A 3-Year Longitudinal Study Examining the Effect of Resilience on Suicidality in Veterans

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Abstract

Background—This study evaluated the correlation and role of resilience and resilience factors in predicting suicidal ideation and attempts in veterans.

Methods—In this 3-year longitudinal study, one hundred and seventy-six Iraq and Afghanistan War veterans were evaluated for a number of clinical and demographic variables. Longitudinal follow-up was performed approximately 3 years.

Results—Resilience at the initial assessment predicted lower suicidality at follow-up, controlling for suicidality at the initial assessment, suggesting a protective effect for resilience. With respect to specific domains of resilience, secure relationships and positive acceptance of change significantly predicted lower suicidality.

Conclusions—These findings have important implications for clinical care and for guiding future research efforts to increase resilience among returning soldiers.

INTRODUCTION

Studies indicate high rates of mental health problems (1–6) and suicidality (7) among returning soldiers. As military troops return from Iraq and Afghanistan, addressing post-deployment adjustment problems, including suicidality, are important priorities (1, 2, 8).

Suicide risk factors in veteran populations have been extensively studied. Studies have indicated that psychiatric disorders, particularly depression and substance use disorders, are strong risk factors for suicide in most cases (9). Other important risk factors include posttraumatic stress disorder (PTSD) (10, 11), previous suicide attempts, and demographic

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factors such as age, gender, and ethnicity (9). Additionally, combat trauma (12) and childhood abuse (13) have been found to be risk factors of suicide. Some of these factors are modifiable to some extent such as reducing or controlling symptoms of psychiatric disorders, while others, such as age, gender, and history of suicide attempts, are not.

Despite extensive literature on understanding and treating risk factors of suicide, little empirical progress has been made towards suicide prevention among military service members, has among whom there has been an alarming increase in suicide (14). In one study, the risk of death from diseases in general did not differ between the veterans and the non-veterans, However, veterans were twice as likely (adjusted hazard ratio 2.13; 95% CI 1.14 to 3.99) to die of suicide compared with non-veterans in the general population (7).

Clinical and research data from other disciplines have indicated that reducing risk factors should be paired with boosting protective factors. For instance, if elimination of risk factors for myocardial infarctions (e.g. smoking cessation) is augmented by protective factors, (e.g. physical exercise) marked reduction in rates of myocardial infarctions could be achieved. The same approach could potentially be helpful in reducing suicide rates.

However, limited data is available on protective factors against suicide, especially among veterans. One possible protective factor is resilience. Resilience is a construct that has received more attention in recent years. It is defined by Conner and Davidson as "qualities that enable one to thrive in the face of adversity" (15). It has also been measured and defined by the well validated Connor-Davidson Resilience Scale (CD-RISC) (15, 16); and has been suggested to be multidimensional (17–20). Resilience can improve in patients with PTSD, with significant reduction in CD-RISC scores after pharmacotherapeutic and psychotherapeutic interventions (21, 22).

Studies that have examined the relationship between resilience and suicidality assessed this relationship cross-sectionally. These studies suggested that resilience might be a protective factor against suicide risk (23–27).

However, assessment of resilience longitudinally is needed to understand this relationship across time. Moreover, there is no study that has examined which factor(s) (of five factors of resilience described by the Connor and Davidson factorial analysis (15)) are correlated with suicide.

Understanding the relationship between resilience and suicide in returning veterans is helpful for a many reasons: First, it could help in identifying individuals who are at the highest risk for suicide, therefore providing further training or excluding them from situations associated with high trauma exposure. Second, interventions that have the most resilience-enhancing effect could be further examined if they would lower the suicide rate. Finally, examining which factor(s) are correlated with resilience might help in psychotherapeutic and psychosocial treatment development to boost resilience, and has implications for treatment policy.

This study extends our previous work (25, 27). Our *apriori* hypothesis is that across time higher resilience would predict lower suicidality. Secondly, we also explored how the five individual factors of resilience (15) predicted protection against suicidality across time.

METHODS

Participants and Procedures

In this longitudinal study, 176 Operation Enduring Freedom, Operation Iraqi Freedom, Operation New Dawn (OEF/OIF/OND) veterans were interviewed at the VISN 6 Mental

Illness, Research, Education, and Clinical Center (MIRECC). The MIRECC houses a research registry of veterans who served in the U.S. Armed Forces after September 11, 2001 and volunteered to be considered for research. All veterans were separated from active duty or were in the National Guard/reserves.

Independent variables on veteran risk factors were gathered at the baseline interviews, which occurred between 2005–2008. This was designated at time 1 (T1). Veterans in the MIRECC registry were recruited through mailings, advertisements, and clinician referrals. Veterans completed informed consent procedures that were approved by VA IRBs at multiple sites in North Carolina and Virginia and afterwards were administered questions concerning post-deployment adjustment. Veterans were compensated for their time and travel expenses.

Dependent variables on veterans' suicidality were gathered from follow-up interviews, designated as time 2 (T2). An average of 3 years after the baseline interview, veterans in the MIRECC registry were contacted and asked to participate in an NIMH study, which served as the follow-up interview for the current study. Since this study is part of a registry database with a 3-year follow-up, the raters did not know the outcome measures or the purpose of this analysis while evaluating subjects. Veterans were compensated for their time and travel expenses after the interviews.

Measures

Beck Scale for Suicide Ideation (BSI)—Suicidality was assessed using the 21-item, self-report Beck Scale for Suicide Ideation (BSI) (28). Severity of suicidal thoughts, intents, and plans are assessed in items 1–19. The number of previous suicide attempts and the seriousness of the attempt to die associated with last attempt are assessed in items 20 and 21. Item responses are rated on a 3-point scale ranging from 0 to 2 and then summed to arrive at a total score. The BSI has demonstrated strong internal reliability (reported α coefficient between 0.90 and 0.97 (29, 30)). BSI has reasonable convergent, discriminative, and predictive validity (29, 31–33). A cutoff score of 3 was used to create a dichotomous index of suicidality, using survival analyses, by Brown and colleagues (32). They determined that a cut-off score of 3 on the BSI yielded the highest hazard ratio in prediction of risk for suicide. Given this data as well as the fact that BSI deviated markedly from normality in our sample, we employed this cut-off score in our current study to create a dichotomous index (2 OR 3) of "suicidality."

Connor-Davidson Resilience Scale (CD-RISC)—The Connor-Davidson Resilience Scale (CD-RISC) is a reliable (Cronbach's alpha = 0.96 in the current sample) and valid (15) instrument for measuring resilience. The scale was administered and validated in several different populations including a community sample, primary care outpatients, general psychiatric outpatients, participants with generalized anxiety disorder, and participants with PTSD.

Items on the CD-RISC assess resilience and include items such as "can deal with whatever comes," "past success gives confidence for new challenge," "see the humorous side of things," "coping with stress strengthens," "tend to bounce back after illness or hardship," "things happen for a reason," "best effort no matter what," "not easily discouraged by failure," "think of self as strong person," "strong sense of purpose," and "in control of your life."

The scale demonstrated sound psychometric properties (15). The CD-RISC has demonstrated sensitivity to the effects of treatment with several therapies (including sertraline, paroxetine, venlafaxine and CBT) in PTSD patients over time (21, 22). This scale

consists of 25 items. Each item is rated on a 5-point Likert scale with a possible score from 0 to 100. Higher scores reflect greater resilience. This was used to measure global resilience.

Factor analysis performed by Connor and Davidson yielded five factors. These factors were interpreted in the following manner: factor 1 reflects personal competence, high standards, and tenacity; factor 2 relates to trust in one's instincts, tolerance of negative affect, and strengthening effects of stress; factor 3 corresponds to the positive acceptance of change and secure relationships; factor 4 relates to control; and factor 5 to the effect of spirituality. The five factors eigenvalues were 7.47, 1.56, 1.38, 1.13, and 1.07 respectively (15). In this study, we examined how the five factors of resilience at time 1 predicted suicidality at time 2.

Davidson Trauma Scale (DTS)—PTSD severity was assessed using the DTS (34, 35). The DTS is a brief global assessment scale for PTSD symptoms. It includes 17 items corresponding to the DSM-IV symptoms of PTSD. The 17 items are rated by both frequency and severity. Reliability and validity of the DTS has been demonstrated in veterans who have served since September 11, 2001 (35).

Alcohol Use Disorders Identification Test (AUDIT)—AUDIT is a 10-item self-report screening questionnaire used to identify individuals with problematic patterns of alcohol consumption (36). The AUDIT is divided into 3 domains: hazardous alcohol use (questions 1–3), dependence symptoms (questions 4–6), and harmful alcohol use (questions 7–10). Each response has a score ranging from 0 to 4. A total score of 8 or more in men (or 7 or more in women) indicates a strong likelihood of hazardous and harmful alcohol use, as well as possible alcohol dependence. The AUDIT has been validated for DSM IV alcohol use disorders.

Analysis Procedures

All statistical analyses were performed using SAS Version 9.2 for Windows (SAS Institute, Cary, NC). Univariate analyses were used to describe the sample. Spearman correlation analyses were conducted to ascertain bivariate relationships between T2 suicidality and T1 variables. Analyses by multiple logistic regression were subsequently subjected to step-wise deletion to obtain a reduced model; exclusion criteria were set at a conservative level of $p<.05$. Specifically, T2 suicidality was regressed on T1 suicidality, T1 resilience, and other clinical and demographic covariates. A parallel analysis was conducted that included multiple domains of resilience derived by previous factor analyses (15).

RESULTS

Demographic and clinical characteristics are shown in Table 1. Participants (N=176) had a mean age of 39 years ($SD = 10.6$) and were primarily White (63%). The study sample was largely men (82%), and the majority completed post high school education (57%).

Resilience Factors Protective Against Suicidality

Table 2 displays Spearman correlation coefficients between suicidality and resilience factors. There was a significant negative correlation between suicidality and secure relationships ($r_s= -0.34$; $p <0.0001$) and control ($r_s = -0.29$; $p = 0.0004$). A trend was found between suicidality and tolerance ($r_s= -0.16$; $p = 0.049$). There was no significant correlation between suicidality and tenacity, or suicidality and spirituality.

We also examined the resilience factors (15) most predictive of suicidality across time using multivariate regression. The factor corresponding to secure relationships and positive acceptance of change ($r^2=0.04$; $F =8.19$, $p=0.005$) was most predictive both in the bivariate

analysis (Table 2) and in the multivariate regression (Table 4). Although control (factor 4 of resilience) was correlated with suicidality in the bivariate correlation, it was not correlated when examined in the multivariate model.

Resilience Is Protective Against Suicidality in Multivariate Model

The results of the multivariate forward stepwise regression are summarized in Table 3. Resilience at baseline (T1) was found to be predictive of suicidality at follow-up (T2) (r^2=0.17, F=3.95, p= 0.0485), controlling for several demographic and clinical variables (Table 3) including suicidality at baseline (r^2=0.X, F=X, p<.0001) (15). Low resilience was a stronger predictor of suicidality than alcohol misuse (on the AUDIT) and PTSD. (AUDIT = Alcohol Use Disorders Identification Test; the AUDIT has been validated for DSM IV alcohol use disorders).

DISCUSSION

In this study, suicidality and resilience have been shown to be inversely related across time. Longitudinal follow-up was performed at approximately 3 years. This suggests a protective effect of resiliency on suicidality. Of the five factors of resiliency, the factor corresponding to secure relationships and positive acceptance of change was most significantly predictive of lower suicidality.

To our knowledge, this is the first study to examine the relationship between suicidality and resilience longitudinally. Our result of an inverse relationship between global resilience and suicidality is in agreement with and extends the results of the few cross-sectional studies that examined this relationship (23–27). One of these cross-sectional studies is a study by Roy and colleagues that examined the relationship between suicidality and resilience. The sample included 20 veterans who were abstinent from substance abuse and had attempted suicide, and another sample of 166 prisoners who had attempted suicide (23). Both samples were matched to a control group. In these samples, those who had never attempted suicide had significantly higher CD-RISC resilience scores compared to those who had attempted suicide. The authors reported that the study "suggest that resilience may be a protective factor mitigating the risk of suicidal behavior associated with childhood trauma" (23).

Another study included 272 Iraq and Afghanistan veterans who were assessed cross-sectionally by a survey that contained measures of resilience. Of those, 34 participants (12.5%) reported that they were contemplating suicide in the two weeks prior to the survey. Suicide contemplators had lower scores of resilience on CD-RISC. The investigators also found that suicide risk associated with childhood trauma was associated with lower resilience. Of relevance to our study, the investigators also found that "sense of purpose and control were negatively associated with suicidal ideation" (24).

Moreover, a valuable study by Green and colleagues showed resilience to be inversely related to PTSD in veterans and to functional response to PTSD (25). In another study by our group, resilience has also been shown to mitigate the effect of depression and suicidal ideations in Iraq and Afghanistan war veterans cross-sectionally (27).

Although a study by Nrugham and colleagues (26) examined this relationship in a longitudinal study, they measured resilience cross-sectionally. Nrugham and colleagues (26) examined a subset sample of 252 participants from eighth and ninth grade. The participants were followed up at 1 year and reassessed 5 years later. Resilience was assessed using the CD-RISC only at the last visit of the study (T3). The investigators found high resilience to be negatively associated with suicide attempt even if the adolescents were victims of violent life events and had been depressed at age 15.

It should also be noted that secure relationships were significantly correlated to lower suicidality both in the bivariate and multivariate model. However, in the multivariate model, secure relationships contributed to a small portion of the variance of about 13%. It is not clear why that is so, and needs to be further validated in future studies. Possible explanations could be moderation due to other variables. Potential interacting and moderating effects that are worth examining in future studies are gender, age, and clinical variables such as PTSD diagnosis {Carter, 2011 #144; Meis, 2010 #145}.

It has been recommended by several investigators that longitudinal studies are needed to increase the robustness of the relationship between resilience and suicidality, and examine the relationship across time (37). The current study fills this gap and confirms the previous finding suggesting the protective effect of resilience across time. It is the first study to examine the relationship between suicidality and global resilience longitudinally, and the first to examine the factors of resilience individually across time. Interestingly, our longitudinal study results suggest that low resilience was a stronger predictor of suicidality than alcohol misuse (on the AUDIT: validated for DSM IV alcohol use disorders) and PTSD.

Increasing the confidence that this relationship between resilience and suicidality still holds across time paves the way to the development of further programs and interventions to address and boost resilience as an important target for reducing suicidality above and beyond reducing risk factors for suicidality.

These interventions would best address psychosocial aspects that can bolster resilience, improve acceptance to change, and improve relationships. In addition, initial clinical trials of psychopharmacological agents have provided early evidence that resilience can be enhanced pharmacologically(21, 22). In addition, an exploratory study has found that pretreatment resilience to be a predictor of positive treatment response to the antidepressant venlafaxine (38). Thus, further examination of this line of research might lead to important interventional modalities for both preventative and treatment purposes above and beyond symptom control.

However, these results should be interpreted with caution in light of the study limitations. For instance, the possibility of other confounding effects could not be eliminated due to the observational design of the study. Potential confounders such as diagnosis of schizophrenia or bipolar disorder are also limitations of this observational study. However, these disorders generally have a low base rate in military veterans due to being screened out on military admission evaluations. Another limitation of the present study is that it included sample of convenience of those who completed the interviews and the rating scales. Baseline assessment consisted of self-selected veterans. As a result, participants were never initially approached at baseline. With respect to the follow-up, about one quarter of initial patients had bad contact information and could not be followed. Another limitation is that, suicidality (suicidal ideation and attempts) not completed suicide, was examined in this study. Assessment of suicidality is, however, the standard of clinical care and a proxy for assessing the risk of suicide (9). Also, a potential limitation is confounding due to psychotropic medications given the FDA warning of suicidality (for antidepressant and anticonvulsants) and may be seen as a limitation. However, the contribution of antidepressants and anticonvulsants to suicidality (beyond the suicidality due to the primary mental illness) has recently been called into question from multiple rigorous studies (39–45).

Despite the limitations, initial results from this longitudinal observational study are clinically informative and encouraging and would inform further studies that replicated this work. These results suggest that comprehensive assessment of resilience and its factors

among veterans can contribute to the understanding of their clinical status in terms of suicidality and inform clinical care. These can be important steps toward development of targeted preventative therapeutics programs, especially toward suicide prevention. In addition, the results could help direct future programs and therapeutics to bolster resilience and reduce suicidal ideation and attempts. Both the Department of Veterans Affairs and the Department of Defense have current efforts underway to potentially increase resiliency among active duty soldiers (46) and veterans (47).

CONCLUSIONS

This study is the first longitudinal study to establish the protective effect of resiliency in veterans with suicidality. However, further longitudinal studies may increase confidence in these findings if the results are replicated in a larger sample and in other populations. Also, further research in this area with candidate interventions is still needed.

Acknowledgments

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Table 1

Demographics and Clinical Characteristics at Baseline

Variable	Total Sample (N=176)
	Mean (*SD*)
Age (years)	39 (10.6)
Education Post High School (%)	57%
Gender, (%) male	82%
Race, (%) White	63%
Days between baseline and follow-up Visits	1057 (174)
Suicidality	
Baseline BSS	0.50 (1.9)
Follow-up BSS	0.55 (2.3)
Resilience (CD-RISC)	76.7 (15.7)
Alcohol Use Disorder (AUDIT)	8%
PTSD (SCID)	16%

BSS= Beck Scale for Suicide Ideation Score

Table 2

Spearman Correlation Coefficients Between Suicidality and Resilience Factors

Variables	r_s	P
Tenacity (factor 1)	−0.15	0.06
Tolerance (factor 2)	−0.16	0.049
Secure Relationships (factor 3)	−0.34	<0.0001
Control (factor 4)	−0.29	0.0004
Spiritual (factor 5)	−0.10	0.22

Table 3

Forward Stepwise Regression of the Total Sample for Baseline Resilience Score on Follow-up Suicidality (BSS). [*]

Variable	Partial R-Square	Model R-Square	C(p)	F Value	*p*-value
Baseline BSS[†]	0.09	0.09	19.65	16.43	<.0001
Baseline CD-RISC[‡]	0.01	0.17	8.61	4.02	0.047

[*] All variables left in the model are significant at the 0.05 level. No other variable met the 0.05 significance level for entry into the model.

The other variables that were included in the model were education, gender, ethnicity, and, race, PTSD, and alcohol misuse on the AUDIT, and major depressive disorder. These variables (except gender) did not meet the 0.05 significance level for entry into the final model. Thus, resilience was stronger predictor than PTSD and alcohol for suicidality. (AUDIT = Alcohol Use Disorders Identification Test; the AUDIT has been validated for DSM IV alcohol use disorders).

[‡] CD-RISC= Connor Davidson Resilience Scale.

[†] BSS= Beck Scale for Suicide Ideation Score.

Table 4

Forward Stepwise Regression of the Total Sample for Resilience Factors on Follow-up Suicidality. [*]

Variable	Partial R-Square	Model R-Square	C(p)	F Value	p-value
Baseline BSS [†]	0.09	0.90	19.93	16.73	<.0001
Baseline Secure relationships [‡]	0.04	0.13	13.92	7.52	0.007

[*] All variables left in the model are significant at the 0.05 level. No other variable met the 0.05 significance level for entry into the model.

[†] BSS= Beck Scale for Suicide Ideation Score

[‡] Secure relationships factor of the Connor Davidson Resilience Scale (factor 3)