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Posttraumatic Stress Disorder After Combat Zone Deployment Among Navy and Marine Corps Men and Women

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Abstract

Background: As more women are deployed into combat environments, preliminary findings have been inconsistent regarding gender differences in symptoms of posttraumatic stress disorder (PTSD) following deployment. Very little is known about the experiences of Navy and Marine Corps personnel deployed to combat zones.

Methods: The study population consisted of Navy and Marine Corps personnel who completed a Post-Deployment Health Assessment upon return from deployment to Iraq, Afghanistan, or Kuwait during 2008 and 2009 and a Post-Deployment Health Reassessment approximately 6 months later. These instruments included screening questions for PTSD.

Results: The final sample of 31,534 service members included 29,640 men and 1,894 women. Within occupation categories, women were overrepresented relative to men in the roles of functional support/administration and healthcare specialists, whereas men were overrepresented in the role of combat specialist. Screening rates were similar by gender, with a slightly higher percentage of women compared with men screening positive for PTSD (6.6% vs. 5.3%). These symptoms of PTSD among men and women in this sample could not be attributed to combat exposure or other deployment-related characteristics.

Conclusions: Relative to men, women in this sample had a similar probability of screening positive for PTSD following deployment. These PTSD symptoms were not associated with deployment-related variables, suggesting that deployment to a combat zone does not affect women differently from men. This finding could have meaningful implications for policies surrounding women in the military.

Introduction

ACCORDING TO THE DEPARTMENT OF VETERANS AFFAIRS (VA), women accounted for 16.4% of active Navy and 6.8% of active Marine Corps personnel as of November 2011. Given the size and duration of the Operations Iraqi Freedom and Enduring Freedom (OIF/OEF), many of these women were deployed to war zones. Studies suggest that men who have returned from deployment to combat areas experience high levels of posttraumatic stress symptoms and possibly posttraumatic stress disorder (PTSD).^{1–3} Although they do not technically serve in occupations that engage in direct combat, women may be exposed to combat as support personnel, and this exposure could increase their risk of subsequent mental health problems: specifically, PTSD.

In response to the National Defense Authorization Act for Fiscal Year 2009, the Military Leadership Diversity Commission conducted a comprehensive assessment of the policies and practices that shape diversity among military leadership. The final report called for the eventual elimination of combat-exclusion policies for women to “level the playing field” with respect to career-advancement opportunities.⁴ The report further recommended that a time-phased approach be taken in opening to qualified women career fields and units engaged in direct ground combat. In light of this report and recent sentiment among policymakers, it is increasingly important to investigate potential repercussions of further integration of female service members into combat operations. However, prior to the conflicts in Iraq and Afghanistan, a very small percentage of servicewomen were

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exposed to direct combat, making historical research into the effects of combat exposure on the development of PTSD among female personnel limited and inapplicable to the current operational setting.

For example, a representative sample of Canadian Forces personnel conducted in 2002 (pre-OIF/OEF) identified a significantly increased likelihood of PTSD in the past year among reserve force women relative to men, after adjusting for work stress, traumatic events, and a number of demographic covariates.⁵ However, this study was not linked directly to deployment and assessed lifetime exposure to both trauma and deployment-related trauma.

Several other studies have explored this issue, using data from more recent conflicts. A US Army study found that combat exposure was a stronger predictor of postdeployment depression and PTSD for women than for men for approximately 500 women and 6,500 men who returned from deployment between March 2006 and July 2009.⁶ Another study of US National Guard soldiers found that women had an increased prevalence of PTSD compared to men after deployment, but deployment-related factors were not found to be associated.⁷ In contrast, findings from two studies of the UK Armed Forces suggest that combat deployment to Iraq was not associated with increased PTSD among female service members compared to their male counterparts.^{8,9} Another study of US Army soldiers in 2005 found no gender differences in posttraumatic stress symptoms, but only 5% of the sample were women.² A pre- and postdeployment screening study designed to investigate differences in combat exposure and mental health found no gender differences in PTSD symptoms after deployment.¹⁰ A community study of veterans who had been deployed in support of the wars in Afghanistan and Iraq found that men and women were equally likely to report PTSD symptoms.¹¹ Another study of veterans did not find gender differences but, similar to the US National Guard study,⁷ recognized that the contribution of pre- and postdeployment factors may vary by gender.¹²

Previous studies on this topic have been conducted in Army, National Guard, and veteran populations with various exposure and outcome measures. From these studies, it is apparent that attempts to answer the important question of whether the risk of PTSD symptoms differ among female and male service members exposed to deployment stress are often complicated by confounding factors and baseline gender differences.¹³ Although men traditionally report greater exposure to high-intensity combat,^{7,9,10} female service members are more likely to report military-related sexual trauma.^{7,10,14} A recent study found approximately 15% of female vs. <1% of male veterans of OIF/OEF reported military-related sexual trauma.¹⁵ It is unknown to what extent the incidence of PTSD observed among recently deployed military servicemen and servicewomen is attributable to combat-related trauma or to other stressors, such as military sexual trauma. Because women in the general population of US veterans report higher levels of PTSD than men,¹⁶ there is some concern that combat exposures may affect women disproportionately, leading to the question "Do women deployed to combat zones incur PTSD at higher rates than men deployed to combat zones?" The aim of our study was to examine postdeployment gender differences in PTSD symptoms among a large sample of Navy and Marine Corps men and women deployed to a combat zone.

Materials and Methods

Study population and data sources

We selected our study population by first obtaining Post-Deployment Health Assessment (PDHA)¹⁷ and Post-Deployment Health Reassessment (PDHRA)¹⁸ records completed by Navy and Marine Corps personnel returning from deployment in support of OIF/OEF during 2008 and 2009. Completed assessment records were obtained from the US Navy electronic Pre- and Post-Deployment Health Assessment database. The PDHA is a brief questionnaire completed by the service member and a trained healthcare provider during in-theater out-processing or within 30 days following return from deployment. The PDHRA is a follow-up questionnaire that is similar in format to the PDHA and is typically administered 90–180 days after return from deployment. Both assessments were developed by the US Department of Defense (DoD) and aim to characterize the service member's current health, identify potential health issues resulting from deployment-related experiences, and provide the service member with an opportunity to discuss health concerns with a trained military healthcare provider.

Subject-specific PDHA and PDHRA records were matched according to administration date. A PDHRA completed between 30 and 365 days following completion of a PDHA was considered a match. If several PDHRA records met the criteria for association with a single PDHA record, the PDHRA completed closest to the date of the PDHA was selected for inclusion, and duplicates were excluded.

The deployment event associated with each pair of assessments was verified using personnel records obtained from the Defense Manpower Data Center. For the purpose of this study, deployments in support of OIF/OEF were defined as those during which a service member received hazardous-duty pay while deployed for more than 30 days in Afghanistan, Iraq, or Kuwait. Deployments lasting longer than 18 months were excluded to avoid inclusion of prolonged duty-station changes to geographical regions deemed hazardous.

Demographic and deployment-related variables

Categorical variables obtained from personnel files indicated service branch (Marine Corps or Navy), service component (active duty or reserve), deployment location (Afghanistan, Kuwait, or Iraq), and age in years (<25, 25–29, 30–34, 35–39, or ≥40) at the time of PDHA administration. The effect of long deployments was examined by comparing the fourth quartile of deployment length for the entire sample (≥214 days) to the three lesser quartiles (<214 days). The deployment file was also used to obtain military pay grade (officer or enlisted) and category of duty occupation at deployment start. The categorization was performed according to the DoD Occupational Conversion Index (DoD 1312.1-I), yielding 10 categories (combat specialists, functional support/administration, communications/intelligence, service and supply, craft workers, healthcare specialists, electronic repair, other technical specialists, trainees, and electrical/mechanical repair). Three combat-exposure items on the PDHA ask service members to respond yes or no to having in their most recent deployment (1) encountered dead bodies or seen people killed or wounded, (2) engaged in direct combat in which they discharged a weapon, or (3) felt in great danger of being killed.

As a result of combat-duty restrictions, a low percentage of female service members reported having engaged in direct combat in which they discharged a weapon (0.26%, $n = 5$). In analyses, combat-exposure items (2) and (3) were therefore combined to create a single variable indicating whether either exposure was reported.

PTSD screen

The PDHA and PDHRA contain an abbreviated PTSD screening instrument known as the four-item Primary Care PTSD screen (PC-PTSD). On both assessments, the original stem of the four-item PC-PTSD was adapted to read "Have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month, you ..." to increase the instrument's relevance among a military population. The adapted stem is expected to have increased capacity to identify current PTSD cases because a 1-month time frame is stipulated, and reference is made to a specific traumatic experience. For the purpose of this study, service members were considered to have screened positive for PTSD if they answered yes to at least three of the four questions about having experienced symptoms related to the four dimensions of PTSD (reexperiencing, numbing, avoidance, and hyperarousal).¹⁹ The four-item PC-PTSD has been validated among combat-exposed military service members, and the three-item cutoff is known to have reasonable screening properties, with a sensitivity of 0.76 and a specificity of 0.88.^{19,20} In accordance with the 1-month minimum duration of symptoms outlined in the Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV), service members who screened positive for PTSD on either the PDHA or the PDHRA were assigned a positive screening status for the purpose of this study.

Statistical analyses

To examine distributional differences, gender-specific frequencies and percentages were tabulated for all demographic, occupational, and deployment-related variables, and chi-square tests were conducted. A similar approach was taken to test potential associations between gender and screening positive for PTSD. For all demographic, occupational, and deployment-related variables, gender-specific univariate logistic odds ratios (ORs) and associated 95% confidence intervals (CIs) were calculated to present the relative odds of screening positive for PTSD. For each variable, a Breslow-Day test for homogeneity of the OR across genders was conducted to determine whether the role of each demographic, occupational, or deployment-related variable differed between male and female service members in detecting a positive PTSD screen. In the occupational category, electrical and mechanical repairers reported the lowest rates of combat exposure and were therefore selected as the reference group. All analyses were conducted using SAS software, version 9.2 (SAS Institute Inc., Cary, NC).

Results

The final sample consisted of 31,534 completed PDHAs and associated PDHRAs. On average, the PDHRA was reported as having been completed 162.8 days following the PDHA (standard deviation [SD] = 57.6 days, median = 147

days). To address the issue of representativeness, we compared the size of our study sample to the full population of Navy and Marine service members who returned from deployment during the time frame of our study (2008–2009). Our numbers indicate that between 25% of the total Navy and Marine Corps service members deployed during that time completed both measures and were included in our study sample. However, we did omit those who were deployed but had no combat exposure, based on deployment status with hazardous pay, which may also account for some of this difference. To further explore this issue, we compared demographic characteristics of our study sample with the full population of deployed Navy and Marine service members. We found that 6.1% of the full population was female compared to 6.0% of our study sample. Likewise, there was very little difference in age distribution, although our study sample was younger (54.5% under age 25 compared to 52.2% among the entire deployed population). There was no difference in the proportion of Navy and Marine Corps service members (70.3% in the study sample were Marines compared to 69.4% in the full sample). There were large differences in the proportion of active-duty members versus reserves (94.8% were active duty in our study sample compared to 83.1% in the full population). Finally, the area of deployment differed, with 77.3% of the study sample deployed to Iraq compared to 41% of the full population. Based on our selection criteria, these differences are not surprising, and we feel confident that these data are representative.

Significant distributional differences between male and female service members were identified for the variables age group, service branch, service component, deployment location, military pay grade, and duty occupation category (Table 1). Male service members were more likely to be under 25 years of age, active duty, deployed to Iraq, and Marines; female service members were more likely to be older, members of the reserve component, deployed to Afghanistan or Kuwait, and Navy personnel. Only 10.5% of male personnel deployed as officers, relative to almost 18% of the female personnel in this sample.

As anticipated, significant differences with respect to occupation were found between male and female service members. Within the duty-occupation categories, women were overrepresented in the roles of functional support/administration, craft workers, and healthcare specialists. Not surprisingly, male service members were overrepresented in the role of combat specialist, with approximately 32.0% of men categorized under this occupation as compared with only 4.4% of female personnel.

Screening rates for PTSD differed according to gender, with a higher percentage of women screening positive (6.6% vs. 5.3%). Female service members reported combat exposures less frequently than their male counterparts. Only 8.3% of women indicated having engaged in direct combat where they discharged a weapon or felt in great danger of being killed, relative to 14.6% of men. Rates of having encountered dead bodies or seen people killed were similarly higher among male compared with female service members (15.5% and 11.4%, respectively).

Breslow-Day tests for homogeneity of the ORs were conducted (Table 2) to identify demographic and deployment-related variables whose association with a positive PTSD screen differed across genders. Results indicated that

TABLE 1. POSTDEPLOYMENT CHARACTERISTICS AMONG 31,534 SERVICE MEMBERS DEPLOYED TO IRAQ, KUWAIT, OR AFGHANISTAN IN 2008–2009, BY GENDER

	n	Men		Women	
		(n = 29,640)		(n = 1,894)	
		n	%	n	%
Age group, ^a years					
<25	17,198	16,360	55.20	838	44.24
25–34	9,770	9,068	30.59	702	37.06
≥35	4,566	4,212	14.21	354	18.69
Service branch ^a					
Marine Corps	22,169	21,289	71.83	880	46.46
Navy	9,365	8,351	28.17	1,014	53.54
Service component ^a					
Active duty	29,901	28,137	94.93	1,764	93.14
Reserve	1,633	1,503	5.07	130	6.86
Deployment location ^a					
Iraq	24,375	23,154	78.12	1,221	64.47
Kuwait	4,044	3,606	12.17	438	23.13
Afghanistan	3,115	2,880	9.72	235	12.41
Deployment length					
Long (>214 days)	7,786	7,293	24.61	493	26.03
Short (≤214 days)	23,748	22,347	75.39	1,401	73.97
Military pay grade ^a					
Enlisted	28,097	26,541	89.54	1,556	82.15
Officer	3,437	3,099	10.46	338	17.85
Duty occupation category ^a					
Combat specialists	9,563	9,480	31.98	83	4.38
Functional support/administration	2,902	2,465	8.32	437	23.07
Communications/intelligence	3,773	3,541	11.95	232	12.25
Service and supply	2,886	2,691	9.08	195	10.30
Craft workers	2,529	2,309	7.79	220	11.62
Healthcare specialists	2,407	2,050	6.92	357	18.85
Electronic repair	1,487	1,415	4.77	72	3.80
Other technical specialists	1,196	1,149	3.88	47	2.48
Trainees	598	536	1.81	62	3.27
Electrical/mechanical repair	4,193	4,004	13.51	189	9.98
Positive PTSD screen ^{a,b}	1,697	1,573	5.31	124	6.55
Combat-exposure items					
Encounter dead bodies, see people killed ^a	4,821	4,605	15.54	216	11.40
Engaged in direct combat and discharged weapon or felt great danger of being killed ^a	4,473	4,315	14.56	158	8.34

^aSignificant distributional gender differences at the $p < 0.05$ level, chi-square test.

^bA service member who screened positive on either the Post-Deployment Health Assessment or the Post-Deployment Health Reassessment was considered to have screened positive for PTSD.
PTSD, posttraumatic stress disorder.

whereas male enlisted service members had 2.7 times (95% CI 2.1–3.4) the odds of screening positive for PTSD relative to male officers, female enlisted service members were not significantly more likely to screen positive for PTSD than female officers. Specific occupational differences were also observed, with such occupations as communication/intelligence specialist, and healthcare specialist associated with significantly increased rates of positive PTSD screening among male personnel but not among female personnel. Importantly, ORs associated with deployment location and length did not differ significantly between male and female service members, implying that these deployment-related variables affected the likelihood of PTSD to the same extent for both men and women in this sample. Of interest, the high

ORs associated with indicating each of the combat-exposure items did not differ according to gender, suggesting that differences in combat experiences do not affect the likelihood of PTSD among women returning from deployment to a different extent than among men.

Discussion

Although female service members were more likely to screen positive for PTSD compared with male service members (6.6 and 5.3, respectively), this small difference may be statistically significant owing to the large sample size but not be clinically significant. Most importantly, the results of this analysis suggest that factors related to deployment and

TABLE 2. ODDS RATIOS FOR A POSITIVE PTSD SCREEN AFTER DEPLOYMENT
AMONG 31,534 SERVICE MEMBERS, BY GENDER

	<i>Men</i> <i>OR (95% CI)</i>	<i>Women</i> <i>OR (95% CI)</i>	<i>p-value</i> ^a
Age group, years			
<25	0.88 (0.76–1.02)	0.79 (0.49–1.27)	0.66
25–34	0.93 (0.79–1.09)	0.76 (0.46–1.25)	0.45
≥35	1.00	1.00	
Service branch			
Marine Corps	0.96 (0.85–1.07)	0.79 (0.55–1.15)	0.34
Navy	1.00	1.00	
Service component			
Reserve	1.58 (1.30–1.92)	2.15 (1.23–3.76)	0.30
Active duty	1.00	1.00	
Deployment location			
Iraq	1.77 (1.45–2.17)	1.81 (1.06–3.08)	0.95
Afghanistan	3.85 (3.06–4.83)	2.82 (1.48–5.36)	0.37
Kuwait	1.00	1.00	
Deployment length			
Long (>214 days)	1.44 (1.29–1.61)	1.68 (1.15–2.46)	0.45
Short (≤214 days)	1.00	1.00	
Military pay grade			
Enlisted	2.64 (2.07–3.37)	1.22 (0.73–2.01)	0.01
Officer	1.00	1.00	
Duty occupation category			
Combat specialists	1.96 (1.63–2.35)	2.15 (0.98–4.76)	0.82
Functional support/administration	1.03 (0.79–1.33)	0.53 (0.26–1.06)	0.08
Communications/intelligence	1.01 (0.80–1.28)	0.31 (0.12–0.81)	0.01
Service and supply	1.39 (1.09–1.76)	1.71 (0.87–3.35)	0.57
Craft workers	1.11 (0.85–1.44)	0.85 (0.40–1.79)	0.50
Healthcare specialists	2.64 (2.12–3.30)	0.73 (0.36–1.44)	<0.01
Electronic repair	0.73 (0.51–1.05)	0.33 (0.07–1.49)	0.30
Other technical specialists	1.10 (0.79–1.54)	0.80 (0.22–2.85)	0.62
Trainees	1.11 (0.70–1.75)	1.02 (0.35–2.92)	0.89
Electrical/mechanical repair	1.00	1.00	
Combat-exposure items			
Encounter dead bodies, see people killed	3.76 (3.38–4.18)	3.30 (2.16–5.03)	0.55
Engaged in direct combat and discharged a weapon or felt in great danger of being killed	6.67 (6.01–7.41)	5.27 (3.42–8.11)	0.30

^aBreslow–Day test for homogeneity of the OR across genders.
CI, confidence interval; OR, odds ratio.

combat experiences do not appear to differentially influence the likelihood of PTSD symptoms among women returning from deployment compared with their male counterparts. This finding supports work done among the UK Armed Forces,^{8,9} where deployment status did not affect women differently from men in terms of psychological symptoms. Our findings do not support work done with US Army soldiers deployed to combat zones between May 2006 and July 2009 that found both depression and PTSD symptoms were more common among women than men.⁶ However, a nationally stratified random sample of 2,000 OEF/OIF US military personnel who had returned from deployment between October 2007 and July 2008 concluded that women were as resilient to combat-related stress as were men.²¹

The discrepancies noted in the various studies on this topic may involve sample selection. For example, the stratified random sample included 50% women and all branches of the service,²¹ whereas most of the other studies included only US Army soldiers, with women comprising less than 10% of the

sample.^{2,6} Measurement issues may also play a role. The screen for PTSD used in the current study has been well validated.^{19,20} However, studies on this topic have various ways to assess PTSD symptoms, so the comparability of the symptoms may be in question.

Although specific occupations may play a role in the probability of screening positive for PTSD, only a few OR estimates differed significantly between men and women. Male healthcare specialists were almost three times more likely to screen positive for PTSD, whereas no significant association was found among female healthcare specialists. Furthermore, an occupation within the communications/intelligence group was found to be protective against a positive PTSD screen among women but not among male service members. These differences could potentially be attributed to the differing roles of male and female service members classified under these occupations. For example, male healthcare specialists may be much more likely to serve in combat zones as field medics, whereas female healthcare

specialists may serve more frequently in noncombat hospital settings. Importantly, no significant differences were found between male and female service members with respect to combat-exposure ORs, suggesting that the strong association between heightened combat exposure and PTSD is similar for men and women. Likewise, findings suggest that the increased odds of a positive PTSD screen associated with increased deployment length and deployment to Iraq or Afghanistan do not differ by gender.

These results suggest that the slightly increased rates of PTSD among women returning from deployment, relative to men, may be the result of relatively high rates within specific groups defined by officer/enlisted status or unmeasured factors rather than gender-specific differences in response to combat or other deployment stressors. Other studies have suggested that the increased odds of PTSD after deployment could be the result of sexual trauma either prior to entering the service or during the term of military service. With the data available, there was no way to measure sexual trauma or discrimination, and the findings of the current study do not contradict the hypothesis that these experiences contribute to the observed small gender differences in PTSD symptoms following deployment. Other factors that could not be explored include family violence and childhood adversity, to name a few. Further research should be conducted to examine the confounding effects of these concerns.

Conclusions

Among the many strengths of this study are a large sample size (almost 2,000 women), comparable data for men and women, and standard assessments. However, limitations include the self-report nature of the data, the lack of clinical verification of PTSD, and having only Navy and Marine Corps men and women available for analysis. Another limitation involves the low frequency of combat exposure, as measured by engaging in direct combat, discharging a weapon, seeing dead bodies, or feeling in great danger of being killed. Even though all the participants were in a "hazardous pay" location, actual combat exposure was low.

Because of the nonanonymous nature of the survey instruments, socially acceptable answers may be common. For example, military members may be unlikely to report symptoms if doing so may delay their return home or loss of benefits. The strength of surveys on mental health symptoms rely on honest responses to sensitive questions, and this may be difficult to obtain when identifiers are used.²² Furthermore, the results of this study could be affected in either direction if men or women reported symptoms differentially.

Although we could not control for military sexual trauma or other preexisting mental health conditions, there is some evidence that persons with better psychological health are more likely to be deployed than those with poorer psychological health, so this limitation may not have had a large effect on the results.²³ There is also some evidence that military sexual trauma may be a more important indicator of PTSD symptoms than combat exposure, and it would have been helpful to have the information in order to tease out this potential confounder.²⁴

Another consideration is that research has not been conducted comparing the women exposed to combat in this

sample with the potential population of women who would be exposed to combat were existing policies amended to allow for the further inclusion of women in combat roles. Women exposed to combat in the current sample may represent a distinct subpopulation of those who obtained their reported exposure to combat owing to certain characteristics that also make them more resilient. This potential sampling bias may affect the generalization of these findings to the population of all women who could potentially be exposed to combat if policy changes were enacted.

In summary, we found that, compared to men, women deployed to Iraq, Afghanistan, or Kuwait had a similar probability of screening positive for PTSD upon return from deployment. The conclusion that combat exposure does not affect female service members differently from male service members in terms of PTSD symptoms could have meaningful implications for policies surrounding women in the military.

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Author Disclosure Statement

No competing financial interests exist.

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14. ABSTRACT (maximum 200 words)

Abstract

Background: As more women are deployed into combat environments, preliminary findings have been inconsistent regarding gender differences in symptoms of posttraumatic stress disorder (PTSD) following deployment. Very little is known about the experiences of Navy and Marine Corps personnel deployed to combat zones.

Methods: The study population consisted of Navy and Marine Corps personnel who completed a Post-Deployment Health Assessment upon return from deployment to Iraq, Afghanistan, or Kuwait during 2008 and 2009 and a Post-Deployment Health Reassessment approximately 6 months later. These instruments included screening questions for PTSD.

Results: The final sample of 31,534 service members included 29,640 men and 1,894 women. Within occupation categories, women were overrepresented relative to men in the roles of functional support/administration and healthcare specialists, whereas men were overrepresented in the role of combat specialist. Screening rates were similar by gender, with a slightly higher percentage of women compared with men screening positive for PTSD (6.6% vs. 5.3%). These symptoms of PTSD among men and women in this sample could not be attributed to combat exposure or other deployment-related characteristics.

Conclusions: Relative to men, women in this sample had a similar probability of screening positive for PTSD following deployment. These PTSD symptoms were not associated with deployment-related variables, suggesting that deployment to a combat zone does not affect women differently from men. This finding could have meaningful implications for policies surrounding women in the military.

14. SUBJECT TERMS
PTSD, Military women, occupation, combat exposure

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