

Predictors of suicidal ideation among active duty military personnel with posttraumatic stress disorder



Carmen P. McLean^a, Yinyin Zang^{a,*}, Laurie Zandberg^a, Craig J. Bryan^{b,c}, Natalie Gay^a, Jeffrey S. Yarvis^d, Edna B. Foa^a, the STRONG STAR Consortium¹

^a Department of Psychiatry, University of Pennsylvania, Philadelphia, PA, United States

^b National Center for Veterans Studies, Salt Lake City, UT, United States

^c Department of Psychology, University of Utah, Salt Lake City, UT, United States

^d Headquarters, Carl R. Darnall Army Medical Center, Fort Hood, TX, United States

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ABSTRACT

Background: Given the alarming rate of military suicides, it is critical to identify the factors that increase risk of suicidal thoughts and behaviors among active duty military personnel.

Methods: This study examined a predictive model of suicidal ideation among 366 treatment-seeking active duty military personnel with posttraumatic stress disorder (PTSD) following deployments to or near Iraq or Afghanistan. Structural equation modeling was employed to examine the relative contribution of combat exposure, social support, PTSD severity, depressive symptoms, guilt, and trauma-related cognitions on suicidal ideation.

Results: The final structural equation model had a highly satisfactory fit [$\chi^2(2) = 2.023, p = .364$; RMSEA = .006; CFI = 1; GFI = .998]. PTSD severity had an indirect effect on suicidal ideation via trauma-related cognitions. Depression had a direct positive effect on suicidal ideation; it also had an indirect effect via trauma-related cognitions and interpersonal support. Among participants who had made a previous suicide attempt, only depression symptom severity was significantly linked to suicidal ideation.

Limitations: Data are cross-sectional, precluding causal interpretations. Findings may only generalize to treatment seeking active duty military personnel with PTSD reporting no more than moderate suicidal ideation.

Conclusions: These findings suggest that depression and trauma-related cognitions, particularly negative thoughts about the self, play an important role in suicidal ideation among active duty military personnel with PTSD. Negative cognitions about the self and interpersonal support may be important targets for intervention to decrease suicidal ideation.

1. Introduction

The rate of suicide in the United States Army has nearly doubled since the initiation of Operations Enduring Freedom (OEF), Iraqi

Freedom (OIF), and New Dawn (OND; Luxton et al., 2012), surpassing the civilian suicide rate for the first time in 2008 (Kuehn, 2010). It is estimated that one active duty US military service member dies by suicide approximately every 36 h (Kinn et al., 2011). Some evidence

Abbreviations: ABS, Aftermath of Battle Subscale; ADF, asymptotically distribution free; BDI-II, Beck Depression Inventory-II; BSS, Beck Scale for Suicide Ideation; CES, Combat Experiences Subscale; DRRI, Deployment Risk and Resilience Inventory; DSM-IV-TR, *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*; ISEL-12, Interpersonal Support Evaluation List – 12; OEF, Operation Enduring Freedom; OIF, Operation Iraqi Freedom; OND, Operation New Dawn; PSS-I, Posttraumatic Stress Scale – Interview; PTCI, Posttraumatic Cognitions Inventory; PTSD, posttraumatic stress disorder; SEM, structural equation modeling; SI, suicidal ideation; TRGI, Trauma Related Guilt Inventory; WRAIR, Walter Reed Army Institute of Research (WRAIR) Military Vertical & Horizontal Cohesion Scales

* Corresponding author.

E-mail address: yinyinz@mail.med.upenn.edu (Y. Zang).

¹ The STRONG STAR Consortium group authors include (listed alphabetically): **Brett T. Litz, Ph.D.**, Massachusetts Veterans Epidemiological Research Center, VA Boston Healthcare System, Department of Psychiatry, Boston University School of Medicine, and Department of Psychology, Boston University, Boston, Massachusetts; **Jim Mintz, Ph.D.**, Department of Psychiatry and Department of Epidemiology and Biostatistics, University of Texas Health Science Center at San Antonio, San Antonio, Texas; **Alan L. Peterson, Ph.D., A.B.P.P.**, Department of Psychiatry, University of Texas Health Science Center at San Antonio, Office of Research and Development, South Texas Veterans Health Care System, and Department of Psychology, University of Texas at San Antonio, San Antonio, Texas; **John D. Roache, Ph.D.**, Department of Psychiatry, University of Texas Health Science Center at San Antonio, San Antonio, Texas; **Elna Yadin, Ph.D.**, Department of Psychiatry, University of Pennsylvania, Philadelphia, Pennsylvania; and **Stacey Young-McCaughan, R.N., Ph.D.**, Department of Psychiatry, University of Texas Health Science Center at San Antonio, San Antonio, Texas.

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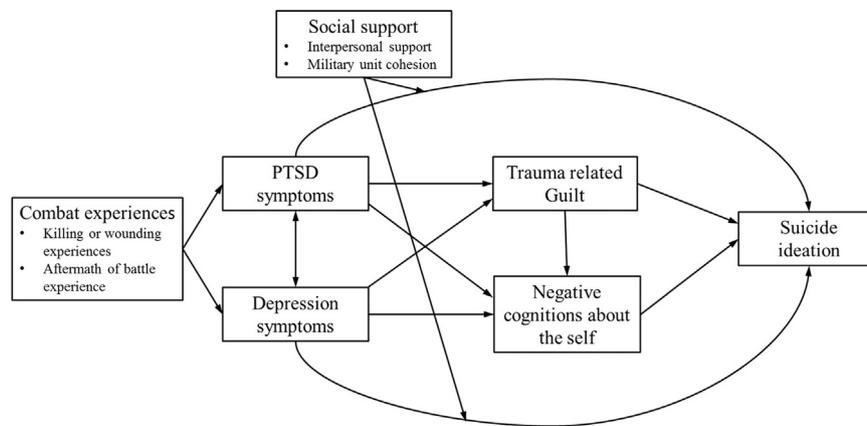


Fig. 1. Hypothesized SEM model. SEM, structural equation modeling; PTSD, posttraumatic stress disorder.

suggests that military suicide rates have stabilized or decreased in the last few years, but there is considerable variation from year to year and across military branches (Franklin, 2015). This suicide rate among military personnel has raised great public and professional concern and has prompted a call for research to identify risk factors for suicide in this population.

Posttraumatic stress disorder (PTSD) is associated with increased risk for suicidal thoughts and behaviors in the general population (Tarrier and Gregg, 2004) and in active duty military samples (Bryan and Corso, 2011; Nock et al., 2014) and Iraq and Afghanistan veterans (Guerra and Calhoun, 2011; Jakupcak et al., 2011). PTSD is also associated with more severe suicidal ideation (SI) in deployed military personnel (Bryan et al., 2013a, 2013b) and combat veterans (Butterfield et al., 2005; Rudd et al., 2011) and with attempted suicide (Nad et al., 2008) and death by suicide (Boscarino, 2006; Drescher et al., 2003) in combat veterans. Moreover, PTSD is highly prevalent among military personnel: studies show that 5–20% of US military personnel returning from deployments in support of OIF/OEF have symptoms of PTSD (Institute of Medicine, 2014). Depression, which is frequently comorbid with PTSD (Galatzer-Levy et al., 2013), is also associated with suicide risk in active duty military samples (Bryan et al., 2013c; Bush et al., 2011). Some studies (e.g., Lemaire and Graham, 2011) but not all (e.g., Guerra and Calhoun, 2011) indicate that suicide risk is higher among OEF/OIF veterans with both depression and PTSD than those with either disorder alone.

At present, research is needed that moves beyond *whether* PTSD is associated with suicidal thoughts and behaviors to examine *how* PTSD is associated with SI. One possibility is that PTSD increases SI through associated negative perceptions about the meaning of the trauma. This notion is consistent with evidence that even when controlling for severity of combat exposure, guilt is significantly associated with PTSD severity in veterans (Henning and Frueh, 1997). In active duty military personnel, guilt predicted greater SI above and beyond the effects of PTSD, depression, and their interaction (Bryan et al., 2013a, 2013b). Moreover, guilt has been found to fully mediate the relationships of PTSD and depression with SI in active duty and veteran samples (Bryan et al., 2015b, 2013a, 2013b). These studies suggest that PTSD and depression increase the severity of SI via cognitive-affective processes that are more proximally related to SI than PTSD or depression. Related to the construct of guilt are negative trauma-related cognitions, which include negative cognitions about the self (e.g., “I’m incompetent”), negative cognitions about the world (e.g., “the world is a dangerous place”; “no one can be trusted”), and self-blame (e.g., “the event [trauma] happened because of the sort of person I am”; Foa et al., 1999). Although research has consistently shown strong associations between negative trauma-related cognitions and PTSD severity, no published study has examined the relationship between PTSD, negative trauma-related cognitions, and SI (Mueser

et al., 2008; Zalta et al., 2014; Zoellner et al., 2011).

The stress of combat exposure has been hypothesized to increase suicide risk (e.g., Selby et al., 2010). While combat exposure has not been found to predict death by suicide in current and former military personnel (LeardMann et al., 2013) and OEF/OIF veterans (e.g., Reger et al., 2015), a recent meta-analysis found that certain types of combat exposure are associated with suicidal thoughts and behaviors in active duty military personnel and veterans (Bryan et al., 2015b). In particular, exposure to the grotesque aftermath of battle and death (e.g., seeing dead bodies or body parts, exposure to devastated communities and prisoners of war) and acts of killing were associated with suicidal thoughts and behaviors among military personnel, while other forms of combat exposure (e.g., firing a weapon at enemy combatants, disarming explosive devices) were not (Bryan et al., 2015b). Much less is known, however, about how these specific types of combat experiences relate to SI among military personnel with PTSD.

In contrast to risk factors such as guilt and exposure to killing and death, perceived social support has been associated with decreased suicidal ideation, suggesting it functions as a protective factor in OEF/OIF veterans (Jakupcak et al., 2010; Lemaire and Graham, 2011; Pietrzak et al., 2011). However, the protective effect of social support was found to be lower in those with PTSD than those without PTSD, highlighting the need to examine the relationship between social support and SI in treatment-seeking soldiers (Jakupcak et al., 2010). Because military personnel may derive social support from civilian family and friends as well as members of their unit, an examination of social support resources should include both military unit cohesion and general interpersonal social support.

The purpose of the current study was to examine the relative contribution of combat exposure, social support, PTSD, depression, trauma-related cognitions, and guilt on SI among active duty military personnel seeking treatment for PTSD. As depicted in Fig. 1, based on previous research, we hypothesized that: (1) combat exposure (specifically, exposure to the aftermath of battle and killing) would show both a direct relationship with SI and an indirect relationship with SI through PTSD and depressive symptoms; (2) PTSD and depressive symptoms would each show both a direct relationship with SI and an indirect effect on SI through guilt; and (3) the effect of PTSD and depressive symptoms on SI would be moderated by social support. In addition, we hypothesized that the effects of PTSD and depression on SI would be accounted for by negative trauma-related cognitions.

Finally, we sought to test this model among those with and without a history of suicide attempts. Several studies show that factors similar to guilt and negative trauma-related cognitions, such as self-blame and self-criticism, differentiate those with SI-only from those who have acted upon suicidal thoughts (Bryan et al., 2014). In fact, it has been proposed that these types of negative self-perceptions account for the

relationships between PTSD, depression, and increased risk for suicide attempts (Bryan et al., 2015a). If the hypothesized relationships differ across groups, this may help identify factors related to the progression from SI to suicide attempts.

2. Methods

2.1. Procedure

This study utilized baseline data collected as part of a larger randomized controlled trial evaluating the efficacy of Prolonged Exposure (PE) therapy for the treatment of PTSD in active duty military personnel (Principal Investigator: Edna B. Foa). Following informed consent, eligibility was determined during a baseline evaluation consisting of a clinical interview and self-report measures. The institutional review boards of Brooke Army Medical Center, the University of Texas Health Science Center at San Antonio, and the University of Pennsylvania approved the protocol.

2.2. Participants

Participants included 366 treatment-seeking post-9/11 active duty military personnel who had returned from deployments to Afghanistan, Iraq, or nearby locations and were diagnosed with PTSD according to the fourth edition, text revision of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR; American Psychiatric Association, 2000). Inclusion criteria were: (1) adult (ages 18–65) men and women active duty military personnel, activated Reservist, or activated National Guard seeking outpatient treatment for PTSD; (2) diagnosis of PTSD as determined by the Posttraumatic Stress Scale-Interview (PSS-I); (3) exposure to a DSM-IV-TR Criterion A traumatic event that was a combat-related event or high magnitude operational experience that occurred during a military deployment. Exclusion criteria were: (1) current bipolar disorder or psychotic disorder; (2) current alcohol dependence; (3) moderate or severe traumatic brain injury; (4) current suicidal ideation severe enough to warrant immediate attention; and (5) other disorders severe enough to warrant immediate treatment.

2.3. Measures

2.3.1. PTSD Symptom Scale – Interview Version (PSS-I; Foa et al., 1993)

The PSS-I is a 20-min, 17-item clinician-administered interview that evaluates DSM-IV PTSD symptoms in the past 2 weeks on frequency and severity. Items are rated on a 4-point scale (0=*not at all* to 3=*very much*). The PSS-I has excellent test-retest reliability (.80) and inter-rater reliability ($\kappa = .91$; Foa and Tolin, 2000). The PSS-I is comparable to the gold standard employed in studies of veterans (the Clinician Administered PTSD Scale) and is considered a common data element for PTSD research (Foa and Tolin, 2000; Kaloupek et al., 2010). The Cronbach's alpha for the PSS-I in the current sample was .67.

2.3.2. The Beck Depression Inventory (BDI-II; Beck et al., 1996a, 1996b)

The BDI-II is a 21-item self-report measure of depressive symptoms during the past 2 weeks. Items are rated on a 4-point scale (0= *no disturbance* to 3= *maximal disturbance*). The BDI-II has demonstrated 1-week test-retest reliability and concurrent validity (Beck et al., 1996a, 1996b). The Cronbach's alpha for the BDI-II in the current sample was .89.

2.3.3. The Beck Scale for Suicide Ideation (BSS; Beck and Steer, 1991)

The BSS is a 19-item self-report measure of the severity of SI during the past week, including the frequency and duration of ideation,

specificity of planning, and preparations for death. The BSS has demonstrated good concurrent validity (Beck et al., 1997). The Cronbach's alpha for the BSS in the current sample was .83. Item #20, which is rated on a 3-point scale (0= *I have never attempted suicide*, 1= *I have attempted suicide once*, 2= *I have attempted suicide two or more times*), was used to identify participants who had attempted suicide one or more times.

2.3.4. Interpersonal Support Evaluation List – 12 (ISEL-12; Cohen and Hoberman, 1983)

The ISEL-12 is a 12-item self-report measure of perceived current social support that consists of three subscales: appraisal support (perceived availability to speak with someone about personal problems), belonging support (perception that one can identify and socialize with a group), and tangible support (perceived availability of material aids; Brookings and Bolton, 1988). Items are rated on a 4-point scale (1= *definitely false* to 4= *definitely true*). The measure has demonstrated strong psychometric properties (Cohen et al., 1985). The Cronbach's alpha for the ISEL in the current sample was .87.

2.3.5. The Walter Reed Army Institute of Research (WRAIR) Military Vertical & Horizontal Cohesion Scales; Podsakoff and MacKenzie, 1994)

The WRAIR is the gold standard method of evaluating perceived current support from peers (horizontal) and leaders (vertical) in the military. Horizontal cohesion was measured using a revised three-item cohesion scale assessing the degree to which unit members are cooperative, can depend on one another, and stand up for one another (Podsakoff and MacKenzie, 1994). The Cronbach's alpha for the WRAIR in the current sample was .94.

2.3.6. The Posttraumatic Cognitions Inventory (PTCI; Foa et al., 1999)

The PTCI is a 36-item self-report questionnaire of negative trauma-related thoughts and beliefs during the past 2 weeks. The measure consists of three subscales: negative cognitions about the self, negative cognitions about the world, and self-blame. The PTCI has demonstrated good test-retest reliability, discriminant validity, and convergent validity (Beck et al., 2004; Foa et al., 1999). The Cronbach's alpha for the PTCI in the current sample was .95.

2.3.7. The Trauma Related Guilt Inventory (TRGI) – Brief; Kubany et al., 1996)

The TRGI-Brief is a 16-item version of the TRGI, a self-report measure of current feelings of guilt related to a specific traumatic event. The TRGI-Brief is comprised of three subscales: Hindsight-Bias/Responsibility, Wrongdoing, and Lack of Justification. The TRGI has demonstrated good temporal stability and convergent validity (Kubany et al., 1996). The Cronbach's alphas for the three subscales of the TRGI-Brief in the current sample were .89, .71, and .84, respectively.

2.3.8. The Deployment Risk and Resilience Inventory (DRRI) Combat Experiences Subscale (CES) and Aftermath of Battle Subscale (ABS; King et al., 2006)

The CES and ABS are two of 14 sub-measures comprising the DRRI. The CES measures exposure to common warfare experiences during deployment. Two of the 15 items comprising the CES were used in the current study: “*I killed or think I killed the enemy in combat*” and “*I wounded or think I wounded someone during combat operations.*” The Cronbach's alpha of these two items in the current sample was .95. The ABS is a 15-item self-report measure of exposure to the consequences of combat, including observing or handling human remains and observing devastated communities and homeless refugees. The ABS has demonstrated convergent and discriminant validity (Vogt et al., 2008). The Cronbach's alpha for the DRRI ABS in the current sample was .91.

2.4. Data analyses

The hypothesized model (see Fig. 1) was tested via structural equation modeling (SEM). SEM allows for the simultaneous calculation of regression equations and generates fit statistics to determine the adequacy of the model (Ullman and Bentler, 2003). Because most participants had a score of 0 on the BSS, the SEM with asymptotically distribution-free (ADF) estimation, which does not require multivariate normality, was selected as most appropriate (Browne, 1984). Indirect and direct effects of the variables on SI were calculated to understand relationships among variables. Bootstrapping was employed to estimate bias-corrected standard errors and confirm indirect effects. Using AMOS 23 software, models were constructed and compared using the following indices of fit: nonsignificant χ^2 value, root mean square error of approximation (RMSEA) < .08, comparative fit index (CFI) > .90, and goodness-of-fit index (GFI) > .90 (Hair et al., 2006; Hu and Bentler, 1999). Standardized regression coefficients are reported.

As an exploratory aim, the final SEM model was evaluated among participants who did ($n = 40$) and did not ($n = 326$) report at least one past suicide attempt. Given the small number of participants reporting a past attempt, the results of this exploratory analysis should be interpreted with caution because small sample sizes may increase the risk of type II error, nonconvergence, and improper solutions.

3. Results

3.1. Structural Equation Modeling

Participant characteristics are reported in Table 1. The means and standard deviations of all study variables and the Pearson's correlations among all variables included in the hypothesized model are reported in Table 2.

SEM failed to identify the full, initial model because there were several hypothesized paths among uncorrelated variables. Combat experiences were not significantly associated with either PTSD or depression and were excluded from the model. Subsequent models were constructed and trimmed by comparing standardized beta coefficients and fit indices. Contrary to hypothesis, interpersonal support did not moderate the relationship between either PTSD and SI or depression and SI. Guilt was tested and excluded from the model because no path through it resulted in a significant effect. The final, simplified model (see Fig. 2) demonstrated very good fit: $\chi^2(2) = 2.023$, $p = .364$; RMSEA = .006; CFI = 1; GFI = .998. All paths and covariates in the final model were significant. PTSD severity covaried with depression severity ($\beta = .436$, SE = .043). PTSD symptoms were associated with greater negative cognitions about the self ($\beta = .229$, SE = .045). Depression was associated with lower interpersonal support ($\beta = -.147$, SE = .061), greater negative cognitions about the self ($\beta = .512$, SE = .041), and greater SI ($\beta = .212$, SE = .063). Negative cognitions about the self were associated with lower interpersonal support ($\beta = -.361$, SE = .054) and greater SI ($\beta = .142$, SE = .065). Interpersonal support was associated with lower SI ($\beta = -.107$, SE = .057).

Standardized regression coefficients for the final model are summarized in Table 3, and standardized direct and indirect effects are reported in Table 4. There were no significant pathways from PTSD to SI or from PTSD to interpersonal support. PTSD demonstrated an indirect effect on SI through negative cognitions about the self ($\beta = .041$, SE = .015). Depression demonstrated both a direct ($\beta = .212$, SE = .063) and indirect effect ($\beta = .108$, SE = .034) on SI through negative cognitions about the self and interpersonal support, and it had the greatest accumulated total effect on SI ($\beta = .320$, SE = .048). Negative cognitions about the self had the second greatest total effect on SI ($\beta = .181$, SE = .060). Interpersonal support had only a direct effect on SI ($\beta = -.107$, SE = .057).

Table 1
Participant characteristics ($N = 366$).

Characteristic	#/Mean	%/(SD)
Gender		
Men	322	88.0
Women	44	12.0
Age	$M = 32.73$	(7.34)
Marital status		
Not married	104	28.4
Married or cohabiting	262	71.6
Education		
High school	117	32.0
College	241	65.8
Postgraduate	8	2.2
Ethnicity		
Hispanic	71	19.4
Non-Hispanic	295	80.6
Race		
Black	86	23.5
White	224	61.2
Asian	3	.8
Other	53	14.5
Military service Army	363	99.2
Air Force	3	.8
Military grade		
Enlisted		
E-1 to E-3	2	.5
E-4 to E-6	285	77.9
E-7 to E-9	62	16.9
Officer	9	2.5
Warrant officer	5	1.4
Time in military, years	$M = 11.12$	(6.35)
Number of deployments	$M = 2.26$	(1.04)

E-1 to E-3, junior enlisted; E-4 to E-6, junior noncommissioned officers; E-7 to E-9, senior noncommissioned officers.

3.2. Exploratory analyses

Neither convergence problems nor improper solutions were found in the exploratory model. Among participants with a past attempt ($n = 40$), the paths from depression to interpersonal support, from interpersonal support to SI, and from negative cognitions about the self to SI were nonsignificant. After eliminating these paths, the model demonstrated good fit: $\chi^2(5) = 4.411$, $p = .492$; RMSEA < .001; CFI = 1; GFI = .956. Only depression demonstrated a direct effect on SI ($\beta = .390$, SE = .134). Independent t -tests showed that depression severity was higher among those with a past attempt ($M = 31.40$, SD = 9.64) than those with no past attempt [$M = 28.04$, SD = 9.91, $t(364) = -2.03$, $p = .04$]. Among those without a past attempt ($n = 326$), the model was the same as the final model and demonstrated good fit: $\chi^2(2) = 4.337$, $p = .114$; RMSEA = .06; CFI = .983; GFI = .994.

4. Discussion

This study aimed to elucidate factors associated with SI severity among treatment-seeking active duty military personnel with PTSD. Contrary to hypothesis, PTSD severity was not directly associated with SI. Direct associations between PTSD and SI have been found in some prior studies (e.g., Bush et al., 2011; Maguen et al., 2012; Ramsawh et al., 2014) but not in those that included cognitive and affective variables as potential mediators of the PTSD-SI relationship (e.g., Bryan and Corso, 2011; Bryan et al., 2013a, 2013b). PTSD was, however, indirectly associated with increased SI via trauma-related negative cognitions. In particular, negative thoughts about the self fully

Table 2
Correlations between all study variables (N=366).

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. BSS	–													
2. PSS-I	.147**	–												
3. BDI-II	.337**	.436**	–											
4. PTCL_NS	.320**	.453**	.616**	–										
5. PTCL_NW	.143**	.274**	.365**	.584**	–									
6. PTCL_SB	.185**	.236**	.294**	.513**	.294**	–								
7. ISEL	-.228**	-.273**	-.360**	-.448**	-.282**	-.215**	–							
8. WRAIR	-.135**	-.170**	-.211**	-.263**	-.221**	-.161**	.207**	–						
9. TRGI_R	.118**	.189**	.226**	.329**	.235**	.626**	-.143**	-.075	–					
10. TRGI_W	.164**	.220**	.235**	.412**	.289**	.386**	-.170**	-.152**	.440**	–				
11. TRGI_J	.061	.052	.103	.134	-.031	.285**	-.213**	-.061	.222**	.131*	–			
12. DRRI_C	.084	.036	-.067	-.064	.047	.009	.123*	-.072	.109*	.023	-.114*	–		
13. DRRI_A	.103*	.081	.105*	.039	.149*	-.047	.019	-.044	.088	.066	-.099	.540**	–	
14. BSS-Attempt	.119*	.046	.081	.094	.049	.059	-.098	-.011	.066	.100	.019	-.010	-.020	–
M	.99	25.47	28.40	3.26	4.98	2.37	34.22	44.19	1.13	1.09	1.90	3.83	34.45	.14
SD	2.72	6.39	9.92	1.19	1.23	1.27	7.80	13.20	1.12	.92	1.28	2.04	11.40	.44

BSS, Beck Scale for Suicide Ideation; PSS-I, PTSD Symptom Scale – Interview Version; BDI, Beck Depression Inventory; PTCL_NS, Posttraumatic Cognitions Inventory-negative cognitions about the self; PTCL_NW, Posttraumatic Cognitions Inventory-negative cognitions about the world; PTCL_SB, Posttraumatic Cognitions Inventory-self-blame; ISEL, Interpersonal Support Evaluation List; WRAIR, Walter Reed Army Institute of Research (WRAIR) Military Vertical & Horizontal Cohesion Scales; TRGI_R, Trauma Related Guilt Inventory-Hindsight-Bias/Responsibility; TRGI_W, Trauma Related Guilt Inventory-wrongdoing; TRGI_J, Trauma Related Guilt Inventory-Lack of Justification; DRRI_C, Deployment Risk and Resilience Inventory - killing or wounding combat experiences; DRRI_A, Deployment Risk and Resilience Inventory-Aftermath of Battle; BSS-Attempt, Beck Scale for Suicide Ideation-item 20 previous suicidal attempt.

* P < .05
** P < .01;

accounted for the association between PTSD and SI. This suggests that the link between PTSD and SI among military personnel with PTSD is mediated by negative self-perceptions related to the trauma.

Consistent with Bryan et al. (2013a, 2013b), we found that negative trauma-related cognitions about oneself were associated with SI. In contrast, trauma-related guilt was not associated with SI in the current sample. Although these variables are conceptually similar, negative trauma-related cognitions about the self reflect more global self-perceptions (e.g., “I’m incompetent”; “I have permanently changed for the worse”) than trauma-related guilt, which is more specific and similar to self-blame (e.g., “I should have known better”; “I did something that went against my values”). Thus, our finding suggests that global negative trauma-related self-perceptions are more closely associated with SI than trauma-related guilt. Future research on SI in military personnel should consider guilt stemming from sources other than trauma (see Kopacz et al., 2015).

This is the first study of PTSD and SI to examine negative trauma-related cognitions. Prior studies document that negative trauma-related cognitions are closely associated with PTSD severity (Zoellner et al., 2011) and mediate PTSD reduction during treatment (McLean et al., 2015; Zalta et al., 2014), suggesting that they are an important mechanism of therapeutic recovery. The current findings expand our understanding of negative trauma-related cognitions by identifying their importance in understanding SI among military personnel with PTSD. Additional research to determine the directionality of the relationship between negative trauma-related cognitions and SI is clearly warranted. If negative cognitions are found to predict SI, monitoring and targeting these cognitions during treatment may help alert providers to suicide risk in military personnel with PTSD.

Consistent with our hypothesis and replicating previous research,

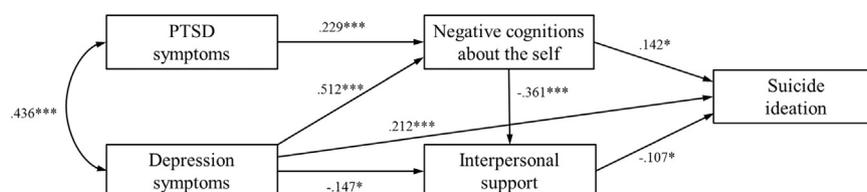


Fig. 2. Final model for the whole sample (N = 366), with standardized beta weights and significant level. Fit statistics: $\chi^2(2) = 2.023, P = .364$; RMSEA = .006; CFI = 1; GFI = .998. PTSD, posttraumatic stress disorder. ***P < .001; *P < .05.

Table 3
Standardized regression coefficients and standard errors for all pathways of the final SEM model (N = 366).

Path		Final model				
Variable 1	Variable 2	B	SE ^a	β	SE ^b	P
PTSD	Negative cognitions about the self	.043	.008	.229	.045	***
Depression	Negative cognitions about the self	.061	.005	.512	.041	***
Negative cognitions about the self	Interpersonal support	-2.375	.372	-.361	.054	***
Depression	Interpersonal support	.116	.049	-.147	.061	.030
Negative cognitions about the self	Suicidal ideation	.323	.149	.142	.065	.016
Depression	Suicidal ideation	.057	.018	.212	.063	***
Interpersonal support	Suicidal ideation	-.037	.020	-.107	.057	.026
Covariate PTSD	Depression	27.356	3.520	.436	.043	***

SEM, structural equation modeling; PTSD, posttraumatic stress disorder.

^a Standard error of unstandardized coefficient (B).

^b Standard error of standardized coefficient (β).

*** P < .001.

depression demonstrated a direct positive effect on SI. It also demonstrated an indirect effect via trauma-related cognitions and interpersonal support. Interpersonal support is frequently conceptualized as a

Table 4
Standardized direct, indirect, and total effects of all study variables on suicidal ideation.

Variable	Direct effect			Indirect effect			Total effect		
	β	SE	<i>P</i>	β	SE	<i>P</i>	β	SE	<i>P</i>
PTSD	.000	0	/	.041	.015	.004	.041	.015	.004
Depression	.212	.063	.005	.108	.034	.002	.320	.048	.005
Negative cognitions about the self	.142	.065	.046	.039	.021	.018	.181	.060	.005
Interpersonal support	-.107	.057	.016	.000	0	/	-.107	.057	.016

PTSD, posttraumatic stress disorder.

protective buffer against SI, and it has been found to moderate the relationship between PTSD and SI. For example, one study of military personnel found that PTSD and depression had almost no relationship to SI when postdeployment social support was high (DeBeer et al., 2014). The present study did not find that social support moderated the effects of PTSD or depression on SI, but it did find that low social support significantly contributed to the association between depression and SI.

Interestingly, we found that interpersonal social support, but not unit cohesion, was associated with SI. A sense of belonging and perceived support engendered through connections with others generally, rather than military peers and leaders specifically, may serve a protective function thwarting negative thought processes that engender SI among service members. This suggests that enhancing social support in general among service members seeking treatment for PTSD, focusing on connections with friends and family outside of the military unit, may be especially critical to mitigating SI among PTSD patients with higher levels of depression.

Among participants with at least one previous suicide attempt, depression emerged as the sole factor associated with SI. This finding, which should be considered preliminary due to the restricted sample size, suggests that depression and SI are more closely linked among those with a past attempt than those who have never attempted, and it shows that depression may represent a critical variable in understanding the progression from SI to suicide attempt. This finding aligns with results from a recent clinical trial showing that depression, but not PTSD, drove reductions in SI during treatment for PTSD among active duty military personnel (Bryan et al., 2015c).

Contrary to hypothesis, exposure to killing and aftermath of battle experiences were not related to SI, either directly or indirectly. This is inconsistent with results of a meta-analysis showing that these types of combat experiences had a small but significant effect on suicide-related outcomes (Bryan et al., 2015b); however, the meta-analysis included military personnel with and without PTSD. Thus, it may be that these types of experiences relate to SI in general military samples, but not among individuals with PTSD specifically, for whom overall levels of both combat exposure and PTSD are more consistently elevated, resulting in a restricted range within which correlations may not occur.

4.1. Limitations

The sample was comprised of treatment-seeking military personnel with PTSD, therefore findings may only be generalized to similar samples (e.g., military PTSD patients presenting for care) and may not generalize to military personnel returning from deployment without PTSD. It should also be noted that only patients with mild to moderate levels of suicidal ideation were included in the study and therefore the results may not generalize to those with severe suicidal ideation, or to patients with bipolar disorder, psychosis or alcohol use disorders, who were also excluded from this study. Other limitations of the study include the reliance on self-report data to assess suicidal ideation,

which can be influenced by demand characteristics and thus be susceptible to bias. In addition, the cross-sectional design precludes causal interpretations regarding mediation and the factors that lead to the development or increase of SI over time. Longitudinal studies with repeated assessments of military personnel are needed to elucidate how and for whom PTSD predicts SI.

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