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Anger and Suicidality in Veterans: Impact of Postseparation Time and Combat

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Objective: The study investigated the association over time between the rates of anger/hostility and suicidality in post-9/11 veterans as a function of time following separation from the military and combat exposure.

Method: Structured clinical interviews were conducted with $N = 2,580$ Iraq/Afghanistan-era U.S. military veterans serving since 9/11/01. For each participant, a postseparation interval was calculated as the time between military separation and the clinical interview, with a range of up to 9 years. Combat exposure was assessed using a three-level categorical proxy derived from the Combat Exposure Scale indexing levels of none, below, and above median exposure. Three separate estimates measuring anger/hostility and three separate measures of suicidality were modeled variously across separation intervals and levels of combat exposure. **Results:** In bivariate analyses, higher levels of combat exposure were associated with overall significantly higher levels of both anger/hostility and suicidality. Based on multivariable analyses, rates in measures indexing suicidality among veterans did not decrease as a function of the number of years postseparation. In contrast, rates in measures indexing anger/hostility among veterans endorsing above-median levels of combat exposure decreased significantly with increasing time since separation. Nonetheless, even at longer time points, both suicidality and anger/hostility remained elevated among respondents endorsing above-median combat exposure.

Conclusions: These findings illustrate the importance of implementing suicide prevention and anger management programs for postseparation adjustment as well as for the period beyond the immediate postseparation, with particular attention paid to the level of combat exposure experienced.

Clinical Impact Statement

Using multiple indices in a post-9/11 cohort, we observed that anger/hostility and suicidality were elevated among veterans endorsing high levels of combat exposure. Examining time since separation after military service, we found that measures indexing anger and hostility were decreased in cohorts sampled at longer postseparation intervals. In contrast, suicidality did not diminish among veterans at longer postseparation intervals. Results suggest treatment for anger/hostility and suicidality is critical for postseparation adjustment and emotional well-being and that efforts should extend beyond the immediate postseparation period.

Keywords: military separation, time-in-the-community, combat exposure, suicide, anger

A subset of military veterans struggles with anger/hostility and suicidality. It has been documented that veterans exhibit higher rates of suicide relative to nonveterans following separation from the military (Blow et al., 2012; Lund et al., 1984; McCarthy et al.,

2009; Pietrzak et al., 2011). Postseparation anger is also documented (Elbogen et al., 2010; Elbogen, Johnson, Wagner, et al., 2014; Renshaw & Kiddie, 2012), and a direct association between anger/hostility and combat exposure has been previously reported

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methodology, software, writing—original draft, and writing—review and editing. Kiera Molloy served in a supporting role for writing—review and editing. Lynn Van Male served in a supporting role for writing—review and editing. Mid-Atlantic Mental Illness Research, Education and Clinical Center Workgroup served in a supporting role for project administration. Eric B. Elbogen contributed equally to investigation and validation. Megan Lanier and Eric B. Elbogen contributed equally to writing—review and editing. Lynn Van Male and Eric B. Elbogen contributed equally to conceptualization.

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in a brigade combat team shortly after returning from Afghanistan (Wilk et al., 2015). For clinicians charged with treating anger management and assessing risk for suicide in veterans, identifying factors associated with both is critical in prioritizing high-risk cases and implementing appropriate and timely interventions. In the following, we describe an investigation into the effects of combat exposure and postseparation time-in-the-community on a variety of measures sampling anger/hostility and suicidality in a convenience cohort of post-9/11 veterans.

Prior research has identified factors associated with anger/hostility and suicidality among veterans. Combat exposure has been linked to increased risk for both suicide and aggressiveness (Fanning & Pietrzak, 2013; Stappenbeck et al., 2014), and risks may be further exacerbated in the immediate postseparation period by reintegration stress (Wang et al., 2020). The association between postseparation time-in-the-community and adverse outcomes has received less attention. A study examining the association between deployment and suicide among 3.9 million U.S. military personnel who served during the first 6.25 years of Operation Enduring Freedom/Operation Iraqi Freedom (Reger et al., 2015) described a small decrease in the rate of suicides following the transition from military service to civilian life; higher risks for suicide were documented among veterans with shorter terms of time in the service relative to veterans with longer (four-plus) service times (Reger et al., 2015). Importantly, suicide rates among deployed versus nondeployed veterans did not differ statistically.

The current study expands research into the association between postseparation time-in-the-community and current anger/hostility and suicidality in veterans. Do veterans report anger/hostility and suicidality less often, more often, or at the same rate as a function of how long it has been since their separation from the military? Are these rates affected by combat exposure during military service? And if so, how? Answers to these questions are germane to policies that target separated veterans as exemplified by the Joint Action Plan designed to improve the transition from active military service to veteran status by providing “seamless access to mental health treatment and suicide prevention resources in the year following discharge, separation, or retirement” (Executive Order No. 13822, 83 FR 1513, 2018).

Toward that end, this article investigates within a retrospective survey ($N = 2,580$) of Iraq/Afghanistan veterans (a) to what extent—if any—anger/hostility and suicidality are associated with time since separation from the military, and (b) whether those rates are also associated with combat exposure. Based on previous literature, we hypothesize that higher rates will be associated with greater levels of combat exposure and extended postseparation time-in-the-community will be correlated with reduced odds of current anger/hostility and suicidality, that is, reported rates of both problematic conditions will abate with time.

Method

Participants

The current study sample comprised U.S. military veterans enrolled in a cross-sectional cohort study compiled between 2001 and 2018 as part of a multisite study of postseparation mental health (postdeployment mental health [PDMH]) conducted by the Department of Veterans Affairs Mid-Atlantic Mental Illness Research, Education, and Clinical Center (Brancu et al., 2017). All the participants provided written informed consent to participate

in procedures approved by the Institutional Review Board at the Durham VA Medical Center.

The majority were enrolled as eligible to receive health care within the VA health care system (Veterans Health Administration [VHA]) with approximately one-half receiving VHA medical or mental health services. Study participant composition included Iraq/Afghanistan-era veterans, active-duty personnel, and reserve forces members (National Guardsmen and Reservists) who had served since September 11, 2001. Participants were recruited through mailings (all VA patients who met the criteria), advertisements, and VA clinician referrals to provide a purposive convenience sample of individuals largely served by the VA medical centers in the Mid-Atlantic region of the United States. Participants' military service was verified with a copy of their military service documentation form at study enrollment. Starting in 2015, recruitment was modified to oversample women with a target goal of recruiting 1,000 female veteran participants by 2017 (see Brancu et al., 2017 for details of recruitment and enrollment procedures).

Analyses were restricted to a cohort of veterans reporting concise separation dates from the military; instances in which separation and interview dates overlapped (same year) were examined to ensure that respondent status was not on active duty at the time of the interview. Time-in-the-community was defined as the interval between separation from the military and the date of the interview. The final sample was restricted to a cohort of 2,580 veterans with separation times up to 9 years; data beyond was not analyzed due to limited sample sizes. Note also that respondents on active-duty status at the time of the interview were excluded.

Measures

The primary outcomes were anger/hostility and suicidality. These were assessed using six separate measures (Appendix D) indexed by three measures of anger/hostility, two measures of suicidality, and a dichotomous proxy variable denoting a suicide attempt (ever).

Measures of suicidality included: suicidal ideation as measured by Item 9 from the Beck Depression Inventory (BDI; Beck et al., 1996); suicide risk as measured on the first 19 items comprising the Beck Scale for Suicide Ideation (BSS; Beck & Steer, 1991); and past suicide attempts as indexed by Item 20 of the BSS. Note the latter item was excluded from BSS scores described above. Querying past instances of suicide attempts, it is the only measure focusing on past status; the two remaining suicide items—suicidal ideation and suicide risk—represent ratings of current or recent status (within the past week [BSS] or past 2 weeks [BDI Item 9]).

Measures indexing anger and hostility included: a six-item hostility subscale from the Symptom Checklist-90-R (SCL-90-R; Derogatis & Unger, 2010); Item 13 (in the past week: Have you been irritable or had outbursts of anger?) from the Davidson Trauma Scale (DTS; Davidson et al., 1997); and a dichotomous interview item coded positive for problems controlling violent behavior (e.g., hitting someone) in the prior 30 days. Excepting the BSS scale, the text of the measures is presented in Appendix C.

Combat exposure was assessed using the Combat Exposure Scale (CES; Lund et al., 1984). Reflecting nonlinearity and to facilitate interpretation, the underlying CES index was coded as a three-level factor as follows: 0 = *no exposure* (CES = 0: none), 1 = *below-median exposure* (CES between 1 and 13: low), and 2 = *above-median* (CES \geq 14: high); calculation of the median CES value

was restricted to respondents reporting combat exposure. Text of the seven-item CES index is presented in Appendix A; a table describing the distribution and sample size of the scores is presented in Appendix B.

Additional scales describing cohort characteristics (Table 1) include the Connor–Davidson Resilience Scale (Connor & Davidson, 2003), and the Higgins–Biddle and Babor Alcohol Use Disorders Identification Test (Higgins–Biddle & Babor, 2018).

Data Analyses

Analyses were designed to investigate two primary questions: (a) differences in the six outcome measures aggregated over the approximate 9-year postseparation intervals as a function of combat exposure and (b) analyses of changes from postseparation cohort to cohort in those same measures over time. In the first instance, bivariate analyses testing for differences between aggregate levels of combat exposure were based on nonparametric Wilcoxon rank test procedures.

At the second level, temporal effects were evaluated using multivariable procedures based on generalized linear model procedures (SAS 9.4; PROC GLIMMIX or PROC GENMOD). For the latter, tests for the effect of combat exposure were based on a series of generalized linear models regressing each candidate outcome on main effects for age, the proxy variable denoting combat exposure, and an interaction term

crossing the latter with a measure of time since separation per an equal slopes protocol (Littell et al., 2002; W. Stroup et al., 2018).

Time in the multivariable analyses was entered variously as both a continuous factor as well as categorically (using dichotomous proxy variables to denote each temporal cohort) to derive, respectively, an overall measure of time-dependent trend (test for trend, i.e., slope; Table 3) as well as least-square mean estimates at each combination of combat exposure and time (least square mean [LSM] contrasts at specified intervals; Table 4); all models controlled for age. Using adjusted results, differences in least-square means contrasted between levels of combat exposure were tested at each time interval using SAS slice protocols.

The three contrasts of combat status at each postseparation interval included (a) no exposure versus low, (b) no exposure versus high, and (c) low versus high. For trend, the primary interest was on the sign and magnitude of the slope coefficients associated with the time adjusted by the level of combat exposure and age. For continuity, all models were estimated using log-linear regression procedures under an assumed Poisson distribution applying a Pearson correction for overdispersion.

A second focus in both sets of analyses—anger/hostility and suicidality—addressed the effects of postseparation time-in-the-community on time-dependent changes in the rates of occurrence as a function of combat exposure: Were adverse effects associated with combat exposure ameliorated by time? Our hypothesis was twofold: (a) that high levels of combat exposure would be associated with

Table 1
Cohort Characteristics by Level of Combat Exposure

Variable	Total (N = 2,580)	No CES (n = 646)	Lo CES (n = 924)	Hi CES (n = 1,010)	Contrast ^a
Demographics					
Age	37.6 (0.2)	38.6 (0.4)	39.3 (0.3)	35.4 (0.3)	2, 3
Female (%)	21.0	35.0	24.1	9.2	1, 2, 3
White (%)	50.2	43.0	43.5	60.8	2, 3
Education (years)	13.5 (0.7)	13.6 (0.2)	13.7 (0.1)	13.2 (0.1)	2, 3
Married (%)	52.7	50.1	53.2	54.0	
Military history					
Tours	1.6 (0.3)	1.1 (0.1)	1.6 (0.1)	1.9 (0.1)	1, 2, 3
CES	11.6 (0.2)	0.0	6.7 (0.1)	23.4 (0.2)	1, 2, 3
Separated (years)	3.3 (0.5)	4.0 (0.1)	3.3 (0.1)	2.9 (0.1)	1, 2, 3
Clinical scales					
CD-RISC	71.3 (0.4)	77.4 (0.7)	72.2 (0.6)	66.5 (0.6)	1, 2, 3
DTS	43.3 (0.8)	19.9 (1.1)	36.8 (1.2)	64.0 (1.2)	1, 2, 3
BDI	15.5 (0.3)	9.6 (0.4)	14.2 (0.4)	20.4 (0.4)	1, 2, 3
AUDIT	5.0 (0.1)	3.6 (0.2)	4.2 (0.2)	6.7 (0.2)	2, 3
Psychiatric Dx (%)					
SCID PTSD	31.9	9.8	24.5	52.9	1, 2, 3
SCID MDD	20.3	11.1	17.1	29.2	1, 2, 3
PTSD + MDD	14.6	3.9	10.5	25.4	1, 2, 3
Treatment history (%)					
Any MH Hosp	16.1	8.8	13.1	23.8	1, 2, 3
Any MH Outpat	56.5	37.7	52.2	73.0	1, 2, 3
Tx Phy-past3yr	76.7	71.7	73.1	83.3	2, 3
Tx Psy-past3yr	54.2	35.3	49.3	70.9	1, 2, 3
Tx Trma-past3yr	32.3	15.8	23.7	50.6	1, 2, 3

Note. Score denotes mean ± SE or proportion (%). Contrasts were evaluated using Wilcoxon rank tests. No = none; CES = Combat Exposure Scale; Lo = below median; Hi = above median; CD-RISC = Connor–Davidson Resilience Scale; DTS = Davidson Trauma Scale; BDI = Beck Depression Inventory; AUDIT = Alcohol Use Disorders Identification Test; Dx = diagnosis; SCID = Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders; PTSD = posttraumatic stress disorder; MDD = major depressive disorder; Any MH Hosp = any mental health hospitalization; Any MH Outpat = any mental health outpatient treatment; Tx Phy-past3yr = treatment for a physical condition in the past 3 y; Tx Psy-past3yr = treatment for a psychiatric condition in the past 3 y; Tx Trma-past3yr = treatment for a trauma-related condition in the past 3 y.

^a Contrast (*p*-values ≤ .05): 1. Post hoc test between No CES and Lo CES. 2. Post hoc test between No CES and Hi CES. 3. Post hoc test between Lo CES and Hi CES.

higher levels of anger/hostility and suicidality and (b) that prevalence of current anger/hostility and suicidality would diminish with increasingly long postseparation intervals. Although also explored as a function of the postseparation time-in-the-community, endorsement of suicide attempts did not necessarily apply to the immediate postseparation interval (i.e., the attempt could have occurred in years before the interview) and thus, as a function of question structure, represents—based on an increasing time at risk with increasingly long postseparation intervals—a cumulative measure of a history of attempts rather than a current index.

Graphical results included box-and-whisker plots of model-derived least-squares means as well as means and standard errors plotted at each time point for each outcome measured by the level of combat exposure (no CES, low CES, high CES). Nonparametric regressions (local regression) tracing the course of each measure over time were overlaid on mean plots. Analyses were conducted using SAS Statistical Software (SAS 9.4).

Results

Cohort Characteristics

The analysis cohort comprised 2,580 veterans with firm discharge dates; veterans with discharge dates over 9 years were excluded due to the limited sample size. At the time of the interview, cohort age averaged 38 years, was evenly divided between Caucasian and African American races with <2% identifying as other, and had a reported average educational level above 13 years. By gender, women veterans comprised slightly more than one-fifth (21.8%) of the sample. Average time since discharge approached 4 years with multiple tours common.

Psychiatric assessment scores were notable for relatively high ranges on both the DTS, an index of posttraumatic stress, and the BDI. Consistent with high symptom counts, respectively for posttraumatic stress disorder (PTSD) and major depressive disorder (MDD), approximately one-third of the cohort met Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders (SCID) diagnostic criteria for current PTSD (31.6%) while approximately one-fifth met criteria for MDD (19.4%); within the latter two categories, 14.1% were comorbid. Reflecting high diagnostic levels, over 50% of respondents reported episodes of outpatient mental health treatment in the 3 years before the interview (53.2%) with approximately one-third endorsing trauma-centered treatment (32.5%; Table 1).

Cohort Characteristics by Combat Exposure

Cohort characteristics were subsequently reanalyzed after stratification by combat exposure (none vs. low; none vs. high; and low vs. high; Table 1). Effects of exposure on indices of mental health were substantial: veterans reporting exposure were adversely affected on virtually all scales and diagnoses in a graded fashion relative to exposure. Thus, outcomes among respondents with below-median exposure were generally worse when contrasted against respondents with no exposure; respondents with above-median exposure were worse again when contrasted against veterans with below-median exposure.

Demographically, veterans with above-median (high) combat exposure were younger, male, Caucasian, and had, on average, spent approximately 1 year less in the community since discharge (3 years vs. 4 years) relative to veterans not reporting exposure. At the highest level of exposure, 60.8% of respondents identified as

Caucasian versus 37.3% identifying as Afro-American. Levels of combat exposure (limited to veterans endorsing at least some exposure) varied dramatically between the low and high CES subgroups, differing by more than 16 points (6.6—low vs. 23.2—high).

As inferred above, the most striking aspect distinguishing the two combat-exposed cohorts was the magnitude of the difference in psychiatric measures. Veterans with above-median combat exposure scored significantly lower on a measure of psychological resilience (Connor–Davidson Resilience Scale; Connor & Davidson, 2003) and significantly higher on measures of PTSD (DTS; Davidson et al., 1997), depression (BDI-II), and alcohol use (Alcohol Use Disorders Identification Test; Higgins-Biddle & Babor, 2018). Effects of combat exposure on psychiatric status were also reflected in rates of diagnosis and treatment. Current SCID-based diagnoses for PTSD, MDD, comorbid PTSD and MDD, and treatment histories for mental problems—both lifetime and recent—were significantly elevated among respondents expressing high levels of combat exposure relative to low. Note that queries about recent treatment (past 3 years) were added to the interview at a later date and, hence, were not available for all subjects.

Outcomes: Anger/Hostility and Suicidality

Combat Exposure

Aggregated across time, the three outcome measures for anger/hostility and the two outcome measures of suicidality differed significantly across levels of combat exposure (Table 2; Figure 1). Suicide attempts (BSS Item 20) did not differ significantly between levels of no and low combat exposure but were substantially higher among veterans with high exposure relative to the latter two groups. After adjusting for age, all remaining measures increased incrementally and significantly with increasing levels of exposure.

Combat Exposure by Time Since Separation

Temporal Analysis

Two separate sets of models distinguished by temporal status were estimated. Models in the first instance estimated the trend (slope) of outcomes over time treating postseparation time as a continuous factor (Table 3). In the second instance, models were reestimated with time entered as a categorical factor, a prerequisite for deriving separate least-squares mean prevalence estimates at each of the 27 separate permutations of time and combat status (Table 4). Two overall conclusions followed: (a) indices of both domains (anger/hostility and suicidality) were substantially higher as a function of greater levels of combat exposure irrespective of time and (b) measures of anger and hostility trended down with time-in-the-community while measures of suicidality did not.

Trend

Regression coefficients associated with exposure-by-time interaction terms were estimated in a set of six multivariable generalized linear regression models (Table 3). Slope coefficients for indices of anger and hostility among respondents endorsing above-median levels of combat were significant (“problems with violence” marginally so) with negative valence. Inspecting exponentiated coefficients, outcome measures indexing anger and hostility decreased approximately 5% with each increment in time, but only in the high combat condition.

Table 2
Anger/Hostility and Suicide Risk by Combat Exposure

Outcome	No CES (n = 646)	Lo CES (n = 924)	Hi CES (n = 1,010)	Contrast ^a
SCL-90-R: hostility	2.58 (0.16)	4.70 (0.18)	7.93 (0.21)	1, 2, 3
DTS: anger	1.13 (0.08)	2.26 (0.09)	3.87 (0.09)	1, 2, 3
Probs: violence	0.04 (0.01)	0.08 (0.01)	0.16 (0.01)	1, 2, 3
BDI: suicidal ideation	0.09 (0.01)	0.15 (0.01)	0.24 (0.02)	1, 2, 3
BSS: suicide risk	0.57 (0.08)	1.02 (0.10)	1.73 (0.13)	1, 2, 3
BSS: past suicide attempts	0.10 (0.01)	0.09 (0.01)	0.13 (0.01)	2, 3

Note. Scores denote mean ± SE. Contrasts were evaluated using Wilcoxon rank tests. No = none; CES = Combat Exposure Scale; Lo = below median; Hi = above median; SCL-90-R = Symptom Checklist-90-R; DTS = Davidson Trauma Scale; Probs = probabilities; BDI = Beck Depression Inventory; BSS = Beck Scale for Suicide Ideation.

^a Contrast (*p*-values ≤ .05): 1. Post hoc test between No CES and Lo CES. 2. Post hoc test between No CES and Hi CES. 3. Post hoc test between Lo CES and Hi CES.

Coefficients associated with suicidality did not differ significantly from zero. Simply put, anger and hostility among respondents endorsing high combat exposure decreased over time while associations between time and indices of suicidal ideation (Item 9 of BDI-II) and suicide risk (BSS) did not. In contrast with ideation, the association between suicide attempts and time was significant, with positive valence irrespective of combat exposure reflecting the cumulative structure of the underlying question (ever).

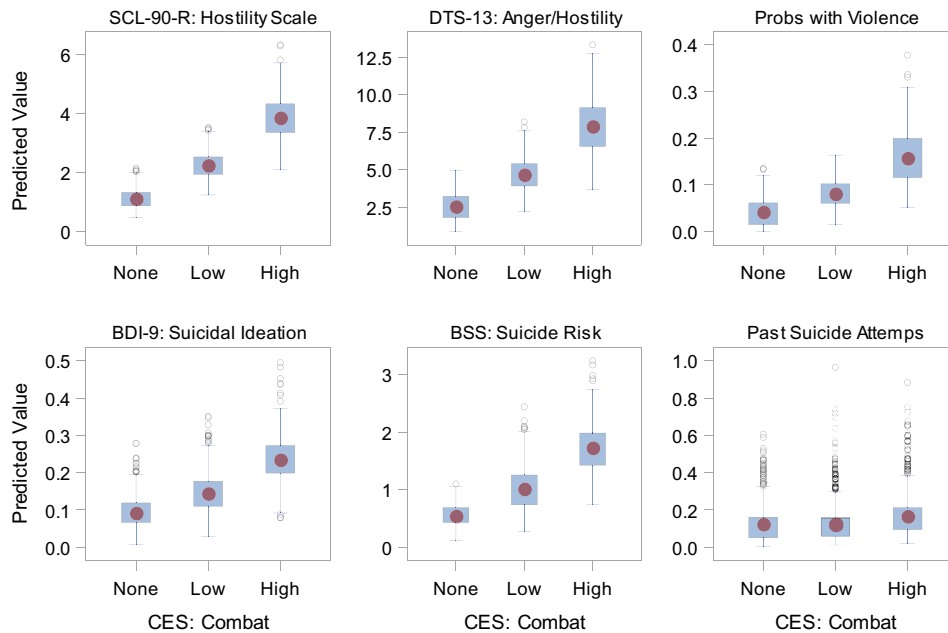
Least-Square Mean Contrasts by Combat Level by Time

Multivariable tests of the association between combat exposure and prevalence rates over time were operationalized in a series of

generalized linear models focusing on differences in rates at nine annualized time points following separation using equal slopes protocols (Littell et al., 2002; W. W. Stroup, 2012). Thus, each outcome measure (SCL-90-R, DTS-13, problems controlling violence, BDI-9, BSS, and BSS-20) was regressed on a model including age, the three-level categorical proxy denoting combat exposure, and an interaction term crossing the latter with time since separation. Three subsequent LSM contrasts were estimated at each of the nine time points contrasting the three permutations of the combat proxy for a total of 27 contrasts (Table 4).

Three general trends were evident: (a) combat exposure adversely affected outcomes—excepting suicide attempts—in a graded manner irrespective of time; (b) levels of anger and hostility at high levels

Figure 1
Model-Predicted Outcomes by Combat Exposure



Note. Predicted values by level of combat exposure. All models include age at interview. SCL-90-R = Symptom Checklist-90-R; DTS = Davidson Trauma Scale; Probs = probabilities; BDI = Beck Depression Inventory; BSS = Beck Scale for Suicide Ideation; CES = Combat Exposure Scale. See the online article for the color version of this figure.

Table 3
Outcomes by Time by Level of Combat

CES	SCL-90-R: hostility scale				BDI Item 9: suicidal ideation			
	Coef	SE	Exp ^{Coef}	Prob	Coef	SE	Exp ^{Coef}	Prob
No	0.01	0.02	1.01	0.714	-0.01	0.05	0.99	0.874
Lo	0.02	0.02	1.02	0.147	0.06	0.04	1.06	0.130
Hi	-0.04	0.01	0.96	0.001	-0.01	0.03	0.99	0.705
	DTS Item 13: anger/hostility				BSS scale: suicide risk			
	Coef	SE	Exp ^{Coef}	Prob	Coef	SE	Exp ^{Coef}	Prob
No	0.03	0.03	1.03	0.323	0.10	0.06	1.10	0.138
Lo	-0.02	0.02	0.99	0.378	0.05	0.04	1.05	0.234
Hi	-0.04	0.01	0.96	0.003	0.00	0.03	1.00	0.911
	Problems controlling violence				BSS Item 20: past suicide attempts			
	Coef	SE	Exp ^{Coef}	Prob	Coef	SE	Exp ^{Coef}	Prob
No	0.17	0.08	1.18	0.036	0.17	0.06	1.18	0.003
Lo	-0.04	0.05	0.96	0.389	0.12	0.05	1.13	0.007
Hi	-0.05	0.04	0.95	0.160	0.14	0.04	1.15	0.000

Note. Coefficients represent a change in outcomes over postseparation time and are in the model scale. Exp^{Coef} are expressed in a data scale. SCL-90-R = Symptom Checklist-90-R; BDI = Beck Depression Inventory; CES = Combat Exposure Scale; No = none; Lo = below median; Hi = above median; DTS = Davidson Trauma Scale; BSS = Beck Scale for Suicide Ideation.

of exposure decreased over time while measures indexing suicidal ideation did not; (c) suicide attempts in the aggregate were higher among veterans with greater levels of combat exposure, but not in general (excepting year-7) when contrasted at specific time points

(Table 4; Figure 2). Although trend lines derived from regressions appear to indicate that the number of suicide attempts was elevated in the high combat condition (Figure 2), this was not statistically supported (Table 4).

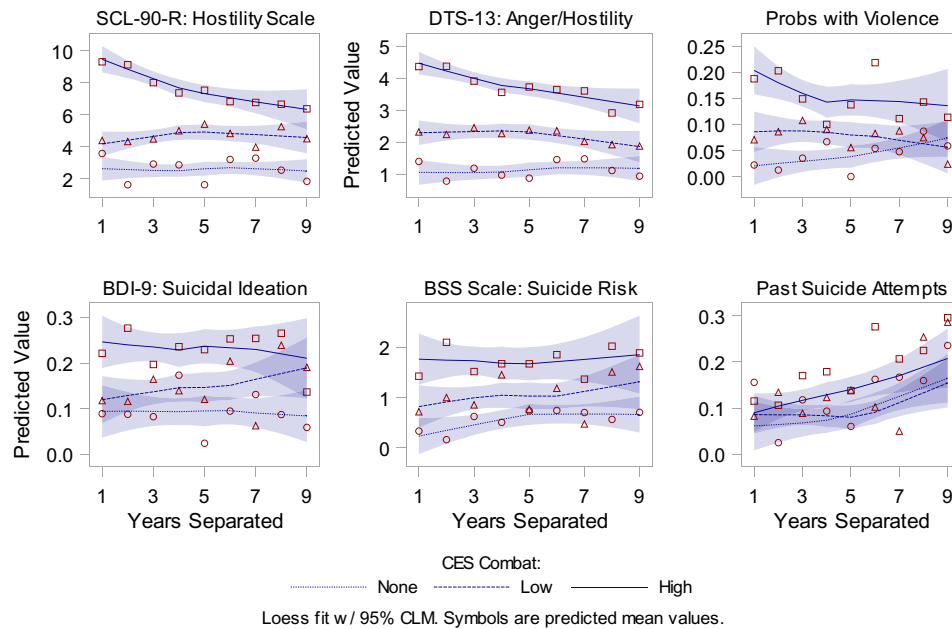
Table 4
Effects by Level of Combat Exposure Over Time (Years Postmilitary Separation)

Yr	SCL-90-R: Hostility Scale				DTS Item 13: anger/hostility				Problems controlling violence			
	No CES	Lo CES	Hi CES	Contrast ^a	No CES	Lo CES	Hi CES	Contrast ^a	No CES	Lo CES	Hi CES	Contrast ^a
1	3.25	4.22	8.60	2, 3	1.25	2.37	4.23	1, 2, 3	0.02	0.07	0.19	2, 3
2	1.51	4.17	8.49	1, 2, 3	0.74	2.17	4.25	1, 2, 3	0.01	0.08	0.20	1, 2, 3
3	2.78	4.32	7.50	1, 2, 3	1.14	2.38	3.83	1, 2, 3	0.03	0.10	0.14	2
4	2.77	5.20	7.27	1, 2, 3	1.11	2.32	3.60	1, 2, 3	0.06	0.09	0.10	
5	1.51	5.41	7.25	1, 2, 3	0.95	2.32	3.70	1, 2, 3	0.00	0.05	0.14	3
6	2.98	5.15	6.68	1, 2	2.24	2.41	3.63	1, 2, 3	0.05	0.08	0.22	2, 3
7	3.27	3.92	6.75	2, 3	2.17	1.95	3.65	2, 3	0.04	0.10	0.11	
8	2.58	5.65	6.91	1, 2	2.38	2.03	3.04	1, 2	0.09	0.09	0.15	
9	1.96	4.60	6.79	1, 2	0.95	1.86	3.40	1, 2, 3	0.06	0.02	0.12	
Yr	BDI Item 9: suicidal ideation				BSS: suicide risk				BSS Item 20: past suicide attempts			
	No CES	Lo CES	Hi CES	Contrast ^a	No CES	Lo CES	Hi CES	Contrast ^a	No CES	Lo CES	Hi CES	Contrast ^a
1	0.09	0.11	0.21		0.33	0.71	1.30		0.12	0.06	0.10	
2	0.08	0.11	0.27	2, 3	0.16	1.00	2.01	1, 2, 3	0.02	0.11	0.09	1, 2
3	0.08	0.16	0.19	2	0.60	0.84	1.44	2	0.09	0.07	0.15	
4	0.17	0.14	0.24		0.51	1.51	1.69	1, 2	0.07	0.12	0.17	
5	0.01	0.12	0.23	1, 2	0.70	0.77	1.63	2, 3	0.05	0.11	0.13	
6	0.09	0.20	0.25	2	0.71	1.11	1.83	2	0.13	0.11	0.25	3
7	0.12	0.05	0.25	3	0.69	0.47	1.32		0.13	0.05	0.20	1
8	0.09	0.25	0.27	1, 2	0.56	1.55	2.02	2	0.13	0.28	0.23	
9	0.06	0.19	0.14		0.70	1.65	1.91		0.21	0.24	0.33	

Note. Models were estimated using generalized linear regression procedures. Results are model-predicted outcome estimates by postseparation intervals. SCL-90-R = Symptom Checklist-90-R; DTS = Davidson Trauma Scale; No = none; CES = Combat Exposure Scale; Lo = below median; Hi = above median; BDI = Beck Depression Inventory; BSS = Beck Scale for Suicide Ideation.

^a Contrast (p -values ≤ 0.05): 1. Post hoc test between No CES and Lo CES. 2. Post hoc test between No CES and Hi CES. 3. Post hoc test between Lo CES and Hi CES.

Figure 2
Anger/Hostility and Suicidality by Combat Exposure and Time Since Discharge



Note. Loess fit w/ 95% CLM. Symbols are predicted mean values. SCL-90-R = Symptom Checklist-90-R; DTS = Davidson Trauma Scale; Probs = problems; BDI = Beck Depression Inventory; BSS = Beck Scale for Suicide Ideation; CES = Combat Exposure Scale; CLM = confidence level of the mean. See the online article for the color version of this figure.

Discussion

The above findings inform rates of anger/hostility and suicidality in a cohort of Iraq/Afghanistan veterans as a function of both post-separation time-in-the-community and prior combat exposure. Three primary findings follow: (a) exposure to combat was significantly associated with a higher prevalence of both anger/hostility and suicidality (Table 2; Figure 1); (b) prevalence of hostility and anger among veterans exposed to high levels of combat significantly decreased with time-in-the-community over the decade-long interval covered by the study whereas rates of suicidality remained high and constant (Table 3; Figure 2); and (c) nonetheless, even at longer postseparation intervals, both anger/hostility and suicidality remained elevated among respondents endorsing above-median exposure to combat.

Regarding the effects of time, we hypothesized that reports of both anger/hostility and suicidality would decrease with time. In fact, the former's measures decreased with time since separation but only for respondents endorsing above-median levels of combat exposure. In contradistinction to our hypothesis and to findings related to anger, the prevalence of suicidality remained relatively constant over time.

These findings have important clinical and policy implications. Based on multivariable analyses, rates in measures indexing suicidality among veterans did not decrease as a function of years postseparation. A policy implication following from the latter observations on the enduring nature of suicide risk would suggest enhanced and extended programmatic efforts to assess and treat suicidality at longer postseparation intervals with a particular focus on veterans

exposed to high levels of combat. While preventative measures focusing on problems of reintegration at the early stages of separation are undoubtedly appropriate, such services should optimally be extended to include longer postseparation intervals. Informing this risk, research on veterans has shown that protective factors in various life domains (e.g., vocational, financial, social, physical, psychological, and spiritual) are associated with reduced odds of suicidal ideation (Elbogen et al., 2020).

In addition to observations documenting the constancy of suicidality over time, we also observed an increase in the prevalence of prior suicide attempts (any) in longer-dated cohorts. The increase itself is partly explained by the cumulative structure of the question (Appendix C) which lacks temporal specification. Nonetheless, evidence of a prior attempt, regardless of recency, stands as a signal indicator for the risk of subsequent attempts (Bostwick et al., 2016), and, while the increase in prevalence with longer-dated cohorts is in part an artifact of question structure (i.e., increased time at risk), the higher levels of endorsement of this high-risk indicator with increasing duration of time since separation further confirms the importance of recognizing the need for continued programmatic vigilance and treatment for suicide risk.

Additional policy implications regard programs addressing anger and hostility in veterans. Stressors—for example, personal, housing, social, economic, etc.—for veterans in the period immediately following separation are well documented (Elbogen, Johnson, Newton, et al., 2014; Wilks et al., 2020). Speculatively, anger and hostility in these early periods may be manifestations of stress with subsequent decreases over time mediated by decreases in these emotions as veterans adjust to civilian life. Despite this, and

although rates indexing anger/hostility among veterans endorsing above-median levels of combat exposure decreased significantly with increasing time since separation, rates nonetheless remained elevated at longer postseparation intervals (Table 4; Figure 2), perhaps as a sequela of ongoing PTSD and depression (Kimbrel et al., 2014). Anger management treatments have shown therapeutic benefits for veterans—including those diagnosed with PTSD (Morland et al., 2020; Wilks et al., 2019). The current findings point to an enduring need among veterans with higher levels of combat exposure for such programmatic interventions extending well beyond the immediate postseparation period.

Limitations of this study include a self-selected sample, and as such is not necessarily representative across all veterans. An initial aim of the PDMH study was to provide an assessment of the mental health and resilience of post-9/11 veterans. It provides an invaluable resource in that respect, and although prior research on the sample has shown that it is representative of the veteran population in the southeast region of the United States and is comparable to the U.S. veteran population serving after 9/11 (Brancu et al., 2017), its provenance remains a caveat.

Analyses are focused on nine cohorts defined by the interval between the time of military separation and the PDMH clinical interview. Although intervals within a cohort are homogeneous, interview dates are not; accordingly, we cannot exclude a possible temporal confound. As a third limitation, collected data were based on self-report and are vulnerable to variations in recall over time, particularly at extended intervals. Although age is included as a covariate in all models, given the numerous long postseparation intervals, recall nonetheless remains a vulnerability. As an additional limitation, both anger/hostility and suicide may be under-reported; future studies incorporating collateral sources would strengthen findings. Furthermore, timeframe is not specified in the BSS item on suicide attempts; future research should examine whether temporal order of events took place before, during, or after military service.

Treatment history was added to the survey protocol postinception at a later point. As such it was unavailable for earlier study intervals and was not incorporated into the study design. Based on the limited data available, treatment increased with increasing combat exposure but remained constant over time, supporting an assumption that treatment need and treatment utilization were at least partially associated. Nonetheless, we have limited data on the receipt of treatment and none on its amount or quality; thus further elucidation of the extent and quality of treatment related to combat experience postseparation remains a priority focus for further study.

The CES is a seven-item scale querying combat exposure focusing on combatants but fails to ask about combat experiences related to noncombatants (e.g., injury to civilians/children). The latter is a critical component of trauma related to moral injury, and the lack of its inclusion is an important limitation. Lastly, the study findings are based on panel data and do not address within-subject change. A second wave of follow-up interviews with study participants is currently underway but, as of this time, is not yet available for analysis.

Summarizing, we observed (a) that higher levels of combat exposure were associated with overall significantly higher levels of both anger/hostility and suicidality, (b) that rates in measures indexing anger/hostility among veterans endorsing above-median levels of combat exposure decreased significantly with increasing time since separation, while in contrast, rates in measures indexing

suicidality among veterans did not decrease as a function of the number of years postseparation, and (c) that nonetheless, even at longer postseparation intervals, both anger/hostility and suicidality remained elevated among respondents endorsing above-median exposure to combat. These findings suggest that for a subset of combat-exposed veterans, efforts at community support, outreach, and treatment not only must address the period of transition from the military to the community but also must recognize the importance of addressing these critical needs and problems well beyond the immediate postseparation time period.

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(Appendices follow)

Appendix A

Combat Exposure Scale

<p>Item 1: Did you ever go on combat patrols or have other very dangerous duty?</p> <p>0 = <i>no</i> 1 = <i>1–3 times</i> 2 = <i>4–12 times</i> 3 = <i>13–50 times</i> 4 = <i>51+ times</i></p> <p>Item 2: Were you ever under enemy fire?</p> <p>0 = <i>never</i> 1 = <i><1 month</i> 2 = <i>1–3 months</i> 3 = <i>4–6 months</i> 4 = <i>7 months or more</i></p> <p>Item 3: Were you ever surrounded by the enemy?</p> <p>0 = <i>no</i> 1 = <i>1–2 times</i> 2 = <i>3–12 times</i> 3 = <i>13–25 times</i> 4 = <i>26+ times</i></p> <p>Item 4: What percentage of the men in your unit were killed (Killed in action), wounded, or Missing in action?</p> <p>0 = <i>none</i> 1 = <i>1%–25%</i></p>	<p>2 = <i>26%–50%</i> 3 = <i>51%–75%</i> 4 = <i>76% or more</i></p> <p>Item 5: How often did you fire rounds at the enemy?</p> <p>0 = <i>never</i> 1 = <i>1–2 times</i> 2 = <i>3–12 times</i> 3 = <i>13–50 times</i> 4 = <i>51+ times</i></p> <p>Item 6: How often did you see someone hit by incoming or outgoing rounds?</p> <p>0 = <i>never</i> 1 = <i>1–2 times</i> 2 = <i>3–12 times</i> 3 = <i>13–50 times</i> 4 = <i>51+ times</i></p> <p>Item 7: How often were you in danger of being injured or killed (e.g., pinned down, overrun, ambushed, near miss, etc.)?</p> <p>0 = <i>never</i> 1 = <i>1–2 times</i> 2 = <i>3–12 times</i> 3 = <i>13–50 times</i> 4 = <i>51+ times</i></p>
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Appendix B

Combat Exposure Scores by Postseparation Years

Table B1
Combat Exposure as Measured in Years Postseparation From the Military

CES score	0			1–13			14–40		
	<i>n</i>	<i>M</i>	<i>SE</i>	<i>n</i>	<i>M</i>	<i>SE</i>	<i>n</i>	<i>M</i>	<i>SE</i>
Year									
0	45	0.00	0.00	85	6.87	0.41	113	24.86	0.67
1	80	0.00	0.00	164	7.08	0.27	217	23.53	0.43
2	85	0.00	0.00	158	7.14	0.30	188	23.11	0.47
3	75	0.00	0.00	122	6.52	0.33	140	23.76	0.56
4	83	0.00	0.00	108	6.03	0.34	109	22.40	0.63
5	74	0.00	0.00	98	6.48	0.36	87	23.24	0.65
6	84	0.00	0.00	80	6.33	0.43	63	23.87	0.90
7	69	0.00	0.00	67	6.60	0.47	49	22.00	0.95
8	51	0.00	0.00	42	5.93	0.65	44	23.80	0.87
All	646	0.00	0.00	924	6.66	0.12	1,010	23.44	0.21

Note. CES = Combat Exposure Scale.

(Appendices continue)

Appendix C

Outcome Measures

Beck Depression Inventory

- Item 9:
 0 = *I don't have any thoughts of killing myself*
 1 = *I have thoughts of killing myself, but I would not carry them out*
 2 = *I would like to kill myself*
 3 = *I would kill myself if I had the chance*

Beck Scale for Suicide Ideation (BSS)

- Item 20:
 0 = *I have never attempted suicide*
 1 = *I have attempted suicide once*
 1 = *I have attempted suicide two or more times*

Davidson Trauma Scale

- Item 13: Have you been irritable or had outbursts of anger?
 0 = *no*
 1 = *yes*

Symptom Checklist 90

- Item 11: Feeling easily annoyed or irritated
 Item 24: Temper outbursts that you could not control
 Item 63: Having urges to beat, injure, or harm someone
 Item 67: Having urges to break or smash things
 Item 74: Getting into frequent arguments
 Item 81: Shouting or throwing things
 0 = *not at all*
 1 = *a little bit*
 2 = *moderately*
 4 = *quite a bit*
 5 = *extremely*

Postdeployment mental health registry:

- During the past 30 days, have you had trouble controlling violent behavior (e.g., hitting someone)?
 0 = *no*
 1 = *yes*

Appendix D

Psychometrics: Outcomes

Table D1
Primary Outcome Measures: Psychometrics

Outcome	<i>M</i>	<i>SD</i>	<i>SE</i>	Min	Max
SCL-90-R hostility	5.24	5.91	0.12	0	24
DTS violence	2.53	2.82	0.06	0	8
Probs w/ viol	0.10	0.29	0.01	0	1
Suicidal Ideation	0.16	0.39	0.01	0	3
BSS score	1.17	3.24	0.06	0	29
Any suicide attempts	0.11	0.31	0.01	0	1

Note. Min = minimum; Max = maximum; SCL-90-R = Symptom Checklist-90-R; DTS = Davidson Trauma Scale; Probs w/viol = problems with violence; BSS = Beck Scale for Suicide Ideation.

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