Exploration of the Resilience Construct in Posttraumatic Stress Disorder Severity and Functional Correlates in Military Combat Veterans Who Have Served Since September 11, 2001

Kimberly T. Green, MS; Patrick S. Calhoun, PhD; Michelle F. Dennis, BA; the Mid-Atlantic Mental Illness Research, Education and Clinical Center Workgroup; and Jean C. Beckham, PhD

Objective: This study evaluated the relationship between resilience and psychological functioning in military veterans deployed to a region of military conflict in support of Operation Enduring Freedom or Operation Iraqi Freedom.

Method: 497 military veterans completed a structured psychiatric interview and questionnaires measuring psychological symptoms, resiliency, and trauma exposure. The study had 2 primary aims: (1) to examine whether the association between trauma exposure and PTSD was moderated by resilience and (2) to examine whether resilience was uniquely associated with functional outcomes after accounting for PTSD. Measures included the Structured Clinical Interview for *DSM-IV-TR* Axis I Disorders (for PTSD diagnosis), the Connor-Davidson Resilience Scale, and the Traumatic Life Events Questionnaire. Data were collected between June 2005 and February 2009.

Results: Evaluating the association of resilience and trauma exposure with PTSD revealed main effects for combat exposure, lifetime trauma exposure, and resilience. Additionally, there was a significant ($P < .05$) interaction between combat exposure and resilience such that higher levels of resilience were particularly protective among individuals with high combat exposure. After controlling for age, gender, minority status, trauma exposure, and PTSD diagnosis, resilience was uniquely associated with decreased suicidality, reduced alcohol problems, lower depressive symptom severity, and fewer current health complaints and lifetime and past-year medical problems.

Conclusions: These results suggest that resilience is a construct that may play a unique role in the occurrence of PTSD and severity of other functional correlates among deployed veterans. Future studies in this area would benefit from a prospective design, the evaluation of other possible protective processes (eg, social support), and specific examination of particular aspects of resilience and how resilience may be increased.

J Clin Psychiatry 2010;71(7):823–830

Submitted: *October 20, 2009; accepted December 18, 2009.*
Online ahead of print: *June 15, 2010 (doi:10.4088/JCP.09m05780blu).*
Corresponding author: *Kimberly T. Green, MS, VISN 6 MIRECC, 508 Fulton St, Bldg 5, Durham, NC 27705 (Kimberly.Green2@va.gov).*

Although the majority of individuals are exposed to at least 1 traumatic event,[1–3] only 7.8% develop posttraumatic stress disorder (PTSD).[1] In deployed military personnel, trauma exposure and PTSD are typically higher; nonetheless, a significant proportion of veterans do not develop PTSD. One hypothesis to explain this difference is that some individuals are more susceptible to the effects of trauma[4] and potentially more susceptible to the development of a psychiatric disorder such as PTSD. The capacity to tolerate the effects of trauma exposure or successfully manage following a challenge or setback has been termed *resilience*.[5] Interestingly enough, there has been a recent surge in research regarding the construct of resilience in regard to its definition, potential protective processes (eg, contribution of environmental factors and/or individual traits), and the role that it might play in response to challenges or stressors over the life span.[6]

The effect of trauma exposure on the development and severity of PTSD is well established.[7–9] In addition, the negative effects of PTSD on functional outcomes (eg, health) in veterans have also been extensively documented.[9,10] How resilience may be related to the development of PTSD following trauma exposure and whether resilience is related to other functional outcomes after accounting for PTSD have not yet been thoroughly evaluated.

Resilience has been described as a response to situational demands, including the ability to recover from negative and stressful experiences and find positive meaning in seemingly adverse situations.[5,11] Early research efforts in resilience focused primarily on children and have now been evaluated in individuals at various developmental life stages (eg, adolescence, adulthood),[12,13] with recent attention on military veteran populations. A number of investigators have explored resilience as a measurable, multidimensional construct[5,14] that varies considerably across a number of life domains. Although there is initial evidence that resilience may be associated with functional correlates,[5] uncertainty exists as to the potential underlying mechanisms of this association. Multiple researchers have evaluated resilience as an inherent personal trait,[15–18] and there has been recent work describing resilience in an expanded individual differences model that includes appraisal processes and social resources.[19] Wagnild[12] and others investigated resilience as a characteristic of personality that reduces the negative outcomes of stress

and fosters adaptation, while Rutter[13] viewed resilience as a process that encompasses protective features. Conversely, resilience has been theorized as a dynamic process that can be acquired at any point throughout the lifespan.[20,21] Connor and Davidson[5] reported that resilience is modifiable and can increase with pharmacologic intervention. A recent review[22] reported that there is preliminary evidence that a resilience-building therapy entitled "Well Being Therapy" may assist in the reduction of residual symptoms among participants with affective disorders, improve outcomes among generalized anxiety patients receiving cognitive behavioral therapy, and prevent recurrent depressive episodes among treated patients. Taken together, the literature supports the conceptualization that resilience may function as both a state and a trait and may be enhanced through intervention.

Recent reports have suggested that in military samples resilience is related to PTSD and depressive symptoms[23,24] as well as negative affect[25] and may be potentially enhanced through treatment.[26] Prior work has been limited by a lack of formal PTSD diagnosis in study samples, and no study has yet examined resilience in a veteran sample post-deployment.

The finding that resilience can improve over the course of PTSD treatment (eg, Davidson et al[26]) has led some to question whether measures of resilience are simply tapping the absence of PTSD symptoms. Indeed, studies examining the association between resilience and functional outcomes among patients with PTSD have failed to account for PTSD symptom severity.[26] The primary goal of the current study was to examine the relationships between trauma exposure, resilience, and PTSD diagnosis among veterans who were deployed to a war zone since September 11, 2001. A second aim was to explore whether resilience was associated with functional correlates after accounting for both trauma exposure and current PTSD. It was hypothesized that resilience would moderate the relationship between trauma exposure and PTSD. Further, it was hypothesized that increased resilience would be associated with more positive outcomes among functional correlates even after accounting for the deleterious effects of PTSD.

METHOD

Participants and Procedures

Measures in this study were collected as part of a multisite study of veterans who have served since September 11, 2001, conducted through the Department of Veterans Affairs (VA) Veterans Integrated Service Network (VISN) 6 Mental Illness Research, Education and Clinical Center (MIRECC). Participants were recruited through fliers, advertisements, VA clinic referrals, and invitational letters describing a study on deployment and adjustment. Institutional review board approval was secured at all collaborating sites. After a complete description of the study, written informed consent was obtained. Data collection took place across 1 or 2 study visits, between June 2005 and February 2009, and included completion of paper-and-pencil or computer-administered questionnaires to 965 veterans. A subset were administered the Structured Clinical Interview for *DSM-IV-TR* Axis I Disorders (SCID-I).[27] Veterans who were not deployed to the region of conflict during Operation Enduring Freedom and/or Operation Iraqi Freedom (OEF/OIF; n = 198) or who had no lifetime trauma exposure (n = 19) were removed from the analyses, resulting in a final sample of 497. Because PTSD was utilized as a primary variable in this study, only the 497 veterans who received the SCID-I were included in this analysis. However, there were no differences in age, minority status, or gender across those who received the SCID-I and those who did not.

Measures

Trauma exposure. Traumatic Life Events Questionnaire. The Traumatic Life Events Questionnaire (TLEQ)[28] is a 24-item questionnaire designed to assess exposure and response to traumatic events. Respondents are asked how many times they have experienced each of 24 different traumatic events (*DSM-IV* criterion A1 for PTSD), including an item providing an opportunity to report any other potentially traumatic events and an item under which respondents can report an event that they cannot tell about. This item was designed to capture traumatic events about which respondents feel too uncomfortable to discuss openly.[29] Those endorsing a particular event are also asked whether it met *DSM-IV* criterion A2 for PTSD, as well as several other follow-up questions such as when the event first occurred. Initial studies have demonstrated content validity and reliability of this measure.[7,8,28] The average convergent validity with an interview 1 week later for the TLEQ was 85% (range of 74%–97% for individual items). Consistent with previous work,[7] individual items/exposures were summed to produce lifetime trauma exposures, the total number of events that occurred and caused fear helplessness and horror, with a range of 0 to 23. Additionally, individual items were grouped into 7 categories (accident/disaster, medical/death, adult physical assault, adult sexual assault, childhood physical violence, childhood sexual assault, war zone exposure), each of which was designated as present or absent. The number of categories in which participants had a criterion A event is also reported.

Combat Exposure Scale. The Combat Exposure Scale (CES) is a widely used 7-item self-report measure of wartime stressors experienced by combatants. Items are rated on a 5-point frequency (1 = "no" or "never" to 5 = "more than 50 times"), 5-point duration (1 = "never" to 5 = "more than 6 months"), 4-point frequency (1 = "no" to 4 = "more than 12 times"), or 4-point degree of loss (1 = "no one" to 4 = "more than 50%") scale. Respondents are asked to respond based on their exposure to various combat situations, such as firing rounds at the enemy and being on dangerous duty. The total CES score (ranging from 0 to 41) is calculated by using a sum of weighted scores, which can be classified into 1 of 5 categories of combat exposure ranging from "light" to "heavy."[30]

Resilience. Connor-Davidson Resilience Scale. The Connor-Davidson Resilience Scale (CD-RISC) is a reliable (Cronbach $\alpha = 0.89$) and validated instrument for

measuring resilience. This scale has 25 items, each rated on a 5-point scale (0 "not true at all" to 4 "true nearly all of the time"), with higher scores reflecting greater resilience. The CD-RISC has demonstrated sensitivity to the effects of treatment over time in patients with PTSD.[26,31] In a multicenter study, response to venlafaxine was associated with increased resilience.[26,32]

PTSD and other diagnostic information. Structured Clinical Interview for *DSM-IV-TR* Axis I Disorders. The Structured Clinical Interview for *DSM-IV-TR* Axis I Disorders (SCID)[33] was used to assess PTSD and other Axis I psychiatric diagnoses.[33] SCID interviewers received training from experienced interviewers, provided diagnoses of videotaped SCID interviews, and were supervised by psychologists. The raters had a mean κ for interrater reliability of .96.

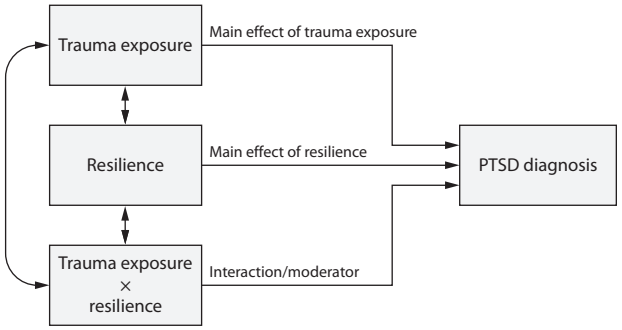
Davidson Trauma Scale. PTSD severity was assessed with the Davidson Trauma Scale (DTS),[34] a brief global assessment scale for PTSD. The DTS includes 17 items that correspond to each of the 17 *DSM-IV* symptoms of PTSD. Respondents rate each of the 17 items on both frequency and severity. The DTS has demonstrated reliability and validity in OEF/OIF veterans.[34]

Functional correlates. Alcohol Use Disorders Identification Test. The Alcohol Use Disorders Identification Test (AUDIT)[35] is a 10-item brief, self-report screening questionnaire used to identify individuals with hazardous and harmful patterns of alcohol consumption and alcohol dependence. 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.[36]

Beck Depression Inventory. The Beck Depression Inventory (BDI-II)[37] is a 21-item, forced-choice scale of general depression severity. Each item contains a list of 4 statements arranged in increasing severity about a particular symptom of depression. Each item is rated on a 0–3 scale, with summary scores ranging between 0 and 63. The BDI-II has been found to demonstrate high internal reliability (α = .93 among college students, α = .92 among outpatients).[37]

Beck Scale for Suicide Ideation. Suicidality was assessed using the 21-item, self-report Beck Scale for Suicide Ideation (BSI).[38] Items 1–19 pertain to current severity of suicidal thoughts, suicidal intent, and plans to commit suicide. Items 20 and 21 address the number of previous suicide attempts and the seriousness of the attempt to die associated with last attempt; these items are not used in the calculation of the total score. Item responses are rated on a 3-point scale ranging from 0 to 2 and then summed to arrive at a total suicidal ideation score (possible range, 0–38). The BSI has demonstrated strong internal reliability, with reported coefficient α values ranging from .90 to .97,[39,40] and there is evidence of the instrument's convergent, discriminative, and predictive validity.[39,41–43] A cutoff score of 3 was used to create a dichotomous index of suicidality following Brown and colleagues,[42] who found that a cutoff score of 3 on the BSI yielded the highest hazard ratio in the prediction of risk for suicide in a prospective study of almost 7,000 outpatient psychiatric patients.

Figure 1. Model of Trauma Exposure, Resilience, and PTSD



Abbreviation: PTSD = posttraumatic stress disorder.

National Vietnam Veterans Readjustment Study Self-Reported Medical Questionnaire. The health measure used in the National Vietnam Veterans Readjustment Study[10,44] was used to assess self-reported health complaints and problems. Participants are presented with 2 dichotomous rating checklists (0 = no, 1 = yes). Participants first indicate whether they currently have any of a 22-item list of physical symptoms (eg, headaches, diarrhea). The second checklist contains 37 chronic health problems that are rated for lifetime and past-year occurrence. Three scores result: total current health complaints, lifetime physical conditions, and past-year physical conditions.

Symptom Checklist-90-Revised. The Symptom Checklist-90-Revised (SCL-90-R)[45] is a 90-item self-report questionnaire designed to screen for a broad range of psychological problems and symptoms of psychopathology. Each of the 90 items is rated on a 5-point Likert scale of distress, ranging from "not at all" = 0 to "extremely" = 4.

General Symptom Index. The General Symptom Index (GSI)[46] provides a measure of overall psychological distress.

Analyses

Univariate analyses including 2-tailed *t* tests (for continuous variables) and χ^2 tests for categorical variables were first conducted to evaluate differences between veterans with and without PTSD on demographic variables, resilience, and psychological variables. A Bonferroni comparison rate for the group comparisons was applied based on the number of comparisons (.05/32 = .0016).

Multivariate logistic regression analyses were then utilized to evaluate the association between trauma exposure, resilience, and PTSD. Models examined both the main effects of trauma exposure and resilience and the interaction between trauma exposure and resilience on PTSD diagnosis. A pictorial representation of these analyses is shown in Figure 1.

Analyses also examined whether resilience was associated with functional correlates after accounting for PTSD. Logistic

Table 1. Demographic and Clinical Characteristics of Deployed Military Veterans With and Without PTSD

Variable	Total Sample (N = 497)	PTSD (n = 189)	Non-PTSD (n = 308)	Test Statistic (PTSD vs non-PTSD)[a]
Age, mean (SD), y	36.57 (10.10)	36.80 (9.93)	36.42 (10.22)	$t = -0.41$
Education, mean (SD), y	13.55 (2.93)	13.20 (3.10)	13.77 (2.80)	$t = 2.11$
Gender, n (%) male	413 (83)	160 (85)	253 (82)	$\chi^2 = 0.53$
Race, n (%)				$\chi^2 = 0.07$
White (including white Hispanic)	260 (52)	100 (53)	160 (52)	
Black or African American	212 (43)	79 (42)	133 (43)	
Other	24 (5)	9 (5)	15 (5)	
Marital status, n (%)				$\chi^2 = 2.70$
Married (not separated)	282 (57)	106 (56)	176 (57)	
Divorced or separated	86 (17)	39 (21)	47 (15)	
Other (widowed or never married)	128 (26)	44 (23)	84 (27)	
No. of times divorced, mean (SD)	0.46 (0.71)	0.55 (0.75)	0.41 (0.69)	$t = -2.24$
Employment status, n (%) working	351 (71)	114 (61)	237 (77)	$\chi^2 = 15.01$*
Military status, n (%)				$\chi^2 = 10.40$
Active duty	17 (3)	8 (4)	9 (3)	
Reserve forces duty	219 (44)	73 (39)	146 (47)	
Discharged	222 (45)	99 (52)	123 (40)	
Retired	39 (8)	9 (5)	30 (10)	
Alcohol Use Disorders Identification Test score, mean (SD)	5.17 (6.22)	6.84 (7.97)	4.14 (4.60)	$t = -4.23$*
Beck Depression Inventory				
Score, mean (SD)	15.60 (12.28)	24.38 (11.18)	10.22 (9.52)	$t = -14.49$*
Normal ups and downs, n (%)	202 (41)	19 (10)	183 (59)	
Mild mood disturbance, n (%)	82 (17)	27 (14)	55 (18)	
Borderline clinical depression, n (%)	57 (11)	33 (17)	24 (8)	
Moderate depression, n (%)	85 (17)	50 (26)	35 (11)	
Severe depression, n (%)	55 (11)	45 (24)	10 (3)	
Extreme depression, n (%)	16 (3)	15 (8)	1 (0)	
Beck Suicide Scale				
Score, mean (SD)	1.03 (3.22)	2.10 (4.48)	0.38 (1.87)	$t = -4.98$*
Score of 3 or greater, n (%)	52 (11)	41 (22)	11 (4)	
Combat Exposure Scale				
Score, mean (SD)	14.95 (10.38)	19.31 (9.98)	12.27 (9.70)	$t = -7.77$*
Light to light-moderate (0–16), n (%)	283 (57)	77 (41)	206 (67)	
Moderate (17–24), n (%)	107 (22)	48 (25)	59 (19)	
Moderate-heavy to heavy (25–41), n (%)	107 (22)	64 (34)	43 (14)	
Davidson Trauma Scale score, mean (SD)	48.42 (40.42)	83.80 (30.36)	26.75 (28.87)	$t = -20.92$*
Traumatic Life Events Questionnaire				
No. of lifetime trauma exposures, mean (SD)	4.36 (3.57)	5.81 (3.58)	3.46 (3.26)	$t = -7.53$*
Accident/disaster, n (%)	225 (45)	114 (60)	111 (36)	$\chi^2 = 27.87$*
Medical/unexpected death, n (%)	294 (59)	136 (72)	158 (51)	$\chi^2 = 20.69$*
Adult physical assault, n (%)	216 (43)	95 (50)	121 (39)	$\chi^2 = 5.75$
Adult sexual assault, n (%)	19 (4)	12 (6)	7 (2)	$\chi^2 = 5.29$
Childhood physical assault, n (%)	187 (38)	80 (42)	107 (35)	$\chi^2 = 2.87$
Childhood sexual assault, n (%)	54 (11)	22 (12)	32 (10)	$\chi^2 = 0.19$
War zone exposure, n (%)	277 (57)	144 (79)	133 (44)	$\chi^2 = 57.3557$*
Total no. of trauma categories, mean (SD)	2.56 (1.69)	3.19 (1.56)	2.17 (1.64)	$t = -6.84$*
Symptom Checklist 90-Revised (Global Severity Index) score, mean (SD)	0.99 (0.84)	1.62 (0.81)	0.57 (0.54)	$t = -15.54$*
Smoking pack-years, mean (SD)	4.05 (8.46)	4.37 (7.88)	3.85 (8.81)	$t = -0.66$
Current smokers, n (%)	130 (26)	61 (32)	69 (22)	$\chi^2 = 5.9104$
National Vietnam Veterans Readjustment Study				
Medical Questionnaire score, mean (SD)				
Current health complaints	4.29 (4.19)	6.24 (4.43)	3.06 (3.52)	$t = -7.21$*
Past-year health problems	2.35 (2.38)	3.24 (2.61)	1.78 (2.03)	$t = -5.64$*
Lifetime health problems	2.96 (2.60)	3.86 (2.68)	2.40 (2.39)	$t = -5.42$*
Connor-Davidson Resilience Scale score, mean (SD)	72.02 (17.52)	62.95 (17.28)	77.59 (15.2)	$t = 9.59$*
Psychiatric morbidity, n (%)				
No diagnosis	207 (42)	0 (0)	207 (67)	NA
Other anxiety disorder[b]	105 (21)	48 (25)	57 (19)	$\chi^2 = 3.20$
Major depressive disorder	119 (24)	91 (48)	28 (9)	$\chi^2 = 98.11$*
Substance use and dependence[c]	37 (7)	18 (10)	19 (6)	$\chi^2 = 1.86$
Other Axis I disorders	49 (10)	28 (15)	21 (7)	$\chi^2 = 8.43$

[a]Comparisons of continuous variables were conducted with *t* tests (2-tailed *P* value). Comparisons of classification variables were conducted using χ^2 tests. Statistical tests were considered statistically significant based on Bonferroni-adjusted comparison rate of .05/34 = .0014.
[b]Includes panic disorder, obsessive-compulsive disorder, generalized anxiety disorder, social phobia, specific phobia, anxiety disorder not otherwise specified, and agoraphobia.
[c]Includes alcohol, cannabis, stimulants, opioid, cocaine, hallucinogens/phencyclidine, and other drugs.
*$P < .001$.
Abbreviations: NA = not applicable, PTSD = posttraumatic stress disorder.

Table 2. Logistic Regression Model Predicting PTSD Diagnosis

Variable	β	SE	Wald χ^2	OR	95% CI
Age	0.00530	0.0115	0.2131	1.005	0.983–1.028
Minority	−0.0646	0.2398	0.0726	0.937	0.586–1.500
Gender	0.0388	0.3299	0.0139	1.040	0.545–1.985
TLEQ	0.1313	0.0347	14.3639	1.140**	1.065–1.221
CES	0.1921	0.0544	12.4607	1.212**	1.089–1.348
CD-RISC	−0.0297	0.0120	6.1696	0.971*	0.948–0.994
CES × CD-RISC	−0.00156	0.0007	4.7821	0.998*	0.997–1.000

*$P < .05$.
**$P < .001$.
Abbreviations: CD-RISC = Connor-Davidson Resilience Scale, CES = Combat Exposure Scale, PTSD = posttraumatic stress disorder, TLEQ = Traumatic Life Events Questionnaire.

and linear regression analyses were employed to examine the relationship between trauma exposure, resilience, and other functional measures including severity of depressive symptoms, probable alcohol problems, suicidal symptoms, health complaints and past-year physical conditions, cigarette pack-years, and marital status after accounting for the presence of PTSD. All models controlled for age, minority status, and gender. Following main effects models, interaction models tested the interactions between resilience and trauma exposure (including both combat exposure and lifetime trauma exposure) as well as the possible interaction between resilience and PTSD.

RESULTS

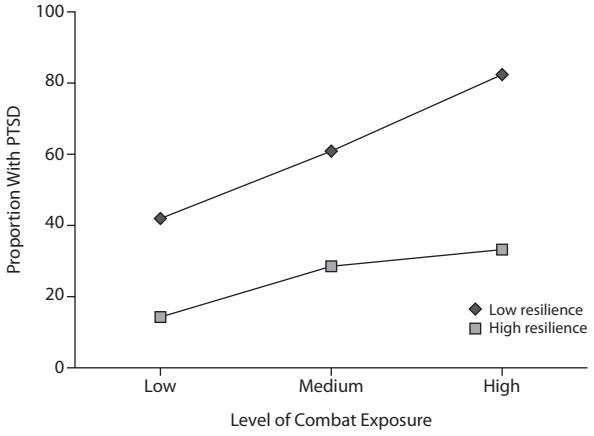
Sample Description

Demographic and clinical characteristics of the sample are shown in Table 1. Participants reported a mean age of 37 years (SD = 10.10; range, 20–64 years), and 17% were female. Race/ethnicity was almost equally divided between African American (43%) and white participants (52%), with other ethnic groups representing 5% of the sample. Fifty-seven percent of participants were currently married, and most of the sample was employed (71%). Forty-five percent were discharged from service, 44% had current military service in the reserve components (ie, National Guard and/or Reserves), and the rest were retired (8%) or active duty (3%). Mean education level was almost 14 years. Twenty-six percent of participants were current smokers, while 50% were lifetime (current or former) smokers. The correlation between PTSD diagnosis and resilience using a Spearman correlation coefficient is –41 ($P < .0001$).

Prevalence of PTSD and Group Differences in Resilience and Psychological Variables

More than 1 in 3 (36%) participants were diagnosed with current PTSD based on the SCID. Demographic differences between those with and without PTSD are presented in Table 1. The PTSD group reported significantly higher combat exposure on the CES, number of lifetime trauma exposures and categories of trauma exposure on the TLEQ, alcohol problems, depressive symptoms, suicidality, health problems, and overall psychological problem endorsement. Those with PTSD reported significantly lower resilience, were more likely to have a diagnosis of current major depressive disorder, and were less likely to be employed.

Figure 2. Interaction Between Combat Exposure[a] and Resilience[b] on PTSD Diagnosis



[a]According to Combat Exposure Scale score; low = score of 0–16, medium = score of 17–24, high = score of 25–41.
[b]According to Connor-Davidson Resilience Scale; resilience was dichotomized on the basis of a median split.
Abbreviation: PTSD = posttraumatic stress disorder.

Association of Resilience With Current PTSD Diagnosis

Multivariate logistic regression was used to examine the relationship between trauma exposure, resilience, and PTSD diagnosis. The model tested both main effects and the 2-way interactions between resilience and trauma exposure (including combat exposure as measured by the CES and lifetime trauma exposure as measured by the TLEQ). A pictorial model is depicted in Figure 1. As shown in Table 2, results indicated that none of the covariates in the models were significant. Main effects were found for combat exposure, lifetime trauma exposure, and resilience. As expected, trauma exposure was associated with increased odds of PTSD, while resilience was associated with a decreased risk of PTSD. Further, as predicted, the relationship between trauma exposure and PTSD was moderated by resilience (see Table 2). The significant interaction between combat exposure and resilience is shown in Figure 2. For purposes of illustration, resilience was dichotomized on the basis of a median split. Combat exposure on the CES was categorized based on the cutting scores shown in Table 1. As displayed in Figure 2, higher levels of resilience appeared particularly protective in individuals with high combat exposure levels.

Association of Resilience With Other Functional Outcomes After Accounting for PTSD

A second aim was to examine the relationship between resilience and other functional outcomes after accounting for PTSD. Outcomes included current marital status, suicidality, hazardous alcohol use (AUDIT-C), depression severity (BDI-II), and health problems including current health complaints, past-year medical conditions, and

lifetime medical conditions. Main effects of trauma exposure, resilience, and PTSD were tested in each model. Additional models tested the trauma-by-resilience and the PTSD-by-resilience interactions. In no case was model fit improved by the inclusion of these interaction terms, which in every case failed to reach statistical significance.

Results from logistic regression analyses examining divorced marital status were not significant. Results of logistic regression analyses examining suicidality as measured by the BSI score of ≥ 3 indicated that younger age ($\chi^2_1 = 4.46$, $P < .04$), increased lifetime trauma exposure (TLEQ; [$\chi^2_1 = 5.16$, $P < .02$)]), and decreased resilience ($\chi^2_1 = 20.45$, $P < .0001$) were associated with higher suicidality scores.

Table 3 provides a summary of linear regression examining the relationship between trauma exposure, resilience, and continuous dependent variables including AUDIT scores, depressive symptom severity (BDI-II scores), smoking (pack-years), and number of medical complaints and conditions. Results examining alcohol indicated that lifetime age, gender, trauma exposure, PTSD, and resilience were associated with AUDIT scores. As predicted, resilience was associated with lower AUDIT scores even after accounting for the presence of PTSD.

As displayed in Table 3, similar results were found for depressive symptom severity. Female gender, trauma exposure, and PTSD were positively associated with current depressive symptom severity, while resilience was negatively associated with depressive symptom severity. Only age and minority status were related to pack-year history of smoking: those who reported minority racial background had a lower lifetime pack-year history. Trauma exposure, PTSD, and resilience were related to health problems including current health complaints, past-year medical problems, and lifetime medical problems. As shown in Table 3, combat exposure, lifetime trauma exposure, and PTSD were positively associated with number of current health complaints. Even after accounting for PTSD, resilience was uniquely associated with health complaints. Examination of past-year and lifetime medical problems revealed that age, lifetime trauma exposure, PTSD, and resilience were significantly associated with the dependent variables. Age, trauma exposure, and PTSD were positively associated with both past-year and lifetime medical problems, while resilience was associated with fewer medical problems.

Table 3. Linear Regression Results Examining the Association Between Trauma Exposure, PTSD,[a] Resilience, and Functional Outcomes

Dependent Variable	Model R^2	Variable	β	SE	B	*P*
AUDIT	0.14					< .0001
		Age	−0.13411	0.02705	−0.21751	< .0001
		Minority	−0.24712	0.55995	−0.01985	.6592
		Gender	−3.26035	0.74891	−0.19691	< .0001
		TLEQ	0.20679	0.08290	0.11852	.0129
		CES	0.02043	0.02916	0.03415	.4838
		PTSD	1.47829	0.63680	0.11527	.0207
		CD-RISC	−0.03800	0.01670	−0.10706	.0233
BDI-II	0.56					< .0001
		Age	−0.02132	0.03789	−0.01753	.5740
		Minority	0.14981	0.78456	0.00610	.8486
		Gender	2.71355	1.05074	0.08288	.0101
		TLEQ	0.59780	0.11620	0.17369	< .0001
		CES	0.13326	0.04089	0.11259	.0012
		PTSD	7.16263	0.89121	0.28339	< .0001
		CD-RISC	−0.32345	0.02341	−0.46126	< .0001
Smoking pack-years	0.11					< .0001
		Age	0.21337	0.03737	0.25464	< .0001
		Minority	−3.98497	0.77369	−0.23540	< .0001
		Gender	−0.13037	1.03617	−0.00578	.8999
		TLEQ	0.11566	0.11459	0.04876	.3133
		CES	−0.03721	0.04032	−0.04562	.3566
		PTSD	0.23305	0.87885	0.01338	.7910
		CD-RISC	−0.01031	0.02308	−0.02134	.6554
Health complaints	0.29					< .0001
		Age	0.01129	0.01979	0.02667	.5688
		Minority	−0.67226	0.39747	−0.08021	.0916
		Gender	0.72260	0.55271	0.06276	.1919
		TLEQ	0.35718	0.05912	0.30253	< .0001
		CES	0.06448	0.02069	0.16141	.0020
		PTSD	1.32485	0.45927	0.15424	.0042
		CD-RISC	−0.03747	0.01181	−0.15799	.0016
Past-year medical conditions	0.25					< .0001
		Age	0.06193	0.01155	0.25818	< .0001
		Minority	−0.34134	0.23192	−0.07183	.1420
		Gender	0.42222	0.32250	0.06468	.1913
		TLEQ	0.13989	0.03450	0.20898	< .0001
		CES	0.00380	0.01207	0.01679	.7529
		PTSD	0.74007	0.26798	0.15197	.0060
		CD-RISC	−0.02057	0.00689	−0.15302	.0030
Lifetime medical conditions	0.27					< .0001
		Age	0.07633	0.01240	0.29086	< .0001
		Minority	−0.31424	0.24903	−0.06044	.2078
		Gender	1.09956	0.34629	0.15395	.0016
		TLEQ	0.15603	0.03704	0.21304	< .0001
		PTSD	0.66235	0.28775	0.12431	.0219
		CES	0.00783	0.01296	0.03161	.5460
		CD-RISC	−0.02399	0.00740	−0.16308	.0013
Global Severity Index	0.60					< .0001
		Age	−0.00163	0.00255	−0.01952	.5237
		Minority	0.02561	0.05297	0.01529	.6290
		Gender	0.09857	0.06992	0.04459	.1592
		TLEQ	0.05388	0.00779	0.22905	< .0001
		CES	0.00770	0.00276	0.09506	.0054
		PTSD	0.61195	0.05900	0.35755	< .0001
		CD-RISC	−0.01915	0.00161	−0.39157	< .0001

[a] As measured by the Davidson Trauma Scale.
Abbreviations: AUDIT = Alcohol Use Disorders Identification Test, BDI-II = Beck Depression Inventory, CD-RISC = Connor-Davidson Resilience Scale, CES = Combat Exposure Scale, PTSD = posttraumatic stress disorder, TLEQ = Traumatic Life Events Questionnaire.

DISCUSSION

In this study of deployed veterans, resilience was significantly related to PTSD diagnosis even when accounting for lifetime and combat trauma exposure. Among veterans with higher levels of combat exposure, a higher level of resilience

appeared particularly protective. Even after accounting for PTSD diagnosis, resilience was significantly associated with other functional correlates including suicidality, probable alcohol problems, depressive symptom severity, and physical health.

These results are consistent with other reports that suggest resilience is a protective factor in the occurrence of PTSD and depressive symptoms.[23,24] Results from the current study extend previous findings by demonstrating that resilience is related to (1) PTSD diagnosis after controlling for level of trauma exposure and (2) functional correlates after controlling for PTSD diagnosis. Indeed, results suggest that variance accounted for by the resilience construct is not completely shared with measures of psychological distress associated with PTSD. One weakness of previous studies (eg, Connor and Davidson[5]) examining the relationship between resilience and functional correlates is that analyses did not control for PTSD, which could inflate the apparent effect of resilience on functional correlates. Findings that resilience increased in proportion to the degree of global clinical improvement seen in patients being treated for PTSD[5] raise further questions about whether measures such as the CD-RISC were essentially assessing the inverse of psychological distress. Our results suggest that resilience still accounted for a modest, although statistically significant, amount of variance in a number of functional correlates even after the effects of PTSD were partialled out.

In considering the implications of the current study findings, clinicians may want to consider evaluating resilience in their assessment of veterans with PTSD in an effort to identify strengths and values that may be leveraged to improve functional outcomes among this veteran group. Researchers in the area of PTSD may want to include assessment of resilience in evaluating the range of risk and protective factors associated with the development and response to PTSD, and in investigating therapeutic methods to increase resilience. Researchers of other at-risk populations, for example, youth from divorced families[47] and in the welfare system,[48] as well as individuals with psychiatric disorders,[49] have demonstrated interventions that increase resilience. In addition, further theoretical investigation of how resilience may be related to other important constructs in PTSD such as memory[50,51] may provide additional understanding of the disorder. For example, Philippe and colleagues[52] found in non-PTSD subjects that emotional memories networks mediated the relationship between psychological resilience and the experience of positive emotions in an emotional context.

Limitations of the current study include a cross-sectional design, a volunteer sample of veterans, a single measure of resilience, and self-report of functional correlates. In addition, because survey data were used in the analyses, causal ordering of the variables cannot be determined. For example, it is difficult to ascertain whether resilience arose in the absence of PTSD following trauma exposure rather than being present prior to trauma exposure. Future studies would benefit from a prospective design to determine the possible overlap of resilience, PTSD, and psychological distress and provide additional examination of resilience as a construct. Despite the promising results of the current study, topics that warrant further research investigation include the measurement of resilience (eg, utility of collateral reports), how resilience functions as a state or trait (and when), whether there are significant variables that erode or enhance resilience across the lifespan (eg, social support, life events, traumatic events, unit support, religiosity), and how resilience may be enhanced[49] (particularly in those with the lowest resilience).

Drug name: venlafaxine (Effexor and others).

Author affiliations: Veterans Integrated Service Network (VISN) 6 Mental Illness Research, Education and Clinical Center; Department of Veterans Affairs Medical Center (Ms Green and Drs Calhoun and Beckham); and Duke University Medical Center (Drs Calhoun and Beckham and Ms Dennis), Durham, North Carolina.

Study group members: The Mid-Atlantic Mental Illness Research, Education and Clinical Center Workgroup for this manuscript includes Marinell Miller-Mumford, PhD, Hampton Veterans Affairs Medical Center, Hampton, Virginia; Antony Fernandez, MD, Hunter Holmes McGuire Richmond Veterans Affairs Medical Center, Richmond, Virginia; Katherine H. Taber, PhD, and Ruth E. Yoash-Gantz, PsyD, W. G. (Bill) Hefner Veterans Affairs Medical Center, Salisbury, North Carolina; and Scott D. Moore, MD, PhD, and Larry A. Tupler, PhD, Durham Veterans Affairs Medical Center, Durham, North Carolina.

Potential conflicts of interest: None reported.

Funding/support: This work was supported by the Office of Mental Health Services, Department of Veterans Affairs.

Disclaimer: The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

Acknowledgment: We extend thanks to the veterans who volunteered to participate in this study. We also thank the research study staff members at the Durham, Hampton, Richmond, and Salisbury Veterans Affairs Medical Centers for their diligent work and essential contributions to the management of this study, recruitment of participants, and collection of data. In particular, we acknowledge Perry Whitted and Courtney Dutton for their extensive administrative contributions on this project.
Mr Whitted and Ms Dutton report no conflict of interest.

REFERENCES

1. Kessler RC, Berglund P, Demler O, et al. Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62(6):593–602.
2. Kessler RC, Sonnega A, Bromet E, et al. Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1995;52(12):1048–1060.
3. Breslau N, Kessler RC, Chilcoat HD, et al. Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma. *Arch Gen Psychiatry*. 1998;55(7):626–632.
4. Yehuda R. Risk and resilience in posttraumatic stress disorder. *J Clin Psychiatry*. 2004;65(suppl 1):29–36.
5. Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety*. 2003;18(2):76–82.
6. Davis MC, Luecken L, Lemery-Chalfant K. Resilience in common life: introduction to the special issue. *J Pers*. 2009;77(6):1637–1644.
7. Clancy CP, Graybeal A, Tompson WP, et al. Lifetime trauma exposure in veterans with military-related posttraumatic stress disorder: association with current symptomatology. *J Clin Psychiatry*. 2006;67(9):1346–1353.
8. Dedert EA, Green KT, Calhoun PS, et al. Association of trauma exposure with psychiatric morbidity in military veterans who have served since September 11, 2001. *J Psychiatr Res*. 2009;43(9):830–836.
9. Flood A, Davidson JRT, Beckham JC. *Traumatic Stress Disorders*. New York, NY: John Wiley and Sons; 2008.
10. Kulka RA, Schlenger WE, Fairbank JA, et al. *Trauma and the Vietnam War Generation: Report of Findings from the National Vietnam Veterans Readjustment Study*. New York, NY: Brunner/Mazel; 1990.
11. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. *Child Dev*. 2000;71(3):543–562.

© Copyright 2010 Physicians Postgraduate Press, Inc.

12. Wagnild G. A review of the Resilience Scale. *J Nurs Meas*. 2009;17(2):105–113.
13. Rutter M. Psychosocial resilience and protective mechanisms. *Am J Orthopsychiatry*. 1987;57(3):316–331.
14. Luthar SS, Brown PJ. Maximizing resilience through diverse levels of inquiry: prevailing paradigms, possibilities, and priorities for the future. *Dev Psychopathol*. 2007;19(3):931–955.
15. Garmezy N. Children in poverty: resilience despite risk. *Psychiatry*. 1993;56(1):127–136.
16. Beardslee WR, Podorefsky D. Resilient adolescents whose parents have serious affective and other psychiatric disorders: importance of self-understanding and relationships. *Am J Psychiatry*. 1988;145(1):63–69.
17. Rabkin JG, Remien R, Katoff L, et al. Resilience in adversity among long-term survivors of AIDS. *Hosp Community Psychiatry*. 1993;44(2):162–167.
18. Antoni MH, Goodkin K. Host moderator variables in the promotion of cervical neoplasia, I: personality facets. *J Psychosom Res*. 1988;32(3):327–338.
19. Mancini AD, Bonanno GA. Predictors and parameters of resilience to loss: toward an individual differences model. *J Pers*. 2009;77(6):1805–1832.
20. Flach FF. Psychobiologic resilience, psychotherapy, and the creative process. *Compr Psychiatry*. 1980;21(6):510–518.
21. Flach FF. *Resilience: Discovering a New Strength at Times of Stress*. New York, NY: Fawcett Columbine; 1988.
22. Fava GA, Tomba E. Increasing psychological well-being and resilience by psychotherapeutic methods. *J Pers*. 2009;77(6):1903–1934.
23. Pietrzak RH, Johnson DC, Goldstein MB, et al. Psychosocial buffers of traumatic stress, depressive symptoms, and psychosocial difficulties in veterans of Operations Enduring Freedom and Iraqi Freedom: the role of resilience, unit support, and postdeployment social support. *J Spec Oper Med*. 2009;9(3):74–78.
24. Pietrzak RH, Johnson DC, Goldstein MB, et al. Psychological resilience and postdeployment social support project against traumatic stress and depressive symptoms in soldiers returning from Operations Enduring Freedom and Iraqi Freedom. *J Spec Oper Med*. 2009;9(3):67–73.
25. Maguen S, Turcotte DM, Peterson AL, et al. Description of risk and resilience factors among military medical personnel before deployment to Iraq. *Mil Med*. 2008;173(1):1–9.
26. Davidson J, Baldwin DS, Stein DJ, et al. Effects of venlafaxine extended release on resilience in posttraumatic stress disorder: an item analysis of the Connor-Davidson Resilience Scale. *Int Clin Psychopharmacol*. 2008;23(5):299–303.
27. First MB, Spitzer RL, Gibbon M, et al. *Structured Clinical Interview for Axis I DSM-IV Disorders*. 2nd ed. New York, NY: Biometrics Research Department; 1994.
28. Kubany ES, Haynes SN, Leisen MB, et al. Development and preliminary validation of a brief broad-spectrum measure of trauma exposure: the Traumatic Life Events Questionnaire. *Psychol Assess*. 2000;12(2):210–224.
29. Vrana S, Lauterbach D. Prevalence of traumatic events and post-traumatic psychological symptoms in a nonclinical sample of college students. *J Trauma Stress*. 1994;7(2):289–302.
30. Keane TM, Fairbank JA, Caddell JM, et al. Clinical evaluation of a measure to assess combat exposure. *Psychol Assess*. 1989;1(1):53–55.
31. Davidson J, Watkins L, Owens M, et al. Effects of paroxetine and venlafaxine XR on heart rate variability in depression. *J Clin Psychopharmacol*. 2005;25(5):480–484.
32. Davidson JRT, Stein DJ, Rothbaum BO, et al. Resilience as a predictor of remission in posttraumatic stress disorder. Presented at the 19th Annual US Psychiatric and Mental Health Congress; November 15–19, 2006; New Orleans, LA.
33. First MB, Spitzer RL, Gibbon M, et al. *Structured Clinical Interview for Axis I DSM-IV Disorders*. New York, NY: Biometrics Research Department, New York State Psychiatric Institute; 1994.
34. McDonald SD, Beckham JC, Morey RA, et al. The validity and diagnostic efficiency of the Davidson Trauma Scale in military veterans who have served since September 11th, 2001. *J Anxiety Disord*. 2009;23(2):247–255.
35. Saunders JB, Aasland OG, Babor TF, et al. Development of the Alcohol Use Disorders Identification Test (AUDIT). WHO collaborative project on early detection of persons with harmful alcohol consumption II. *Addiction*. 1993;88(6):791–804.
36. Babor TF, Higgins-Biddle JC, Saunders JB, et al. *The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Care*, 2nd ed. Geneva, Switzerland: World Health Organization; 2001.
37. Beck AT, Steer RA, Brown G. *Beck Depression Inventory–II*. San Antonio, TX: The Psychological Corporation; 1996.
38. Beck AT, Steer RA. *Manual for Beck Scale for Suicide Ideation*. San Antonio, TX: Psychological Corporation; 1991.
39. Beck AT, Steer RA, Ranieri WF. Scale for Suicide Ideation: psychometric properties of a self-report version. *J Clin Psychol*. 1988;44(4):499–505.
40. Steer RA, Rissmiller DJ, Ranieri WF, et al. Dimensions of suicidal ideation in psychiatric inpatients. *Behav Res Ther*. 1993;31(2):229–236.
41. Beck AT, Brown GK, Steer RA. Psychometric characteristics of the Scale for Suicide Ideation with psychiatric outpatients. *Behav Res Ther*. 1997;35(11):1039–1046.
42. Brown GK, Beck AT, Steer RA, et al. Risk factors for suicide in psychiatric outpatients: a 20-year prospective study. *J Consult Clin Psychol*. 2000;68(3):371–377.
43. Cochrane-Brink KA, Lofchy JS, Sakinofsky I. Clinical rating scales in suicide risk assessment. *Gen Hosp Psychiatry*. 2000;22(6):445–451.
44. Calhoun PS, Wiley M, Dennis MF, et al. Self-reported health and physician diagnosed illnesses in women with posttraumatic stress disorder and major depressive disorder. *J Trauma Stress*. 2009;22:112–130.
45. Derogatis LR, Melisaratos N. The Brief Symptom Inventory: an introductory report. *Psychol Med*. 1983;13(3):595–605.
46. Kinney RK, Gatchel RJ, Mayer TG. The SCL-90R evaluated as an alternative to the MMPI for psychological screening of chronic low-back pain patients. *Spine (Phila Pa 1976)*. 1991;16(8):940–942.
47. Wolchik SA, Schenck CE, Sandler IN. Promoting resilience in youth from divorced families: lessons learned from experimental trials of the New Beginnings Program. *J Pers*. 2009;77(6):1833–1868.
48. Leve LD, Fisher PA, Chamberlain P. Multidimensional treatment foster care as a preventive intervention to promote resiliency among youth in the child welfare system. *J Pers*. 2009;77(6):1869–1902.
49. Gallagher MW, Lopez SJ, Preacher KJ. The hierarchical structure of well-being. *J Pers*. 2009;77(4):1025–1050.
50. Hiskey S, Luckie M, Davies S, et al. The phenomenology of reactivated trauma memories in older adults: a preliminary study. *Aging Ment Health*. 2008;12(4):494–498.
51. Rubin DC, Boals A, Berntsen D. Memory in posttraumatic stress disorder: properties of voluntary and involuntary, traumatic and nontraumatic autobiographical memories in people with and without posttraumatic stress disorder symptoms. *J Exp Psychol Gen*. 2008;137(4):591–614.
52. Philippe FL, Lecours S, Beaulieu-Pelletier G. Resilience and positive emotions: examining the role of emotional memories. *J Pers*. 2009;77(1):139–175.