Suicidal or Self-Harming Ideation in Military Personnel Transitioning to Civilian Life

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Suicides have markedly increased among military personnel in recent years. We used path analysis to examine factors associated with suicidal/self-harming ideation among male Navy and Marine Corps personnel transitioning to civilian life. Roughly 7% of men (Sailors = 5.3%, Marines = 9.0%) reported ideation during the previous 30 days. Results suggest that combat exposure, substance abuse, and resilience are associated with suicidal ideation/self-harming thoughts through the mediation of posttraumatic stress disorder symptoms and/or depression symptoms. Substance abuse plays a moderating role. Resilience had a direct effect only among the Marines. Implications for improving the transition to civilian life are discussed.

Deployment for combat operations has been associated with significant mental health problems in military personnel (Hoge et al., 2004; Tanielian & Jaycox, 2008), with many troops returning from recent deployments with mental health disorders or eventually seeking mental health care (Andrews, Brewin, Philpott, & Stewart, 2007; Bliese, Wright, Adler, & Thomas, 2004; Hoge, AUCHTERLONIE, & Milliken, 2006). Increased psychological symptoms associated with sustained high levels of combat stress have been associated with an increase in suicide and suicidal ideation. A study of naval personnel found that 2.4–4.9% reported suicidal thoughts during various deployment phases (McNulty, 2005), and of 425 deployed soldiers seen for mental health reasons, nearly 30% had considered suicide within the past month (Hill, Johnson, & Barton, 2006). Recent rates of attempted and completed suicides within the U.S. Army have quintupled and doubled, respectively, compared to rates before the invasion of Iraq in 2003 (Pessin, 2008; Suicide Risk Management & Surveillance Office, Army Behavioral Health Technology Office, 2008), and calls to a Veterans Affairs suicide hotline more than doubled within its first year (CBS News/Associated Press, 2008). Although suicidal thinking is well studied in civilian groups, the challenges of war and deployment present additional factors to be considered among service members.

There is ample support in the existing literature to justify modeling the relationship...
between depression and posttraumatic stress disorder (PTSD) and subsequent development of suicidal thinking in a military population. That depression can predict suicidal ideation is documented in nationally representative studies (e.g., Nock, Hwang, Sampson, & Kessler, 2010). Research suggests PTSD symptoms directly influence depression (Asmundson, Stein, & McCreary, 2002; Wittmann, Moergeli, Martin-Solech, Znoj, & Schnyder, 2008), comorbid PTSD and depression represent a shared vulnerability (Wittmann et al., 2008), and individuals with comorbid depression and PTSD are more likely to contemplate or attempt suicide than those with either condition alone (Campbell et al., 2007; Jakupcak et al., 2009; Oquendo et al., 2005). A meta-analysis of 50 articles lends further support to depression as a mediating factor between PTSD and suicidality (Krysinska & Lester, 2010). Substance abuse or dependence increases the risk of depression (Fergusson, Boden, & Horwood, 2009), has been linked with suicidal ideation (Berglund & Ojehagen, 1998; Grant & Hasin, 1999; Murphy & Wetzel, 1990), exacerbates both PTSD and depression symptoms (Jacobsen, Southwick, & Kosten, 2001; Myrick, Cluver, Swavely, & Peters, 2004), and appears to make the move from suicidal ideation to an attempt more likely (Nock et al., 2010). Given increases in drug- and alcohol-related problems among Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans, especially those reporting combat exposure (Dedert et al., 2009; Jacobson et al., 2008), substance abuse is an important factor to consider when examining mental health outcomes among military personnel. The increased number of service members returning with symptoms of PTSD following deployment underscores the importance of understanding the role deployment, in general, and more specifically, combat exposure, play in the development of PTSD, depression, and suicidal thinking. In a review of 29 studies providing prevalence estimates among OEF/OIF veterans, combat exposure emerged as the only consistent correlate associated with PTSD (Ramchand et al., 2010), and both deployment and combat severity among deployed personnel were associated with pre- to postdeployment increases in reported PTSD symptoms (Vasterling et al., 2010).

In addition to positive screens for PTSD, depression, and problematic substance use, OEF/OIF veterans contemplating suicide have reported decreased resilience (Pietrzak et al., 2010). The concept of psychological resilience encompasses those qualities that allow an individual to cope with stressful situations and persevere during times of adversity (Connor & Davidson, 2003). Lower resilience has been reported in persons with a history of suicide attempts and is associated with increased depression symptoms (Roy, Sarchiapone, & Carli, 2007), while similar concepts, such as hardness, have been shown to protect against the development of chronic PTSD following combat exposure (King, King, Fairbank, Keane, & Adams, 1998; Waysman, Schwarzwald, & Solomon, 2001).

Since current combat operations began in Iraq and Afghanistan, tens of thousands of Sailors and Marines have transitioned from the military to civilian life, with many exposed to deployment stressors that have put them at high risk for developing psychological disorders. Some may have experienced a delayed onset of symptoms that were missed by postdeployment health assessments, or may no longer fear the potential negative consequences associated with reporting mental health problems (e.g., stigma, effects on promotion, and deployment). Furthermore, military personnel screening positive for mental health conditions are more likely to leave military service than those screening negative (Hoge et al., 2006), leaving transitioning personnel as a critical target population for mental health screening, surveillance, and intervention. To date, however, little research has focused on this group.

In this study, we examined the relationship between combat exposure and suicidal or self-harming ideation while accounting for the potential mediating effects of PTSD.
and depression symptoms in Navy and Marine Corps personnel during transition from active duty to civilian life. We hypothesized that PTSD, substance abuse, and trauma related to combat exposure would influence thoughts of harming oneself through their ultimate effects on depression, and that resilience would mitigate these effects. Specifically, we used path analysis to evaluate (1) the direct effects of combat exposure on suicidal ideation; (2) the indirect effects of combat exposure on suicidal ideation mediated through PTSD and depression symptoms; and (3) the role of resilience, substance abuse, and service branch in moderating these effects.

**METHODS**

Participants were male Navy and Marine Corps personnel attending mandatory pre-separation classes and workshops at installations (military bases) selected to include a cross-section of mission types; that is, air, surface, and sea-based units, and having a large concentration of separating personnel. Introductory survey sessions were conducted at 13 installations (7 Navy, 6 Marine Corps) and attended by 6,772 individuals preparing to discharge from active-duty service for various reasons including retirement, end of military service term, and physical or mental condition interfering with military service. Attendees were asked to complete a 30–45 minute survey designed to advance the understanding of health-related issues in separating Sailors and Marines. Besides recent suicidal or self-harm ideation, the survey included questions about other mental health symptoms, substance abuse, combat and deployment, and general well-being. Participants were told that their social security numbers would be requested to link survey data with personnel and medical records for analysis purposes only, and that all data would be kept confidential. Although attendance at the introductory briefing was mandatory, participation in the survey was voluntary. Baseline and follow-up study protocols were approved by the institutional review boards of RTI International and the Naval Health Research Center, and signed consent was obtained from each participant.

**Measures**

Suicidal/self-harming ideation was assessed by an item from the PHQ-9 (the 9-item depression module of the Patient Health Questionnaire) asking respondents, “Over the past month have you been bothered by thoughts that you would be better off dead or of hurting yourself in some way?” (Kroenke, Spitzer, & Williams, 2001). This particular item has also been used as a first-level screen for suicidal ideation in previous studies of military personnel (e.g., Bray et al., 2010).

The 20-item Center for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977) was used to assess the frequency of depressive symptoms over the previous week, and has been shown to be a valid and reliable measure across racial, gender, and age categories (Knight, Williams, McGee, & Olaman, 1997; Radloff, 1977; Roberts, Vernon, & Rhoades, 1989). Symptom frequency is rated from 0 (none of the time) to 3 (all of the time) and items are summed for a total score. Respondents missing up to three items had scores for those items imputed using the mean of the nonmissing items, whereas individuals missing more than three items had their total score set to missing.

PTSD symptoms were assessed using the PTSD Checklist-Civilian Version (PCL-C; Weathers, Litz, Huska, & Keane, 1994), a 17-item assessment corresponding to PTSD diagnostic criteria in the most recent revision of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*; American Psychiatric Association, 2000) and supported as a valid and reliable screening instrument (e.g., Keen, Kutter, Niles, & Krinsley, 2008; Ruggiero, Del Ben, Scotti, & Rabalais, 2003). Respondents rate the degree to which they were bothered by each problem in the past month using a 5-point scale (1 = not at all, 5 = extremely). The total score was used as a continuous predictor in this
study. If a respondent was missing more than three of the items, their overall score was also missing. Although a military version of the PCL exists (PCL-M), the PCL-M asks respondents to consider symptoms of PTSD specifically related to military experiences (Weathers, Litz, Herman, Huska, & Keane, 1993), whereas the PCL-C evaluates symptoms resulting from any past traumatic event, not only those attributable to military service. Assessing both military and nonmilitary sources of PTSD symptoms is recommended when considering treatment options among military personnel (National Center for PTSD, Department of Veterans Affairs, 2004), and was one aim of the larger study.

To assess combat exposure, respondents rated the frequency (0 = never to 4 = 51 or more times) with which they experienced 17 potentially traumatic combat experiences (e.g., “I saw dead bodies or human remains”; “I was wounded in combat”) during their last deployment, with responses summed for a total score. If a respondent was missing three or more of the items, their overall score was also missing. Items were modified from various measures of combat trauma, including items used in research on recent conflicts (Hoge et al., 2004; Litz, King, King, Orsillo, & Friedman, 1997), the Deployment Risk and Resilience Inventory (DRRI; King, King, & Vogt, 2003), the seven-item Combat Exposure Scale (CES; Keane et al., 1989), and an additional item regarding questioning of detainees or prisoners. Questions assessing the number of months deployed for combat operations during the past year (i.e., previous 12 months) were also included. This time frame was adopted to provide an anchor for the mental health measures that inquired about more recent symptoms. Revised questionnaire items are available upon request.

Substance abuse symptoms were measured with the two-item conjoint screen (TICS; Brown, Leonard, Saunders, & Papasouliotis, 2001), shown to detect current alcohol or other drug problems with nearly 80% sensitivity and specificity when validated against the Composite International Diagnostic Interview—Substance Abuse Module (CIDI-SAM; Cottler, Robins, & Helzer, 1989; Janca, Robins, Bucholz, Early, & Shykia, 1992) and laboratory tests. “Yes” (1) or “no” (0) responses to “In the past year, have you ever drunk alcohol or used drugs more than you meant to?” and “Have you felt you wanted or needed to cut down on your drinking or drug abuse in the past year?” were summed for the TICS score (0 = no disorder, 1 = substance abuse, 2 = substance dependence). Besides successful use of the TICS in military population health research (Hoge et al., 2004), conjoint questions can be preferable to items on individual substances when respondents fear stigma, disciplinary action, or legal ramifications for illicit drug use—as is likely to be the case in an identifiable survey of service members—since any positive response to a conjoint item could be entirely for alcohol use (Brown & Rounds, 1995; Brown et al., 2001). If a respondent left either item blank it was assumed to be a “no” response and set to zero; however, TICS scores were set to missing if both items were left blank.

The 25-item Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) was used to assess resilience and stress coping over the past month with items rated from 0 (not at all true) to 4 (true nearly all of the time). The scale builds on the work of previous researchers on hardness, action orientation, self-efficacy, confidence, adaptability, patience, and endurance in the face of adversity. The CD-RISC demonstrates good internal consistency (Cronbach’s alpha = .89) and test–retest reliability (intraclass correlation coefficient = .87) in the general population, as well as in clinical samples. It correlates well with measures of stress (Pearson $r = -0.76$, $p < .001$) and hardiness (Pearson $r = 0.83$, $p < .0001$), and reflects different levels of resilience in populations that are thought to be differentiated, among other ways, by their degree of resilience (e.g., general population vs. patients with anxiety disorders; Connor & Davidson, 2003). If up to five items were missing, those items were imputed with the mean across the nonmissing items. Respondents missing more than
five items had their CD-RISC score set to missing.

With the exception of the TICS, scores for missing items were imputed if the scale’s authors had provided such guidance. If no imputation strategy was suggested, total scores for each measure were set to missing based on (1) guidelines from the scale authors, if provided, and if not, (2) respondents missing roughly 20% or more of the scale items. As we assumed a conservative response if missing one item on the TICS (i.e., a respondent’s failure to endorse problematic drinking or drug use), one missing item was allowed for this measure.

Data Analysis

To control potential bias, analysis weights were ratio adjusted to match fiscal year 2007 separation data across service branch, gender, race, age, pay grade, and marital status. The distribution for these characteristics in our purposive sample was very similar to the 2007 separating population as determined by the Department of Defense (DoD) Career History Archival Medical and Personnel System (CHAMPS) database described elsewhere (Gunderson, Garland, Miller, & Gorham, 2005). Consequently, the weight adjustment yielded a very low overall unequal weighting effect (1.09).

The proposed model, including the hypothesized statistical mediation, was fit using path analysis, a methodology used to fit a complex statistical model to the covariance matrix of a data set. The advantage of this method is that it allows one to specify and test relationships among a group of variables in a single model that otherwise would need to be tested in several separate models. If the model-implied covariances fit the data’s observed covariance matrix, the model is one possible explanation of the data, although not necessarily the only explanation as alternative models may fit the data equally well.

We tested mediation effects by testing the product of coefficients (Edwards & Lambert, 2007; MacKinnon, Fairchild, & Fritz, 2007; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) along the various meditational paths using the delta method (Sobel, 1982). Data cleaning and editing were performed using SAS version 9.1.3 software (SAS Institute Inc.; Cary, NC), and the analysis was conducted in Mplus version 5 (Muthén & Muthén, 1998–2007). We estimated the models using maximum likelihood estimation and the standard errors for all direct and indirect effects were derived using a bootstrap resampling approach with 500 draws. A multiple-groups model was applied to allow for separate model estimation and testing in the two service branches, although no tests for equivalence across the groups were conducted as we had no hypotheses directed at such questions. All cases were included in the analysis despite missing data through the multiple-groups approach to handle missing data (Muthén, Kaplan, & Hollis, 1987), resulting in unbiased results under the assumption that the missing data are missing at random.

The core of the model comprised a meditational path from combat exposure through PTSD and depression symptoms, to self-reported suicidal or self-harming ideation. Resilience was included and hypothesized to moderate the effect of combat exposure on the development of PTSD, depression symptoms, and suicidal/self-harming ideation. Substance abuse was hypothesized to moderate the effect of PTSD symptomatology on depression symptoms and suicidal/self-harming ideation. All direct effects and possible indirect effects were included in the initial and subsequent models to test for mediation. The fits of the path models were assessed using the fit measures recommended by Hu and Bentler (1995, 1998, 1999) and MacCallum and Austin (2000): standardized root-mean-square residuals (SRMR), comparative fit index (CFI), root-mean-square error of approximation (RMSEA), and Tucker-Lewis index (TLI). Suggested criteria for acceptable model fit values for these indices are .08 or lower for SRMR, .95 or higher for CFI and TLI, and .08 or lower for RMSEA (Hu & Bentler, 1999).
RESULTS

Of the 6,772 individuals who attended one of the introductory survey sessions, 3,746 returned completed surveys (55% response rate). No nonresponse information was available to compare respondents and nonrespondents. Those missing data for gender, service, or suicidal ideation (n = 131) or individuals with invalid responses for one or more of the modeled variables (n = 4) were excluded from further analysis. Due to insufficient variation in the combat exposure measure, women (n = 546) were also excluded, yielding a final sample of 3,069. Missing data for other study variables were minimal (<3%), with the exception of age (5.3%).

Table 1 provides respondent characteristics by branch of service. Suicidal or self-harming ideation during the past 30 days was reported among approximately 7% of respondents, 5.3% of Navy and 9.0% of Marine Corps personnel. Compared with Sailors, Marines in the study were more likely to be younger, unmarried, non-Hispanic White, of lower rank, experiencing symptoms of depression or PTSD, with a higher percentage reporting substance abuse or dependence, and with lower reported levels of resilience. Time spent deployed during the past year was similar for men in both services, whereas Marines reported more than twice as much combat exposure as Sailors.

Pearson correlations between model variables are presented for Sailors and Marines in Tables 2 and 3, respectively. Significant associations were found among suicidal ideation, symptoms of depression and PTSD, and substance abuse for both services, as was a significant negative association between resilience and these variables. Combat exposure was significantly associated with symptoms of PTSD among all personnel, but was also associated with depression and substance abuse among Marines.

The full model described earlier was fit with subsequent minor trimming. In this initial model, the moderating effects of resilience on combat exposure in regressions of PTSD and depression symptoms and suicidal/self-harming ideation were all non-significant. Only the main effects of resilience and combat exposure predicting any of these variables showed significance. Hence, we simplified the model by removing the interaction, and in all regressions involving them kept only the resilience and combat exposure main effects.

Substance abuse remained in the model as a moderator of the effects of PTSD

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Navy</th>
<th>Marine corps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 1,843)</td>
<td>(n = 1,226)</td>
</tr>
<tr>
<td>Age (Years)</td>
<td>31.8 (8.9)</td>
<td>25.8 (5.5)</td>
</tr>
<tr>
<td>Race/ethnicity (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>57.9</td>
<td>67.8</td>
</tr>
<tr>
<td>Other</td>
<td>42.1</td>
<td>32.2</td>
</tr>
<tr>
<td>Marital status (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not marrieda</td>
<td>43.1</td>
<td>54.7</td>
</tr>
<tr>
<td>Married, spouse not present</td>
<td>11.1</td>
<td>13.8</td>
</tr>
<tr>
<td>Married, spouse present</td>
<td>45.8</td>
<td>31.5</td>
</tr>
<tr>
<td>Paygrade (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E1–E3</td>
<td>11.6</td>
<td>20.7</td>
</tr>
<tr>
<td>E4–E6</td>
<td>65.6</td>
<td>70.1</td>
</tr>
<tr>
<td>E7–E9</td>
<td>14.3</td>
<td>4.7</td>
</tr>
<tr>
<td>W1–W5</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>O1–O3</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>O4–O6</td>
<td>5.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Past year combat deployment (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 months</td>
<td>53.3</td>
<td>38.4</td>
</tr>
<tr>
<td>1–6 months</td>
<td>27.8</td>
<td>17.0</td>
</tr>
<tr>
<td>7–12 months</td>
<td>18.9</td>
<td>44.6</td>
</tr>
<tr>
<td>Suicidal/self-harm ideation (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5.3</td>
<td>9.0</td>
</tr>
<tr>
<td>No</td>
<td>94.7</td>
<td>91.0</td>
</tr>
<tr>
<td>Combat exposure</td>
<td>2.1 (5.6)</td>
<td>10.2 (11.3)</td>
</tr>
<tr>
<td>PTSD symptoms</td>
<td>30.3 (13.7)</td>
<td>38.0 (17.1)</td>
</tr>
<tr>
<td>Depression symptoms</td>
<td>12.9 (10.3)</td>
<td>17.4 (11.7)</td>
</tr>
<tr>
<td>Substance use—TICS (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No disorder</td>
<td>58.7</td>
<td>44.5</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>23.4</td>
<td>26.3</td>
</tr>
<tr>
<td>Substance dependence</td>
<td>18.0</td>
<td>29.2</td>
</tr>
<tr>
<td>Resilience</td>
<td>76.2 (16.0)</td>
<td>72.8 (16.6)</td>
</tr>
</tbody>
</table>

Note: Mean (SD) reported unless otherwise noted; TICS = two-item conjoint screen.

*Single, divorced, widowed, or separated.

suicidal/self-harming ideation were all non-significant. Only the main effects of resilience and combat exposure predicting any of these variables showed significance. Hence, we simplified the model by removing the interaction, and in all regressions involving them kept only the resilience and combat exposure main effects.

Substance abuse remained in the model as a moderator of the effects of PTSD
on depression symptomatology and suicidal/self-harming ideation through the interaction term. In both services, substance abuse was only significant as a moderator of PTSD’s direct effects on suicidal/self-harming ideation (Navy: standardized coefficient = .097, \( p = .005 \); Marines: standardized coefficient = .088, \( p = .009 \)),\(^1\) but not its indirect effects (Navy: \( \beta = .00, p = .453 \); Marines: \( \beta = .00 p = .730 \)). Substance abuse also did not significantly moderate PTSD symptomology’s effect on depression (Navy: \( \beta = -.012, p = .445 \); Marines: \( \beta = .006, p = .729 \)). This slightly simplified model fit fairly well (CFI = .99; TLI = .92; RMSEA = .08; SRMR = .03) and confirmed the mediated path suggested by prior literature linking combat exposure to suicidal/self-harming ideation. Standardized regression coefficients significantly different from zero for the simplified model are presented for Navy and Marine Corps personnel in Figures 1 and 2, respectively. Significant indirect paths are detailed in the following text.

The model results present a set of interconnected mediational subsystems. For the mediation model between PTSD symptomology and suicidal ideation, the direct

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### TABLE 2
Correlations among Model Variables for Navy Personnel

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Suicidal ideation</td>
<td>.35*</td>
<td>.39*</td>
<td>.11*</td>
<td>.01</td>
<td>-16*</td>
</tr>
<tr>
<td>2. PTSD</td>
<td>.81*</td>
<td>.24*</td>
<td>.13*</td>
<td>-34*</td>
<td></td>
</tr>
<tr>
<td>3. Depression</td>
<td>.23*</td>
<td>.04</td>
<td>-46*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Substance use</td>
<td>.02</td>
<td>-13*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Combat exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Resilience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PTSD, posttraumatic stress disorder.

*p < .01.

### TABLE 3
Correlations among Model Variables for Marine Corps Personnel

<table>
<thead>
<tr>
<th>Variable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Suicidal ideation</td>
<td>.36*</td>
<td>.45*</td>
<td>.13*</td>
<td>.06</td>
<td>-29*</td>
</tr>
<tr>
<td>2. PTSD</td>
<td>.81*</td>
<td>.25*</td>
<td>.28*</td>
<td>-35*</td>
<td></td>
</tr>
<tr>
<td>3. Depression</td>
<td>.28*</td>
<td>.16</td>
<td>-47*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Substance use</td>
<td>.10*</td>
<td>-17*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Combat exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Resilience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PTSD, posttraumatic stress disorder.

*p < .01.

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\(^1\)Given our sample size the tests of all the path coefficients reported are essentially z tests. Since the z statistic can be inferred from the \( p \) value, this statistic is omitted to simplify reporting.
effect of PTSD on suicidal ideation was nonsignificant (Navy: \( p = .135 \) and Marines: \( p = .953 \)), although this relationship was significant in a model with just suicidal ideation regressed on PTSD (Navy: \( \beta = .346, p < .0005 \); Marine: \( \beta = .362, p < .0005 \)). The indirect path from PTSD symptoms to suicidal ideation was significant in both services (\( p < .0005 \)) with standardized total indirect effects of .246 (Navy) and .297 (Marines), providing evidence of full mediation of PTSD symptomology’s effect on self-reported suicidal ideation via depressive symptoms.

For the meditational path between combat exposure and depression, the direct effect of combat exposure on depression remained significant (Navy: \( \beta = -.044, p = .000 \); Marines: \( \beta = -.056, p = .004 \)), even after including the indirect path. In a model with only depression regressed on combat exposure, this direct relationship was significant for Marines (\( \beta = .161, p < .0005 \)), but not for Sailors (\( \beta = .046, p = .073 \)). The indirect path from combat exposure to depression was larger than the direct effect and significant in both services (Navy: \( \beta = .099, p < .0005 \); Marines: \( \beta = .166, p < .0005 \)), supporting a strong partial mediation from combat exposure to depression symptoms through PTSD symptomology.

For the meditational path between combat exposure and suicidal ideation, the direct effect of combat exposure on suicidal ideation was nonsignificant (Navy: \( p = .707 \); Marines: \( p = .134 \)), as in a separate model with only suicidal ideation regressed on combat (Navy: \( p = .487 \); Marines: \( p = .564 \)). However, the indirect paths from combat exposure to suicidal ideation were significant in the most important segments of the path model (i.e., the central chain of association: combat exposure to PTSD to depression to suicidal ideation) in both services. The indirect path through PTSD only was not significant (Navy: \( p = .177 \); Marines: \( p = .953 \)). This is not surprising given that depression mediates the PTSD effect on suicidal ideation. As expected, the indirect path straight through depression symptoms was significant (Navy: \( \beta = -.015, p = .001 \); Marines: \( \beta = -.023, p = .005 \)), given the aforementioned strong connection between depression symptoms and suicidal ideation. Finally, the most important complete indirect serial path through PTSD and depression symptoms and on to suicidal ideation was significant (Navy: \( \beta = .033, p < .0005 \); Marines: \( \beta = .075, p < .0005 \)). This provides evidence of a mediated effect of combat exposure on suicidal ideation through PTSD symptoms which was further mediated through depression symptoms. Specifically, greater combat exposure was associated with more suicidal ideation through PTSD and then depression symptoms.

Besides the full meditational path, the only other covariates with significant effects on suicidal ideation were resilience in the Marines (Navy: \( \beta = .016, p = .561 \); Marines: \( \beta = -.092, p = .007 \)) and the substance abuse–by–PTSD–symptoms interaction as detailed earlier. Although neither PTSD nor substance abuse had a direct effect on suicidal ideation, the interaction between these did: substance abuse increased the link between PTSD symptom reporting and suicidal ideation (i.e., individuals who reported greater substance abuse concerns and PTSD symptomatology were more likely to report suicidal ideation).

The two remaining indirect effects on suicidal ideation, for resilience, and substance abuse, paralleled the combat exposure indirect effects. Specifically, the indirect effect of resilience through PTSD symptoms was not significant (Navy: \( \beta = -.021, p = .139 \); Marines: \( \beta = -.001, p = .953 \)), while the indirect effects of resilience through depression symptoms (Navy: \( \beta = -.067, p < .0005 \); Marines: \( \beta = -.085, p < .0005 \)) and resilience through PTSD symptoms further mediated by depression symptoms were each significant (Navy: \( \beta = -.079, p < .0005 \); Marines: \( \beta = -.092, p < .0005 \)). Essentially, higher resilience was associated with lower PTSD and depression symptoms and thus with lower reported suicidal ideation.

Similar to resilience, the indirect effect of substance abuse through PTSD symptoms
was not significant (Navy: $\beta = .013, p = .150$; Marines: $\beta = .001, p = .953$), while the indirect effects of substance abuse through depression symptoms (Navy: $\beta = .009, p = .051$; Marines: $\beta = .027, p < .0005$) and substance abuse through PTSD further mediated by depression were both significant (Navy: $\beta = .049, p < .0005$; Marines: $\beta = .051, p < .0005$). Thus, higher substance abuse was associated through PTSD and depression symptoms with an increase in reported suicidal ideation.

DISCUSSION

Among the 3,069 male respondents examined in this study, 203 (5.3% of Sailors, 9.0% of Marines) reported suicidal or self-harming ideation during the past 30 days. Goodness-of-fit tests indicated that the data were consistent with the study’s proposed model, a chain of statistically significant associations from combat exposure to PTSD to depression symptoms to self-reported suicidal ideation. Virtually the same pattern of significant effects was found for both Sailors and Marines. Consistent with our hypothesis, risk factors including PTSD and substance abuse, and protective factors including resilience, appeared to influence suicidal ideation through their interaction with each other, and by ultimately influencing symptoms of depression. Combat exposure had direct statistical effects on PTSD and depression symptoms without directly affecting suicidal ideation, yet indirect statistical effects of combat exposure on suicidal ideation through PTSD and depression were significant. This suggests that combat exposure may contribute directly to symptoms of PTSD and depression, but its effect on thoughts of suicide or self-harming is conveyed through these two mediators. This indirect effect of combat exposure is also consistent with the indirect effect of traumatic exposure found in suicide attempt—via PTSD and general psychiatric disorders—in a community sample of Vietnam veterans (Fontana & Rosenheck, 1995).

That more Marine Corps than Navy personnel reported recent suicidal ideation is not surprising given the variation between the two groups associated with current operations in Iraq and Afghanistan. Marines reported higher levels of combat exposure during their last deployment, and tend to have longer deployments than Sailors, yet the relationship between combat exposure and the other modeled variables was similar between services as assessed in our path models. The strong repeated finding that depression acts as a statistical mediator of other variables on suicidal ideation in these populations underscores the suggestion that although major depression is often not considered a combat-related injury, “it is highly associated with combat exposure and should be considered on the spectrum of post-deployment mental health consequences” (Tanielian & Jaycox, 2008).

Similar to others (Allen, Cross, & Swanner, 2005; Grant & Hasin, 1999; Murphy & Wetzel, 1990), the current study found that problems with drug and alcohol use were associated with suicidal and self-harming ideation for all respondents. The risk of suicide among recovering alcoholics has been shown to decrease with ongoing abstinence, suggesting that reducing alcohol usage, particularly among those experiencing mental health problems, may lead to reductions in suicidal ideation (Allen et al., 2005). Resilience had a significant protective effect on PTSD and depression symptomatology in both services, and on suicidal ideation among Marines. Dyer and McGuinness (1996) highlighted the importance of protective factors in developing resilience, citing social support as the strongest component. The Canadian Armed Forces developed the concept into an organizational program called the Operational Stress Injury Social Support Program (Grenier, Darte, Heber, & Richardson, 2007). They showed that using the term operational stress injury—meaning any persistent psychological difficulty resulting from operational duties—reduced the ubiquitous stigma associated with mental health seeking in the military. In addition, the program created a
peer support network and environment, providing a continuum of care to members before and after discharge from the military. Stigma continues to be an issue for military personnel seeking mental health care (Greene-Shortridge, Britt, & Castro, 2007; Hoge et al., 2004), and significant difficulties remain in transitioning mental health care between DoD and the Department of Veterans Affairs (VA; American Psychological Association, Presidential Task Force on Military Deployment Services for Youth, Families and Service Members, 2007). As such, this type of program appears appropriate and suited especially for implementation in the U.S. military and may be an important area to target for further intervention programming among transitioning personnel.

Several limitations of this study should be noted. First, data from participants are cross-sectional and examine associations rather than causation. Without longitudinal data, the temporal relationship between combat exposure and mental health symptoms cannot be determined with certainty. Similarly, the models tested herein do not signify the only possible relationships among the studied variables. For example, PTSD, depression, and substance abuse may exert bidirectional influences on one another, an alternative model that may be further explored with longitudinal data. As the sample excluded women and hospitalized personnel, results are not representative of all transitioning Navy and Marine Corps personnel. In addition, the convenience sampling, self-selection to participate in the survey, and lack of nonresponse information means that these results cannot be generalized beyond this sample. Still, the similarity of the sample distribution on key demographic variables with those of separating personnel obtained from the CHAMPS database lends credibility to the findings, although it is possible that an unknown variable related to nonresponse could be introducing bias into our results. Future efforts should specifically target women with combat exposure to determine if results parallel their male counterparts. It should also be noted that the survey measures were all self-reported and that screening instruments, although validated and used extensively in other military mental health research, cannot be equated with clinical diagnoses. Although perhaps not as preferred as a full scale might be, the use of single items to assess suicidal ideation has been reported previously (e.g., Goodwin, Kroenke, Hoven, & Spitzer, 2003; Ilgen et al., 2009). Others may feel more comfortable labeling those who reported thoughts that they would be better off dead or thoughts of hurting themselves as “positive responders,” as was done by Walker et al. (2008). Although all mental health measures in the survey were chosen based on a combination of their brevity, psychometric properties, access in the public domain, and use in comparative military populations, the time frame of the chosen instruments varied. We chose to retain their original time frames as all instruments had been standardized. Asking for respondents’ social security numbers sacrificed anonymity and likely resulted in underreporting of mental health symptoms. As such, the effects of combat on development of PTSD and depression symptoms, and ultimately, on suicidal ideation, may be underestimated in this study. Lastly, the survey only assessed combat exposure during the most recent deployment, and did not include a measure for multiple deployments. As such, we could not assess the relationships among lifetime combat exposure or multiple tours and the other variables modeled herein. Our results may be biased by unknown deployment history for roughly 53% of Sailors and 38% of Marines outside of the previous 12 months. However, that our models hold for both services suggest that if we had accounted for the proximity of last deployment for all participants, the relationship between combat exposure and the outcomes assessed here may actually have been strengthened.

To our knowledge, this is the first study examining suicidal and self-harming ideation in this unique group of military personnel. While other studies have considered military-specific issues related to suicide
(e.g., deployment, combat stress, etc.), little research exists on resilience and suicide risk in the military. The current study indicates that a number of transitioning personnel are experiencing psychological distress and that transitional services need to be alert to their psychological needs. Many personnel may be first experiencing or admitting to problems upon their discharge from the military and the transition process itself may be contributing to the development and/or exacerbation of mental health symptoms (American Psychological Association, Presidential Task Force on Military Deployment Services for Youth, Families and Service Members, 2007).

The relatively small number of completed suicide cases in the military each year makes it a difficult topic to research (Allen et al., 2005). Examining correlates of suicidal and self-harm ideation and targeting interventions to address these issues may provide an opportunity to reach individuals before a suicide attempt is made. Screening transitioning Sailors and Marines for depression may be useful given the strong relationship between depressive symptoms and suicidal ideation. Early intervention for personnel exhibiting symptoms of substance abuse or PTSD may reduce suicidal ideation by preventing subsequent depression. Strategies to foster psychological resilience among active-duty personnel, such as facilitating peer networks and/or instituting a buddy system during discharge preparations, may also lead to reduced suicidal ideation prior to and following their separation from service. Depression treatment and intervention strategies based on the moderating influence of optimistic reframing of negative life events on suicidal ideation found in civilians may also have treatment implications for military personnel (Hirsch, Wolford, LaLonde, Brunk, & Parker-Morris, 2009). Since separation counseling workshops are mandated for Marines and attended by the majority of Sailors, the addition of a formalized routine screening, VA referral, and follow-up program could provide an opportunity to intervene programmatically in reducing the likelihood of suicidal ideation and other mental health problems in this vulnerable and growing population.

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