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Original Contribution

A Decade of War: Prospective Trajectories of Posttraumatic Stress Disorder Symptoms Among Deployed US Military Personnel and the Influence of Combat Exposure

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Posttraumatic stress disorder (PTSD) is a common psychiatric disorder among service members and veterans. The clinical course of PTSD varies between individuals, and patterns of symptom development have yet to be clearly delineated. Previous studies have been limited by convenience sampling, short follow-up periods, and the inability to account for combat-related trauma. To determine the trajectories of PTSD symptoms among deployed military personnel with and without combat exposure, we used data from a population-based representative sample of 8,178 US service members who participated in the Millennium Cohort Study from 2001 to 2011. Using latent growth mixture modeling, trajectories of PTSD symptoms were determined in the total sample, as well as in individuals with and without combat exposure, respectively. Overall, 4 trajectories of PTSD were characterized: resilient, pre-existing, new-onset, and moderate stable. Across all trajectories, combat-deployed service members diverged from non–combat-deployed service members, even after a single deployment. The former also generally had higher PTSD symptoms. Based on the models, nearly 90% of those without combat exposure remained resilient over the 10-year period, compared with 80% of those with combat exposure. Findings demonstrate that although the clinical course of PTSD symptoms shows heterogeneous patterns of development, combat exposure is uniformly associated with poor mental health.

combat; growth mixture models; military; PTSD

Abbreviations: PCL-C, PTSD Checklist – Civilian Version; PTSD, posttraumatic stress disorder.

The past decade of US military engagement in Iraq and Afghanistan has warranted a heightened concern for the long-term mental health and well-being of service members. Service members deployed to active conflict zones have the potential to experience both direct and indirect engagement with hostile forces, which can result in high levels of traumatic stress. Exposure to combat-related trauma and life-threatening experiences have been shown to have a negative impact on the mental health (1–3), sleep (4), and physical health (5) of service members. In addition, previous research indicates that exposure to combat may increase the likelihood of negative health behaviors, such as misuse of alcohol (6, 7), smoking (8), and risk-taking (9). However, although deployment may contribute to diminished mental, physical, and behavioral health, studies have shown few negative effects of deployment with respect to posttraumatic stress disorder (PTSD) (10), depression (11), and alcohol use (6) when combat experiences are minimal.

Recent research suggests that the majority of service members tracked before and after deployments to conflicts in Iraq and Afghanistan are resilient against mental health problems. For example, prospective studies show that 85% or more of returning service members do not develop clinical symptoms of PTSD, even up to a decade after deployment (12). In fact, some studies have found deployment to be a positive experience, particularly in cases where service members do not experience traumatic combat-related events (13). Although deployments are typically stressful (e.g., because of separation from family), they are not necessarily traumatic. This may explain the high prevalence of resilience among deployed service members. However, the impact of combat exposure has been shown to interact with genetic and situational factors (14), suggesting marked individual variation in relation to outcome. Thus, understanding the trajectories of PTSD symptoms in deployed service members with and without combat exposure will help

explicate the clinical course of PTSD after different types of deployment experiences. Such an analysis will better illuminate the health care needs of service members and veterans.

To our knowledge, very few studies have examined the clinical course of PTSD symptoms before and after deployment to date. Of the studies that have examined symptoms of PTSD over time, most had follow-up periods of 1 year or less (13, 15), utilized convenience samples (13, 15, 16), or did not differentiate types of deployment based on combat exposure (12, 17). The present study addressed these limitations by assessing trajectories of PTSD symptoms before and after deployment over a 10-year period using a large, population-based sample of service members from all branches of the military. We investigated the possible influence of exposure to combat by independently assessing trajectories in individuals with and without significant combat exposure.

METHODS

Population and data sources

The Millennium Cohort Study began in 2001, before the start of the recent military operations in Iraq and Afghanistan. Participants were randomly selected from US military personnel serving in October 2000, and those with previous deployment experience, female service members, and Reserve and National Guard members were oversampled. Participants were surveyed approximately every 3 years. Detailed descriptions of methodology for this study are available elsewhere (18).

We examined individuals from the first panel of participants (surveyed in 2001, 2004, 2007, and 2011) who 1) submitted the first 2 surveys, 2) had their first deployment in support of the operations in Iraq and Afghanistan between baseline and the first follow-up survey, and 3) did not deploy again until after the second survey. Each participant ($n = 8,178$) was required to have a predeployment evaluation of PTSD symptoms and risk factors, as well as a follow-up evaluation of PTSD symptoms after deployment. If a participant deployed again after the first follow-up survey, only PTSD symptoms reported before the start of the second deployment were included in the analyses. The average time between surveys was 2.7 (standard deviation, 0.54) years from predeployment survey to first follow-up, 2.9 (standard deviation, 0.43) years from first to second follow-up, and 4.1 (standard deviation, 0.45) years from second to third follow-up. The final study population included 4,129 (50.5%) combat deployers and 4,049 (49.5%) noncombat deployers.

Measures

Deployment and combat exposure. Electronic military records obtained from the Defense Manpower Data Center were used to assess deployments (19). Combat exposure was assessed by whether a person witnessed the following: a person's death due to war, disaster, or tragic event; instances of physical abuse; dead or decomposing bodies; maimed soldiers or civilians; or prisoners of war or refugees (3, 6, 10). A participant was considered to have combat exposure if they endorsed any of the questions on combat experience.

Posttraumatic stress. Posttraumatic stress symptoms were assessed using the PTSD Checklist – Civilian Version (PCL-C), a 17-item self-reported measure that quantifies the severity of symptoms during the past 30 days, on a 5-point scale ranging from "not at all" to "extremely" (20).

Predeployment risk factors. Demographic data were obtained from electronic military personnel records, and included sex, age, race/ethnicity, education, marital status, service component, service branch, military pay grade, and military occupation. Categorizations are shown in Table 1.

Behavioral and mental health variables were obtained from participant responses to a predeployment cohort questionnaire about stress, smoking, and alcohol consumption. Measures included stressful life events adapted from the Social Readjustment Rating Scale, which contained items such as divorce, suffering a violent assault, or death of a family member (21). Heavy drinking was defined as drinking more than 14 and 7 alcoholic drinks in the previous week for men and women, respectively.

Statistical analysis

Latent growth mixture modeling is a data-driven method that uncovers different patterns of growth or change that occur within a heterogeneous population (22, 23), and it was used to determine distinct trajectories of PTSD over a 10-year period. Unlike growth curve models that portray average change over time, latent growth mixture modeling assumes that there are distinct groups that may have differing patterns of change over time, and uses fit indices to select the most parsimonious solution that best describes the data (e.g., fewest distinct groups).

Assessments of PTSD symptoms were obtained approximately 3 years apart, with the last assessment occurring after a slightly longer interval. The nonequivalent spacing of intervals was taken into account in the models. Unconditional models with no covariates were examined initially with only the intercept (no growth), followed by intercept and slope parameters (linear growth), and finally by intercept, slope, and quadratic parameters (nonlinear growth). In these models, the intercept and slope variances were unconstrained (random effects), whereas the quadratic variance was fixed.

We determined the optimal number of classes by examining model fit while increasing the number of latent classes from 1 to 6. Combined with theoretical coherence and interpretability (24, 25), several model fit indices were used to select the number of classes. These included the Lo-Mendel-Rubin likelihood ratio test, bootstrapped likelihood ratio test, Bayesian information criterion, and entropy.

After determining the optimal number of classes, combat exposure was entered as a separate known class (23). This approach creates separate latent trajectory classifications according to whether or not participants had combat exposure. Wald tests were used to determine whether this unrestricted model provided a fit superior to that of a restricted model in which there were no differences in trajectory between combat and no combat. Follow-up testing was possible because trajectories were similar between the 2 groups (26). Wald tests were also used to determine which parameters varied between combat and no-combat trajectories. We also examined conditional models that included covariates chosen a priori as predictors of class membership.

Table 1. Predeployment Characteristics of Study Population, Millennium Cohort Study, 2001

Characteristic[a]	No Combat (n = 4,049)		Combat (n = 4,129)		All (n = 8,178)	
	No.	%	No.	%	No.	%
Sex						
Male	3,209	79.3	3,425	82.9	6,634	81.1
Female	840	20.7	704	17.1	1,544	18.9
Age, years[b,c]	34.0 (8.1)		33.0 (7.9)		33.5 (8.0)	
Educational level						
Less than bachelor's degree	2,820	69.6	2,742	66.4	5,562	68.0
Bachelor's degree or higher	1,229	30.4	1,387	33.6	2,616	32.0
Race/ethnicity						
White, non-Hispanic	2,935	72.5	2,756	66.7	5,691	69.6
Black, non-Hispanic	467	11.5	434	10.5	901	11.0
Asian/Pacific Islander	318	7.9	557	13.5	875	10.7
Hispanic/other	329	8.1	382	9.3	711	8.7
Service branch						
Army	1,222	30.2	2,866	69.4	4,088	50.0
Navy/Coast Guard	797	19.7	327	7.9	1,124	13.7
Marines	156	3.9	282	6.8	438	5.4
Air Force	1,874	46.3	654	15.8	2,528	30.9
Service component						
Reserve/National Guard	1,362	33.6	1,465	35.5	2,827	34.6
Active duty	2,687	66.4	2,664	64.5	5,351	65.4
Pay grade						
Junior enlisted	912	22.5	1,084	26.3	1,996	24.4
Senior enlisted	2,169	53.6	1,902	46.1	4,071	49.8
Officer	968	23.9	1,143	27.7	2,111	25.8
Occupation						
Combat specialist	725	17.9	1,057	25.6	1,782	21.8
Other	3,324	82.1	3,072	74.4	6,396	78.2
Marital status						
Never married	781	19.3	876	21.2	1,657	20.3
Married	2,810	69.4	2,748	66.6	5,558	68.0
Divorced/separated/widowed	458	11.3	505	12.2	963	11.8
Smoking status						
Never smoker	2,407	59.4	2,305	55.8	4,712	57.6
Past smoker	970	24.0	1,015	24.6	1,985	24.3
Current smoker	672	16.6	809	19.6	1,481	18.1
Heavy drinker						
No	3,737	92.3	3,735	90.5	7,472	91.4
Yes	312	7.7	394	9.5	706	8.6
No. of stressful life events[d]						
0	956	23.6	848	20.5	1,804	22.1
1	1,758	43.4	1,671	40.5	3,429	41.9
≥2	1,335	33.0	1,610	39.0	2,945	36.0

[a] Percentages may not add up to 100% because of rounding.
[b] Assessed continuously.
[c] Values are expressed as mean (standard deviation).
[d] Count of affirmative responses to 7 types of stressful events.

Table 2. Fit Statistics for 2- to 5-Class Models, Millennium Cohort Study Participants, 2001–2011

Fit Index Criterion	Fit Statistics							
	2-Class		3-Class		4-Class		5-Class	
	Fit Statistic	%	Fit Statistic	%	Fit Statistic	%	Fit Statistic	%
AIC	167,038	92.8	163,680	89.2	161,852	84.4	160,287	83.5
BIC	167,136	7.2	163,806	5.6	162,006	8.7	160,470	8.6
LRT *P* value	0.0000		0.0000	5.2	0.0202	4.6	0.0011	4.7
BLRT *P* value	0.0000		0.0000		0.0000	2.3	0.0000	1.7
Entropy	0.967		0.968		0.964		0.967	1.4

Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion; BLRT, bootstrapped likelihood ratio test; LRT, likelihood ratio test.

RESULTS

Table 1 presents descriptive characteristics of the study sample, arranged by combat exposure status. Fit indices, entropy, and percentages in each class are presented in Table 2. As classes were added to the model, the information criterion fit indices generally became smaller and the entropy became larger, suggesting improved fit with the addition of more classes. Despite this, we chose the 4-class solution because it was theoretically defensible, was similar to previous trajectory solutions, and produced classes that were large enough to provide stable estimates (12, 13, 17). In the unconditional models, the nonlinear model that included a quadratic parameter provided the best fit. After determining the optimal number of classes, the known class variable representing combat exposure was included.

The omnibus Wald test was significant ($\chi^2 = 379.54$, $P < 0.001$), indicating a better model fit with the known class stratification. The average of the posterior probabilities for the resulting 8 groups ranged from 0.911 to 0.989, indicating distinct classes. Table 3 presents the results of the known class analysis, with estimated percentages of participants in the combat exposure trajectories, as well as the Wald tests for significance. The combat exposure trajectories are shown in Figure 1. The association between individual characteristics (e.g. combat exposure, demographic characteristics, military position, and social/behavioral covariates) and class membership are presented in Table 4. We labeled the 4 classes as 1) resilient, 2) moderate stable, 3) new-onset, and 4) pre-existing. We replicated these analyses with only Army and Marine Corps personnel, who have similar deployment and combat experiences and are more often on the front line in combat operations compared with deployed personnel from the Navy, Air Force and Coast Guard. Findings from the Army and Marine Corps subpopulation were nearly identical to findings from all service branches.

The vast majority of the study population had low PTSD symptoms at the time of predeployment that remained low for the entire study period. This class, labeled resilient, was evidenced in 89.0% and 80.7% of the no-combat and combat deployers, respectively. The resilient class with combat exposure had significantly higher predeployment PTSD symptoms (PCL-C scores of 19.45 vs. 19.11; $P < 0.001$) and a greater increase in symptoms across the 3 study waves, as indicated by the slope and quadratic terms. However, when compared with the resilient class that had no combat experience, the differences between the 2 resilient classes in practical terms were minimal (Figure 1).

The moderate stable class was defined by slightly elevated predeployment PTSD symptoms (average PCL-C scores of 34.75 for the no-combat group and 37.08 for the combat group) that dropped slightly but remained relatively stable across study waves. The moderate stable class was the second largest group, comprising 7.1% and 8.6% of the no-combat and combat groups, respectively. There were no significant differences in parameters of symptom trajectory between combat and no-combat groups within the moderate stable class (Table 3).

The new-onset class was characterized by low PTSD symptoms before deployment (average PCL-C scores of 26.90 for the no-combat group and 23.76 for the combat group) and high

Table 3. Known Class Analysis for Combat and Noncombat Single Deployers Using a 4-Class Solution[a], Millennium Cohort Study, 2001–2011

Trajectory Class	No Combat		Combat		Wald Test	*P* Value
	%	Value	%	Value		
Resilient	89.0		80.7			
Intercept		19.11		19.45	11.72	<0.001
Slope		−0.09		1.66	110.36	<0.001
Quadratic		0.26		0.00	15.57	<0.001
Moderate Stable	7.1		8.6			
Intercept		34.75		37.08	1.41	0.235
Slope		−9.48		−9.36	0.82	0.365
Quadratic		2.51		2.83	0.07	0.791
New-onset	2.6		7.7			
Intercept		26.90		23.76	2.33	0.127
Slope		21.74		30.31	12.41	<0.001
Quadratic		−4.27		−6.51	6.79	0.009
Pre-existing	1.2		3.0			
Intercept		59.49		53.25	2.99	0.084
Slope		−31.72		2.79	14.96	<0.001
Quadratic		8.17		−0.34	12.86	<0.001

[a] Estimated proportions for each class grouped by combat exposure.

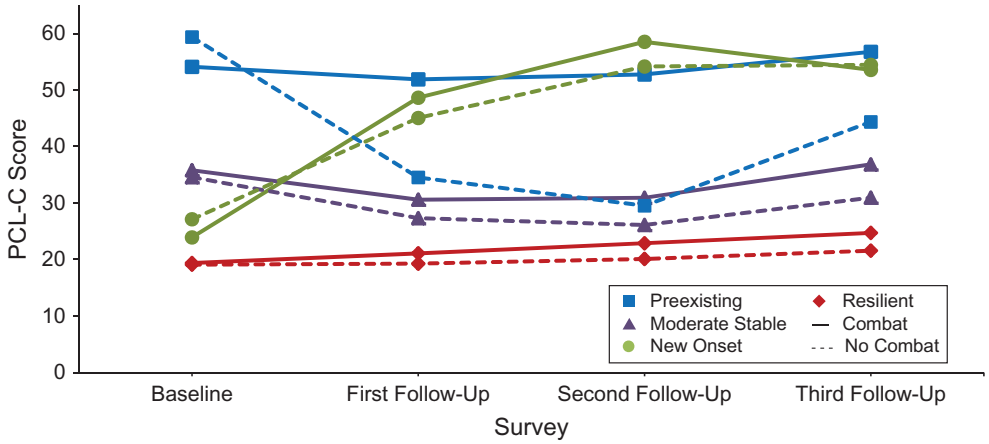

Figure 1. Trajectories of posttraumatic stress disorder symptoms for each latent class by combat exposure status (n = 8,178), Millennium Cohort Study, 2001–2011. Baseline is defined as the first survey assessment of participants, which was performed in 2001. The first, second, and third follow-up time points were measured during the subsequent surveys performed in 2004, 2007, and 2011, respectively. PCL-C, PTSD Checklist – Civilian Version.

symptoms after deployment. This class contained 2.6% of the no-combat group and 7.7% of the combat group. Although the 2 groups did not differ at the predeployment survey in the new-onset class ($P = 0.13$), the combat group showed a greater initial increase in symptoms (slope of 21.74 for the no-combat group vs. 30.31 for the combat group; $P < 0.001$), with a greater deceleration, as noted by the significant difference in the quadratic parameter (quadratic of −4.27 for the no-combat group vs. −6.51 for the combat group; $P = 0.009$; Table 3).

The smallest class in the study population started off high in symptoms of PTSD before deployment. This class was labeled the pre-existing class, and it contained 1.2% of the no-combat group and 3.0% of the combat group. These trajectories meaningfully diverged in the known class analysis (Figure 1). There was no significant difference in predeployment values between the 2 groups (average PCL-C scores of 59.49 for the no-combat group and 53.25 for the combat group; $P = 0.08$). Although the combat group maintained high and relatively stable values after deployment, symptoms in the no-combat group decreased for the first 2 waves and increased in the last wave, but remained substantially lower than the combat group (Table 3).

Next, we examined predictors of class membership (compared with the resilient class) by including covariates in a conditional model, which did not noticeably affect the shape of the trajectories. Compared with persons in the resilient class, those in the moderate stable class were younger, less likely to be non-Hispanic black, less likely to be in the Reserves or National Guard, less likely to be an officer, and more likely to be never married. Those in the new-onset PTSD class were more likely to be female, to be Hispanic or another race, to have a noncombat occupation, to be in the Reserves or National Guard, to be an officer, and to be in the Army. Persons in the pre-existing symptoms class were less likely to be married and more likely to be in the Army. Behaviorally, participants in the moderate stable, new-onset, and pre-existing classes were more likely to be current smokers and heavy drinkers and to have experienced stressful life events predeployment than were those in the resilient class (Table 4). In an additional set of analyses, we included terms for the interactions between combat exposure and covariates. Only one was significant when we used the false discovery rate, which suggests that the risk factors for categorization in a given trajectory were similar between participants with and without combat exposure.

DISCUSSION

Across more than 10 years and 4 waves of data, we observed 4 distinct trajectories of PTSD symptoms and found notable differences between these trajectories based on combat exposure. A major finding from this study is that the majority of both non–combat- and combat-deployed personnel were resilient and experienced very few PTSD symptoms before, directly after, and long after deployment (89% and 80%, respectively). These findings broaden the literature by showing that even after combat-related trauma, the vast majority of service members are resilient. This point has been controversial in past research findings, which have observed resilience in service members, but did not consider the influence of combat exposure (12, 13). These findings contribute to the literature by providing data over many years after a deployment. Other studies that have followed service members before and after deployment have typically lasted for less than a year in duration, which may not be sufficient to fully capture the time period from a traumatic exposure to the onset of PTSD symptoms (13).

Although our findings show that the majority of service members remain resilient even after experiencing combat, our findings also echo the broader literature that indicates that combat deployments have serious consequences for mental health (1). Across all of the trajectory classes in this study, combat-deployed service members diverged after a single deployment, and generally had higher PTSD symptoms than their

Table 4. Odds Ratios for Predictors of Class Membership, Millennium Cohort Study, 2001–2011

Characteristic	Pre-Existing vs. Resilient		Moderate Stable vs. Resilient		New-Onset vs. Resilient	
	OR	95% CI	OR	95% CI	OR	95% CI
Sex						
Male	1.00	Referent	1.00	Referent	1.00	Referent
Female	0.93	0.62, 1.41	0.99	0.78, 1.26	1.51	1.14, 2.01
Age (5-year increments)	0.94	0.82, 1.08	0.92	0.84, 1.00	1.03	0.92, 1.14
Race/ethnicity						
White, non-Hispanic	1.00	Referent	1.00	Referent	1.00	Referent
Black, non-Hispanic	1.68	1.02, 2.78	0.70	0.51, 0.97	1.30	0.90, 1.87
Asian/Pacific Islander	0.96	0.40, 2.31	0.85	0.54, 1.34	0.81	0.45, 1.46
Hispanic/Other	1.75	1.04, 2.93	1.10	0.81, 1.50	1.78	1.26, 2.51
Educational level						
Less than bachelor's degree	1.00	Referent	1.00	Referent	1.00	Referent
Bachelor's degree or higher	0.84	0.47, 1.50	0.73	0.53, 1.00	0.73	0.51, 1.06
Marital status						
Married	1.00	Referent	1.00	Referent	1.00	Referent
Never married	1.67	0.97, 2.86	1.40	1.09, 1.79	0.88	0.63, 1.22
Divorced/widowed	1.62	1.04, 2.52	1.18	0.90, 1.53	1.05	0.74, 1.49
Service branch						
Army	1.00	Referent	1.00	Referent	1.00	Referent
Other[a]	0.81	0.53, 1.24	0.94	0.76, 1.17	0.42	0.32, 0.56
Service component						
Active duty	1.00	Referent	1.00	Referent	1.00	Referent
Reserve/National Guard	0.87	0.59, 1.29	0.70	0.57, 0.86	1.31	1.01, 1.70
Pay grade						
Junior enlisted	1.00	Referent	1.00	Referent	1.00	Referent
Senior enlisted	0.72	0.38, 1.34	0.78	0.59, 1.02	0.53	0.38, 0.75
Officer	0.63	0.21, 1.88	0.45	0.28, 0.73	0.37	0.21, 0.65
Occupation						
Combat specialist	1.00	Referent	1.00	Referent	1.00	Referent
Other	1.20	0.79, 1.84	1.09	0.87, 1.37	1.38	1.00, 1.90
Smoking status						
Never smoker	1.00	Referent	1.00	Referent	1.00	Referent
Past smoker	1.37	0.88, 2.13	1.13	0.90, 1.41	1.05	0.79, 1.39
Current smoker	2.61	1.69, 4.02	1.51	1.19, 1.91	1.60	1.21, 2.12
Heavy drinking						
No	1.00	Referent	1.00	Referent	1.00	Referent
Yes	2.58	1.68, 3.96	2.19	1.70, 2.82	1.57	1.11, 2.21
No. of stressful life events[b]						
0	1.00	Referent	1.00	Referent	1.00	Referent
1	2.15	1.11, 4.15	1.44	1.08, 1.93	1.33	0.93, 1.90
≥2	5.42	2.93, 10.06	3.58	2.66, 4.80	2.14	1.42, 3.23

Abbreviations: CI, confidence interval; OR, odds ratio.
[a] Air Force, Navy, Marine Corps, and Coast Guard.
[b] Count of affirmative responses to 7 types of stressful events.

non–combat-deployed counterparts. Notably, combat-deployed and non–combat-deployed service members had very similar predeployment PTSD symptoms, indicating that there had been no differences between these groups before deployment.

For the pre-existing symptoms class, in which initial levels of PTSD symptoms were elevated before deployment, differences according to combat exposure were especially pronounced. Combat exposure in this class appeared to contribute to the maintenance of continually elevated PTSD symptom levels. However, for a small percentage of service members in this class (1.2%; $n = 68$), deployment without combat exposure appeared to be beneficial and improved PTSD symptoms over time. Although trajectory classes that seemed to benefit from deployment have been found in previous studies (13), the benefits experienced in the current study appear to be longer lasting. There are several plausible explanations for this finding. First, this could indicate a normal recovery pattern, which is not observed in combat-deployed service members because combat may contribute to the maintenance of symptoms. Second, the improvement in PTSD symptoms may also be due to an actual benefit of deployment itself. Service members reporting high PTSD symptoms before deployment may find deployment to be a distraction from stressful circumstances and/or recent traumatic life events. Deployments may also represent a time during which service members feel more fulfillment and increased sense of purpose from performing jobs for which they were trained. Dickstein et al. (15) have referred to this pattern of high PTSD decline after deployment as "unrealized anxiety." Lastly, because deployments are characterized by community living and working situations, deployed symptomatic individuals may experience greater availability for social connection and integration into social networks. These factors may be particularly helpful to individuals without a support network who experience stress in their daily lives (27). Therefore, although deployments are generally thought to be benign or negative, they may be beneficial for individuals with already high levels of PTSD symptoms, but only when the deployment experience does not include combat.

This study also examined predictors of class membership, and found that current smoking, heavy drinking, and experiencing stressful life events were all associated with a higher likelihood of being in the nonresilient classes (pre-existing, moderate stable, and new-onset) rather than in the resilient class. Perhaps this is because participants with maladaptive coping mechanisms are more susceptible to developing PTSD. Being female was associated with a greater likelihood of being in the new-onset group. We questioned whether the interaction between stressful life events and combat exposure might predict class membership, or have a cumulative influence on reduced mental health. We found that stressful life events did not interact with combat exposure in predicting membership in any of the nonresilient classes. We also investigated whether women were more likely than men to be in the new-onset group after experiencing combat, and found that combat exposure did not interact with gender in predicting class membership. Thus, women were more likely to be in the new-onset group regardless of combat exposure, which supports other literature suggesting that women are no more likely than men to develop PTSD when exposed to combat (28).

In this study, we utilized a sophisticated modeling approach to understand how deployment and combat experiences influence PTSD trajectories among deployed service members, both those with and without combat experience. With more than 8,000 participants, the population sample was sufficiently large to obtain robust, meaningful, and stable estimates of PTSD symptoms from a population of individuals with a single deployment in support of the recent operations in Iraq and Afghanistan. This study had several notable strengths. First, it is the longest prospective study to examine the clinical course of PTSD symptoms before and after deployment. Second, the prospective study design allowed us to consider variations in both pre-and post-deployment symptoms, as well as control several potentially confounding factors. Lastly, participants in the sample represented all branches of the uniformed services and also included active-duty military service members, Reservists, and National Guardsmen.

Despite these advantages, the study also has several potential limitations. First, our sample may not be completely representative of previously-deployed military service members. However, using health care data, investigations have found our cohort to be mostly representative with respect to health-care utilization before study enrollment, with reliable data reporting by participants (5, 18). Second, although these data were collected prospectively, there is approximately 3 years between assessments, which may not have fully captured changes in PTSD symptoms over the years. Lastly, there may have been some misclassification of combat exposure because of the use of a short 5-item measure that did not assess "feeling in danger." A more robust 13-item scale was later added to the survey in 2007, which included the "feeling in danger" item. A previous investigation compared the 2 scales, and showed a high internal consistency between them ($\alpha > 0.85$), where only 12% of those reporting combat exposure on the 13-item scale were misclassified using the 5-item scale. Additionally, the 2 scales showed comparable predictive power for new-onset mental disorders.

Within the context of these limitations, our findings may have a number of clinical and societal implications. For example, the high prevalence of resilience to PTSD symptoms even among combat-deployed veterans strongly counters a common perception among civilians that the majority of post-9/11 veterans suffer from serious mental disorders (29). In addition, a small group of veterans who did not develop PTSD nonetheless continually suffered moderate-level symptoms for the entire 10-year duration of the study. These individuals are not likely to seek treatment for PTSD as veterans, but may still benefit from interventions aimed at easing transition stress or other stress-related difficulties (30). Similarly, it will be imperative to better understand the clinical profile of soldiers who experience elevated PTSD symptoms before deployment. Although this group represented only a small portion of our sample, they showed the clearest divergence as a result of combat deployment. Clinical insights may shed important light on the mechanisms by which deployment without combat might lead to symptom reduction among indviduals of this group.

Likewise, it will be crucial for researchers to continue to examine heterogeneous patterns of response to combat exposure. For example, it may be useful to explore new assessment techniques to better identify and track soldiers with elevations in pre-existing PTSD symptoms. In the case of the new-onset class, where trajectories also diverged as a result of combat exposure, a crucial question for future research is not why combat

deployment led to PTSD symptoms, but rather what factors may have increased PTSD symptoms among the relatively small proportion of soldiers who deployed but did not experience combat exposure (2.4%). Further examination of other potentially traumatic life events, such as sexual assault, should be examined among this group.

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