearability, which is supported by exploratory and confirmatory factor analyses conducted in several non-military samples including college students and psychiatric inpatients (Rudd et al., in press). Unloveability entails the perception that one is worthless, defective, and fundamentally flawed (e.g., “I don’t deserve to live another moment”; “I am completely unworthy of love”), consistent with notions of self-hatred and shame, whereas unbearability entails the perception that one is incapable of tolerating distress (e.g., “I can’t stand this pain anymore”; “I can’t tolerate being this upset any longer”). In contrast to measuring situation-specific beliefs and assumptions (e.g., hopelessness), the SCS measures identity-based beliefs and assumptions that confer long-term vulnerability to suicidal thoughts and behaviors independent of an individual’s emotional state. According to the fluid vulnerability theory, identity-based beliefs should be associated with suicidal behaviors over the long term because they tend to be more persistent and enduring. Consistent with this hypothesis, preliminary evaluations of the SCS in non-military samples confirm that it incrementally predicts current suicidal ideation and future suicide attempts, and it differentiates those with and without a history of suicide attempt (Rudd et al., in press). To date, however, the SCS has not been evaluated or used with military personnel.

The current analysis examined the clinical utility of measuring suicide-specific beliefs and cognitions with the SCS among military personnel in two separate clinical samples. It was hypothesized that the SCS would demonstrate good psychometric properties and would improve the detection and prediction of suicidal thoughts and behaviors among military personnel.

2. Methods

2.1. Participants and procedures

2.1.1. Sample 1

Participants for Sample 1 were comprised of active duty U.S. Army personnel referred for a baseline intake evaluation as part of a prospective, randomized controlled trial testing the efficacy of a brief cognitive-behavioral therapy for the prevention of suicide attempts at an Army mental health clinic in the western United States. Participants were referred by Army mental health professionals following participants’ discharge from inpatient psychiatric hospitalization for acute suicidal ideation and/or a suicide attempt. Of 204 soldiers referred to the study, 175 (85.8%) consented to participate in the baseline evaluation. Data for this 2-year prospective study were acquired from all 175 participants who completed the baseline evaluations. Follow-up suicide attempts during the subsequent 2 years were determined via structured clinician-administered interviews (described below). Data were entered directly into a secured, electronic database located at The University of Texas Health Science Center at San Antonio. Demographic descriptive statistics are summarized in Table 1. Regulatory approval for this study was received from the Madigan Army Medical Center Institutional Review Board.

2.1.2. Sample 2

Participants for Sample 2 were comprised of 151 active duty U.S. Air Force personnel in outpatient mental health treatment at two Air Force clinics in the southern and western United States. Patients were invited by their mental health providers to complete an anonymous survey packet immediately after their mental health appointments. Patients agreeing to participate (151 out of 176 invited; 85.8% response rate) filled out a survey packet in the waiting room and then returned the completed packet to a secured box located at the front desk. Surveys were then shipped to the National Center for Veterans Studies at the University of Utah for entry into a secured, electronic database. No follow-up data were collected for Sample 2. Demographic descriptive statistics are summarized in Table 1. Regulatory approval for this study was received from the Wright-Patterson Air Force Base Institutional Review Board.

2.2. Instruments

2.2.1. Sample 1

2.2.1.1. Suicide Attempt Self-Injury Scale (SASII). Follow-up suicide attempts were assessed with the SASII (Linehan et al., 2006), which is a structured clinical interview designed to assess the factors involved in nonfatal suicide attempts and intentional self-
injury. The SASII assesses factors including method, lethality, impulsivity, subjective versus objective intent, reasons for the attempt, and consequences of the attempt. On the basis of all information obtained, the evaluator classified the behavior as a suicide attempt or not. The SASII has high interrater reliability (0.871–0.978, Mdn = 0.956) across assessor-related items, and very high consistency has been found between retrospective self-report of suicide attempts as compared to weekly reports (ICC = 0.91).

2.3. Sample 2

2.3.1. Beck Depression Inventory, second edition (BDI-II). The BDI-II (Beck et al., 1996) was used to assess the severity of depressive symptoms, with higher scores indicating more severe depression. The BDI-II’s reliability and validity are well established, and the scale’s total score is associated with suicidal ideation and suicide attempts.

2.3.1.2. Beck Hopelessness Scale (BHS). The BHS (Beck and Steer, 1993a) was used to assess the severity of hopelessness. The BHS consists of 20 true-false statements that measure the extent of positive and negative beliefs about the future. The scale is reliable and valid and is associated with suicidal ideation, suicide attempts, and death by suicide.

2.3.1.4. Beck Anxiety Scale (BAI). The BAI (Beck and Steer, 1993b) was used to assess the severity of anxiety symptoms, with higher scores indicating more severe anxiety. The BAI’s reliability and validity are well-established.

2.3.1.5. Beck Scale for Suicide Ideation-Current (BSSI-C). The BSSI-C (Beck, 1993) was used to assess the severity of current suicidal ideation. The BSSI-C is a self-report instrument that measures attitudes about suicide such as frequency and duration of ideation, specificity of planning, and preparations for death. Higher scores indicate more severe suicidal ideation. The BSSI-C has very good internal consistency and convergent validity, and it has been found to predict future suicide attempts and death by suicide.

2.3.1.6. PTSD checklist (PCL). The PCL (Weathers et al., 1993) was used to assess the severity of posttraumatic stress symptoms. The PCL directs respondents to consider the most stressful experience in their lives and to indicate the severity with which each symptom of PTSD has been experienced within the past 30 days. The scale has demonstrated excellent reliability, validity, and diagnostic utility.

2.3.1.7. Interpersonal Needs Questionnaire (INQ). The INQ (Van Orden et al., 2012) was used to assess perceived burdensomeness and thwarted belongingness. thwarted belongingness refers to the respondent's current beliefs about feeling disconnected from others, and perceived burdensomeness refers to the respondent's current belief that others in their lives would be better off without them. Higher scores on each scale indicate more severe psychopathology. The two subscales correlate in the expected directions with measures of mood, psychological symptoms, and social connectedness. They incrementally predict past and current suicidal ideation and behaviors beyond other risk factors for suicide.

2.3. Sample 2

2.3.1. Beck Scale for Suicide Ideation-Current (BSSI-C)

The BSSI-C was described above.

2.3.2. PTSD checklist (PCL)

The PCL was described above.

2.3.3. Interpersonal Needs Questionnaire (INQ)

The INQ was described above.

2.3.4. Self-Injurious Thoughts and Behaviors Interview (SITBI)

The SITBI (Nock et al., 2007) was used to assess lifetime history of suicidal ideation (“Have you ever had thoughts of killing yourself?”), nonsuicidal self-injury (“Have you ever actually engaged in nonsuicidal self-injury, that is, purposely hurting yourself without wanting to die, for example by cutting or burning?”), and suicide attempt (“Have you ever made an actual attempt to kill yourself in which you had at least some intent to die?”). The SITBI is a structured interview that assesses the presence, frequency, and characteristics of self-injurious thoughts and behaviors. The interview has good interrater reliability (κ = 0.99) and test-retest reliability over 6 months (κ = 0.70), and it demonstrates strong convergent validity with other measures of suicidal ideation (κ = 0.54).

2.3.5. Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 (Kroenke et al., 2001) was used to assess depression symptom severity. The PHQ-9 directs respondents to indicate the frequency of experiencing the nine symptoms of major depressive disorder during the past 2 weeks, with higher scores indicating greater severity. The PHQ-9 has good internal consistency and sensitivity and specificity for major depressive disorder.

2.3.6. Future Dispositions Inventory

The negative focus subscale of the FDI (Osman et al., 2010) was used to assess the intensity of hopelessness and pessimism about the future. The negative focus subscale consists of eight items (e.g., “I worry that things will never go well for me no matter what I do; I doubt whether things will ever get better for me in life; I fear that I will run into more difficulties in the years ahead”) that respondents rate on a 5-point Likert scale ranging from 1 (“not at all true”) to 5 (“extremely true”). The scale is reliable, correlates strongly in the expected directions with measures of hopelessness, adaptive coping, and psychological symptoms, and can differentiate between suicidal and nonsuicidal groups.

2.3.7. Personal Feelings Questionnaire-2 (PFQ2)

The PFQ2 (Harder et al., 1993) was used to measure shame. The PFQ2 directs respondents to indicate how frequently they experience 10 items assessing emotional or cognitive states associated with shame (e.g., embarrassment, feeling ridiculous, self-consciousness, feeling stupid) on a scale ranging from 0 (“never”) to 4 (“continuously or almost continuously”). The shame subscale has good internal consistency and test-retest stability, correlates strongly with other measures of shame and self-derogation, and is a significant predictor of suicidal ideation and behaviors (Bryan et al., 2013).

3. Results

3.1. What is the factor structure of the SCS?

We used the maximum likelihood mean adjusted (MLM) estimator in the Mplus 6.12 program (Muthen and Muthen, 1998–2011) to conduct the confirmatory factor analysis. The MLM estimator was used because it is robust to violations of normally distributed data. We evaluated two models for adequacy of fit to the sample data. In the one-factor model, we constrained all 18 SCS items to load on a global factor. In the oblique two-factor model, we used the item-factor compositions previously obtained from Rudd et al. (in press). The variance of each factor was set at
1.0, and error terms were not allowed to be correlated. We assessed the adequacy of each model using the Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI), with values of 0.80–0.89 interpreted as moderate, 0.90–0.94 as good, and 0.95 or higher as excellent, and the standardized root mean square of approximation (SRMR), with values less than 0.08 interpreted as good fit. The root mean square error of approximation (RMSEA) was not used as an index of goodness-of-fit because simulation studies have indicated that it tends to overreject correct models in samples with fewer than 250 respondents (Hu and Bentler, 1999).

Consistent with recommendations in the extant literature for conducting confirmatory factor analyses with small sample sizes, we used item parcels due to several advantages including increased power (Cooper et al., 2007; Marsh et al., 1998). We constructed six parcels based on the factor structure previously derived by Rudd et al. (in press). Four parcels corresponded to the SCS’s Unloveability factor (three items per parcel randomly selected from the 12 items of the Unloveability scale) and two parcels corresponded to the SCS’s Unbearability factor (three items per parcel randomly selected from the six items of the Unbearability scale). The reliability estimates for each parcel were all higher than 0.70. Using the parcels as items, we estimated the fits of the one-factor and the two-factor models to each sample’s data.

In Sample 1, the two-factor solution ($\chi^2(8)=23.441$, scaling MLM = 1.493, CFI = 0.98, TLI = 0.97, SRMR = 0.028) yielded a better fit than the one-factor solution ($\chi^2(9)=74.588$, scaling MLM = 1.486, CFI = 0.93, TLI = 0.88, SRMR = 0.046). In Sample 2, the two-factor solution ($\chi^2(8)=32.647$, scaling MLM = 2.194, CFI = 0.94, TLI = 0.90, SRMR = 0.029) also yielded a better fit than the one-factor solution ($\chi^2(9)=58.037$, scaling MLM = 2.228, CFI = 0.89, TLI = 0.81, SRMR = 0.040). Across both Samples 1 and 2, each of the parcels demonstrated very high factor loadings (see Table 2). Taken together, these results suggest the SCS measured the proposed underlying constructs in similar ways across both samples.

3.2. What are the internal consistency estimates and descriptive statistics for the SCS?

Cronbach’s alphas were calculated for the Unloveability and Unbearability scales to obtain internal consistency estimates for the two scales. Items within each scale were summed to obtain mean scores for male and female participants.

For Sample 1, internal consistency estimates were 0.93 for the Unloveability scale and 0.92 for the Unbearability scale. The mean scale scores were $M=31.69$ (SD = 11.56) for Unloveability and $M=18.51$ (SD = 7.13) for Unbearability. Unloveability scores did not differ by gender ($t(170)=0.844$, $p=0.400$), but Unbearability scores were higher among female participants ($M=21.27$, SD = 7.03) than male participants ($M=18.11$, SD = 7.08; $t(170)=1.960$, $p=0.052$).

For Sample 2, internal consistency estimates were 0.94 for the Unloveability scale and 0.93 for the Unbearability scale. The mean scale scores were $M=16.36$ (SD = 7.26) for Unloveability and $M=9.70$ (SD = 5.50) for Unbearability, with neither scale score significantly differing by gender (Unloveability: $t(146)=0.782$, $p=0.435$; Unbearability: $t=1.288$, $p=0.200$).

3.3. What other constructs are correlated with the SCS scales?

We next sought to determine which constructs were most strongly associated with each of the SCS scales by computing the structure coefficients via multiple regression with Unloveability and Unbearability entered as separate criterion variables. Because the SCS was designed to measure the cognitive domain of the suicidal mode (i.e., the suicidal belief system), it was expected that other measures of suicidal beliefs (e.g., perceived burdensomeness, hopelessness, thwarted belongingness) would demonstrate relatively stronger associations with the SCS than mood measures (e.g., depression, anxiety, posttraumatic stress). Results are summarized in Table 3.

In Sample 1, the model in which the Unloveability scale score served as the dependent variable was statistically significant ($F(6, 164)=41.324$, $p<0.001$) and accounted for 73.1% of the total variance in Unloveability. Based on the beta weights and structure coefficients, the strongest correlates of the Unloveability scale were perceived burdensomeness ($\beta=0.398$, $p<0.001$), depression ($\beta=0.248$, $p<0.001$), hopelessness ($\beta=0.190$, $p=0.002$), and thwarted belongingness ($\beta=0.121$, $p=0.031$). The model in which the Unbearability scale score served as the dependent variable was also statistically significant ($F(6, 164)=41.324$, $p<0.001$) and accounted for 60.2% of the total variance in Unbearability. The strongest correlates of the Unbearability scale were depression ($\beta=0.460$, $p<0.001$), hopelessness ($\beta=0.185$, $p<0.001$), and perceived burdensomeness ($\beta=0.178$, $p<0.001$).

In Sample 2, the model in which the Unloveability scale score served as the dependent variable was statistically significant ($F(6, 142)=40.207$, $p<0.001$) and accounted for 62.9% of the total variance in Unloveability. The strongest correlates of the Unloveability scale were perceived burdensomeness ($\beta=0.517$, $p<0.001$), depression ($\beta=0.191$, $p<0.001$), and shame ($\beta=0.189$, $p<0.001$). The model in which the Unbearability scale score served as the dependent variable was statistically significant ($F(6, 142)=29.957$, $p<0.001$) and accounted for 55.9% of the total variance in Unbearability. The strongest correlates of Unbearability were also perceived burdensomeness ($\beta=0.303$, $p<0.001$), depression ($\beta=0.282$, $p<0.001$), and shame ($\beta=0.151$, $p<0.001$).

### Table 2

Fit statistics and factor loading from parcel-level confirmatory factor analyses across both military samples.

<table>
<thead>
<tr>
<th>Parcel (SCS items)</th>
<th>Sample 1</th>
<th></th>
<th>Sample 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-Factor</td>
<td>2-Factor</td>
<td>1-Factor</td>
<td>2-Factor</td>
</tr>
<tr>
<td></td>
<td>Unlove</td>
<td>Unbear</td>
<td>Unlove</td>
<td>Unbear</td>
</tr>
<tr>
<td>Parcel 1 (1, 4, 15)</td>
<td>0.72</td>
<td>0.896</td>
<td>0.912</td>
<td>–</td>
</tr>
<tr>
<td>Parcel 2 (2, 9, 16)</td>
<td>0.77</td>
<td>0.896</td>
<td>0.918</td>
<td>–</td>
</tr>
<tr>
<td>Parcel 3 (6, 17, 18)</td>
<td>0.72</td>
<td>0.893</td>
<td>0.889</td>
<td>–</td>
</tr>
<tr>
<td>Parcel 4 (7, 10, 14)</td>
<td>0.83</td>
<td>0.863</td>
<td>0.851</td>
<td>–</td>
</tr>
<tr>
<td>Parcel 5 (8, 11, 13)</td>
<td>0.86</td>
<td>0.799</td>
<td>–</td>
<td>0.906</td>
</tr>
<tr>
<td>Parcel 6 (3, 5, 12)</td>
<td>0.89</td>
<td>0.817</td>
<td>–</td>
<td>0.934</td>
</tr>
</tbody>
</table>

SCS, Suicide Cognitions Scale; Unlove, Unloveability; Unbear, Unbearability.
3.4. Does the SCS discriminate between military personnel with and without a history of suicidal thoughts and behaviors?

To establish if the SCS could discriminate between theoretically relevant subgroups based on history of self-injurious thoughts and behaviors, patients from Sample 2 were categorized into the following four groups: suicide attempt (n = 11), nonsuicidal self-injury (n = 12), suicidal ideation (n = 24), and control (n = 102). We then conducted a 4 (suicide risk group) x 2 (SCS scales) multivariate analysis of variance (MANOVA), which yielded statistically significant differences between the four groups (F(6, 286) = 9.801, p < 0.001, partial η² = 0.171). Post-hoc analyses indicated that the suicide attempt group scored significantly higher on both scales than all other groups, followed by the suicide ideation group. The nonsuicidal self-injury group and control group did not significantly differ from each other on either scale, however. When PTSD symptoms, depression symptoms, hopelessness, perceived burdensomeness, and thwarted belongingness were added as covariates, significant between-group differences remained (F(6, 280) = 2.615, p = 0.018, partial η² = 0.053). The suicide attempt group continued to show significantly higher scores on both scales than all other groups, but the suicide ideation group only scored higher than the control group on the Unloveability scale. Estimated marginal means and standard errors are reported in Table 4.

3.5. Does the SCS incrementally predict the severity of current suicidal ideation?

Generalized linear regression analyses were used to determine if the SCS scales incrementally predicted the severity of concurrent suicidal ideation beyond the effects of other risk factors. The BSSI-C total score was used as the criterion variable, and the following covariates were selected for inclusion in the model: PTSD symptoms, depression symptoms, hopelessness, perceived burdensomeness, and thwarted belongingness. The regression analyses were constructed in two steps to determine the incremental validity of the SCS scales. First, all covariates were entered into the equation. Second, the Unloveability and Unbearability scales were added to the equation to identify each scale’s incremental value.

In Sample 1, the first step of the model (covariates only) was statistically significant (F(5, 165) = 19.372, p < 0.001) and accounted for 37.0% of the variance in BSSI-C. In the second step, we added Unloveability, which significantly improved model fit (ΔR² = 0.073, F(1, 164) = 21.331, p < 0.001). Unloveability was a significant predictor of BSSI-C (β = 0.518, p < 0.001) and showed the relative strongest relationship with suicidal ideation as compared to all other covariates. Unloveability was then removed from the model and replaced with Unbearability, which also significantly improved model fit (ΔR² = 0.044, F(1, 164) = 12.254, p < 0.001). Unbearability was also a significant predictor of BSSI-C (β = 0.331, p = 0.001) and showed the relative strongest relationship with suicidal ideation as compared to all other covariates. In the final model, we added both Unloveability and Unbearability into the model simultaneously. This final model accounted for 43.2% of the variance in BSSI-C. Both Unloveability (β = 0.426, p < 0.001) and Unbearability (β = 0.194, p = 0.053) were significantly associated with BSSI-C. Consideration of all variables’ beta weights and structure coefficients suggested the Unloveability scale had the relative strongest relationship with severity of suicidal ideation, accounting for 94.1% of the total explained variance.
variance in suicidal ideation and the relative largest proportion of unique variance (partial $r = 0.266$). Unbearability showed the next strongest relationship with severity of suicidal ideation, accounting for approximately 87% of the explained variance in suicidal ideation.

In Sample 2, the covariates-only model was statistically significant ($F(5, 143) = 14.244, p < 0.001$) and accounted for 33.2% of the variance in BSSI-C. Unloveability significantly improved model fit ($\Delta R^2 = 0.144, F(1, 142) = 39.056, p < 0.001$) and demonstrated the strongest association with BSSI-C ($\beta = 0.608, p < 0.001$) relative to all other covariates. Unloveability was then removed from the model and replaced with Unbearability. Unbearability also significantly improved model fit ($\Delta R^2 = 0.045, F(1, 142) = 10.364, p = 0.002$) and demonstrated a significant association with BSSI-C ($\beta = 0.316, p = 0.002$), with only perceived burdensomeness showing a relatively stronger effect ($\beta = 0.437, p < 0.001$). In the final step, both Unloveability and Unbearability were entered into the equation simultaneously. The final model accounted for 45.3% of the variance in BSSI-C, but only Unloveability was significantly associated with BSSI-C ($\beta = 0.674, p < 0.001$). Consideration of all variables’ beta weights and structure coefficients suggested that the Unloveability scale had the relative strongest relationship with severity of suicidal ideation, accounting for approximately 94% of the explained variance in suicidal ideation and the relative largest proportion of unique variance (partial $r = 0.403$).

3.6. Does the SCS incrementally predict future suicide attempts?

To determine if the SCS could incrementally predict future suicide attempts, follow-up suicide attempt data from the prospective portion of Sample 1 were used. Follow-up suicide attempts were available from 144 (82.3%) of participants and were determined based on the results of SASSI interviews, which were cross-referenced with hospitalization and electronic medical records. Twenty (13.8%) made one subsequent suicide attempt and 124 (86.1%) made no subsequent suicide attempts. Logistic regression was used for the analysis, with suicide attempt being the criterion variable and the following covariates selected as covariates: suicide attempt history (zero attempts, one attempt, or multiple attempts), PTSD symptoms, depression symptoms, hopelessness, perceived burdensomeness, thwarted belongingness, and current suicidal ideation. Results of regression analyses indicated that both Unloveability ($B = 0.069, SE = 0.034, p = 0.046, OR = 1.07 [1.00, 1.15]$) and Unbearability ($B = 0.085, SE = 0.043, p = 0.046, OR = 1.09 [1.01, 1.18]$) were independently associated with significantly increased frequency of suicide attempts during the 2-year follow-up period. As can be seen in Table 5 the Unloveability and Unbearability scales were better predictors of future suicide attempts than past suicide attempts and current suicidal ideation. Unfortunately, there was insufficient statistical power to consider both scales simultaneously in the regression model.

### 4. Discussion

4.1. Main findings

As highlighted in the National Research Action Plan (Department of Defense et al., 2013), the prevention of suicide in active duty military and veteran personnel is one of the nation’s highest public health priorities. The development and optimization of clinical suicide risk assessment tools is needed to help to achieve this goal and to guide decisions on intervention, referral, and follow-up. In the present study, we examined the psychometric properties of the SCS in two clinical samples of military personnel and demonstrated measurement invariance and internal consistency. We also evaluated convergent, discriminant, incremental, and predictive validity relative to other well-established and widely used measures of emotional distress and suicide risk. The SCS’s factor structure and internal consistency estimates were stable across two different military samples with different levels of risk, suggesting the SCS can be interpreted in a similar manner across different clinical samples of military personnel. In terms of convergent validity, the SCS’s scales were highly correlated with well-established measures of suicidal thoughts and behaviors, as well as other measures of hopelessness and perceived burdensomeness, two specific suicide-related beliefs and cognitions. Furthermore, in Sample 2, the SCS scales showed a strong association with shame, a conceptually related cognitive-affective state. In contrast, the SCS’s scales showed relatively smaller relationships with thwarted belongingness and only moderate relationships with anxiety and posttraumatic stress symptoms, supporting divergent validity.

In general, Unloveability tended to show relatively stronger relationships with perceived burdensomeness and thwarted belongingness, whereas Unbearability tended to show relatively stronger relationships with depression and anxiety. Conceptually, this may be due to the fact that Unloveability scale items assess perceptions of worthlessness and failure from a more social or interpersonal perspective (e.g., “The world would be better off without me”; “I’ve never been successful at anything”; “No one can help me solve my problems”), whereas Unbearability scale items assess the respondent’s intrapsychic experience of overwhelming emotional distress (e.g., “I can’t stand this pain anymore”; “I can’t tolerate being this upset any longer”). It is important to note that both scales measure the patient’s perceptions about one’s competency, efficacy, and capacity to effectively tolerate or manage distress, but do not necessarily serve as an objective indicator of the respondent’s life circumstances or problems. Indeed, feeling competent and in control of one’s life is associated with significantly less severe suicidal ideation among military personnel (Bryan et al., in press). Prior research also suggests that the intensity and duration of suicidal crises among military personnel who have made multiple suicide attempts are unrelated to accumulative life stress, suggesting that higher-risk patients have poor distress tolerance and are more easily overwhelmed by even relatively mild levels of life stress (Joiner and Rudd, 2000). Although additional research is needed to further examine these relationships, the present results suggest that social support and cognitive interventions focused on undermining faulty beliefs about interpersonal relationships may be implicated for those who score high on the Unloveability scale, whereas

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Unloveability</th>
<th>Unbearability</th>
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</thead>
<tbody>
<tr>
<td>AOR (95% CI)</td>
<td>AOR (95% CI)</td>
<td></td>
</tr>
<tr>
<td>Attempts</td>
<td>1.22 (0.74, 1.99)</td>
<td>1.29 (0.79, 2.11)</td>
</tr>
<tr>
<td>PCL-M</td>
<td>0.96 (0.91, 1.01)</td>
<td>0.95 (0.89, 1.01)</td>
</tr>
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<td>BDI-II</td>
<td>1.02 (0.98, 1.05)</td>
<td>1.02 (0.98, 1.06)</td>
</tr>
<tr>
<td>BHS</td>
<td>1.03 (0.93, 1.15)</td>
<td>1.04 (0.94, 1.14)</td>
</tr>
<tr>
<td>Burden</td>
<td>0.98 (0.92, 1.04)</td>
<td>0.99 (0.95, 1.04)</td>
</tr>
<tr>
<td>Belong*</td>
<td>0.93 (0.88, 0.99)</td>
<td>0.94 (0.89, 1.00)</td>
</tr>
<tr>
<td>BSSI-C</td>
<td>1.04 (0.97, 1.11)</td>
<td>1.05 (0.99, 1.10)</td>
</tr>
<tr>
<td>Unlove*</td>
<td>1.07 (1.00, 1.15)</td>
<td>1.09 (1.00, 1.18)</td>
</tr>
</tbody>
</table>

* $p < 0.05$; attempts suicide attempt group (i.e., zero, single, multiple); BDI-II, Beck Depression Inventory, second edition; BAI, Beck Anxiety Inventory; PCL-M, Posttraumatic Stress Disorder Checklist, Military Version; BHS, Beck Hopelessness Scale; INQ-Burden, Interpersonal Needs Questionnaire, perceived burdensomeness subscale; INQ-Belong, Interpersonal Needs Questionnaire, thwarted belongingness subscale; BSSI-C, Beck Scale for Suicide Ideation, current.
behavioral interventions that focus on distress tolerance and emotion regulation skills might be implicated for those who score high on the Unbearability scale (cf. Rudd, 2013).

In terms of incremental predictive validity, the current findings suggest that the SCS is a significant and robust predictor of concurrent suicidal ideation, history of suicidal behaviors, and future suicide attempts beyond the effects of other well-established predictors. In Sample 2, both SCS scales significantly differentiated between military personnel with a history of suicide attempts from those with no history, even when controlling for other risk factors, which supports incremental validity. In Sample 1, both scales also demonstrated the ability to predict future suicide attempts, suggesting that the scale may hold promise as a screening and assessment tool. Of note, the SCS scales predicted future suicide attempts better than current suicidal ideation and history of suicide attempts, both of which are among the most robust and reliable predictors of suicidal behavior (Joiner et al., 2005). This finding may be understood within the context of fluid vulnerability theory (Rudd, 2006), which posits that suicidal ideation is inherently dynamic over time and fluctuates concurrent with environmental stressors and psychiatric symptoms. Unloveability and Unbearability, by comparison, are believed to be relatively stable, internalized self-perceptions about one’s worth and capacity to tolerate emotional distress that confer vulnerability to suicidal ideation and behaviors over time. Suicidal ideation may therefore function as a more acute or short-term indicator of suicide risk, whereas higher levels of Unloveability and Unbearability may signal more enduring or chronic suicide risk. In other words, a service member is more likely to make a suicide attempt when he or she believes that he or she is a failure who deserves to die, is unworthy of love or respect, and is unable to tolerate emotional distress, regardless of the intensity of their current emotional distress or desire for death. Additional research is needed to examine how suicide-specific beliefs and cognitions fluctuate over time in relation with suicidal ideation and behaviors, especially in response to treatment.

The current analysis also found that, in terms of SCS scores, military personnel with a history of nonsuicidal self-injury did not differ from military personnel without a history of suicidal thoughts or behaviors, but their scores were significantly lower than those of military personnel with a history of suicide attempts. This suggests the SCS is specific to suicidal forms of self-injury, which provides further evidence of construct validity. Conceptually, this supports the notion that suicide attempts and nonsuicidal self-injury are different forms of self-injurious behaviors. From a clinical perspective, this finding further suggests that the SCS may be a useful tool for differentiating between nonsuicidal and suicidal forms of self-injury, which may hold promise for improving the clinical care of military personnel. We were unable to test the SCS’s ability to differentiated between future suicide attempts and nonsuicidal self-injury, however, which is a necessary next step to further evaluate the SCS’s utility as an assessment and treatment tool.

4.2. Limitations

A number of limitations warrant discussion. First, the studies from which data were used for this analysis were not specifically designed to examine the psychometric properties of the SCS. As a result, not all analyses could be replicated across both samples. However, the high degree of consistency in findings across two samples that differed in terms of clinical severity, branch of service with different risk profiles (Army vs. Air Force), gender distribution (87% vs. 63% male), ethnic background (29% vs. 9% Hispanic), rank distribution (73% vs. 21% junior enlisted; 0.6% vs. 22% officer), and deployment history (43% vs. 19% deployed) lends confidence to our conclusions that the SCS performs well across diverse clinical samples. The current study was also unable to test the SCS’s sensitivity to change over time, especially in response to clinical intervention. This will be an important consideration for future studies focused on the SCS, especially in light of theoretical assumptions regarding the presumed chronicity and persistence of its underlying constructs. Furthermore, although the current findings suggest the SCS can differentiate between military personnel with histories of suicidal versus nonsuicidal forms of self-injury, we were unable to determine if the SCS can prospectively differentiate between these two forms of intentional self-injury. Finally, the relatively small sample sizes and skewed gender distribution limited our ability to further explore gender differences. The current findings should therefore be replicated in additional military samples with larger proportions of women. Despite these limitations, the current studies provide new information that advances our understanding of suicidal thoughts and behaviors among military personnel, as well as promising data regarding a new approach for assessing and conceptualizing risk in this population.

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Conflict of interest

Craig Bryan, M. David Rudd, Alan Peterson, and Stacey Young-McCaughon report receiving grant funding from the Department of Defense. All other authors declare they have no conflicts of interest.

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