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Anger problems and posttraumatic stress disorder in male and female National Guard and Reserve Service members

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ABSTRACT

Anger is a common problem among veterans and has been associated with posttraumatic stress disorder (PTSD). This study aimed to improve understanding of how anger and PTSD co-occur by examining gender differences and differences by whether the triggering traumatic event is deployment-related vs. civilian-related in current service members. A representative cohort of Reserve and National Guard service personnel ($n = 1293$) were interviewed to assess for deployment- or civilian-related traumas, PTSD, and anger. The prevalence of self-reported anger problems was estimated among male ($n = 1036$) and female ($n = 257$) service members. Log Poisson regression models with robust standard errors were used to estimate the associations of problems with anger with PTSD and PTSD symptom severity for men and women. Self-reported anger problems were common among male (53.0%) and female (51.3%) service members. Adjusted prevalence ratios (PR) showed associations between anger and PTSD connected to both civilian- and deployment-related traumas (PR were 1.77 (95% CI 1.52–2.05) and 1.85 (95% CI 1.62–2.12), respectively). PTSD symptom severity was also associated with anger. This study was cross-sectional and so a causal relationship between PTSD and anger cannot be established. Problems with anger are common among male and female current Guard and Reserve members. These findings suggest that anger treatment should be made available to current service members and that clinicians should assess anger problems irrespective of gender. Future research should examine the effectiveness of anger treatment protocols by gender.

1. Objectives of the study and background

Anger problems are common among military veterans, with population-based estimates of the prevalence of self-reported anger in post 9/11 veterans ranging between 44% and 57% (Pew Research Center, 2011; Sayer et al., 2010; Wheeler, 2007). In both military and civilian populations, anger problems have been associated with a number of negative consequences, including poor family functioning (Taft et al., 2008), negative workplace and school outcomes (Hershcovis et al., 2007; Thomas and Smith, 2004), aggression (Teten et al., 2010), and poorer treatment outcomes for posttraumatic stress disorder (PTSD) (Forbes et al., 2008).

PTSD is one of the signature wounds of war. PTSD is of particular public health concern for service members who have deployed in support of the wars in Iraq and Afghanistan as these wars have been characterized by longer and multiple deployments, which are known to increase the risk of PTSD (Reger et al., 2009; Smith et al., 2011). Between 11.6% and 24.5% of recently redeployed service members have been found to have PTSD, with higher incidence among Reserve and National Guard members compared to Active Duty military (Litz and Schlenger, 2009; Milliken et al., 2007).

While there have been no population-based studies of the association between PTSD and anger problems in veterans or military service members, the co-occurrence of PTSD and anger problems has been documented in several studies of veterans in treatment for psychosocial problems, substance abuse, and domestic violence

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(e.g. Beckham et al., 1998; Jakupcak et al., 2007; Kulkarni et al., 2012; Lasko et al., 1994; McFall et al., 1999; Novaco et al., 2012). Most research on anger and PTSD has been conducted with male veterans, and a few studies have included both male and female veteran participants. However, none of these studies have presented sub-analyses by gender and so it remains unknown whether the association between PTSD and anger is similar in men and women veterans (Elbogen et al., 2010; Ouimette et al., 2004). The only study to date that compared the association between anger and PTSD in men and women compared a sample of male veterans with PTSD to a sample of female victims of childhood or adult sexual trauma with PTSD; the latter group consisted not just of women veterans, however, but also civilian wives of male service-connected veterans (Castillo et al., 2002). In this study, men had higher levels of anger than women. While there are no studies that examine the association between anger and PTSD in women veterans, a study with women Vietnam veterans seeking treatment at a mental health clinic documented higher levels of hostility in women with PTSD compared to treatment-seeking women without PTSD (Butterfield et al., 2000). Given that women make up 19.5% of Reserve and 15.5% of National Guard service members (The Women's Memorial, 2011), and women are now allowed to serve combat duty, increasing their risk of trauma during future deployments (Roulo, 2013), understanding the relations between anger and PTSD in women service members and veterans is critical. Furthermore, understanding whether and how these relations may differ between men and women will aid in developing appropriate interventions to prevent and treat anger and PTSD.

Less is known about the relations between anger and PTSD in current service members than among veterans who are out of the service. Two recent studies have found high levels of comorbidity between anger and PTSD in current service members (Novaco et al., 2012; Thomas et al., 2010). The first study examined treatment-seeking soldiers recently returned from Afghanistan or Iraq (Novaco et al., 2012), while the second study examined National Guard soldiers recently returned from Iraq (Thomas et al., 2010). In order to capture, address, and alleviate the long-term negative consequences of anger and PTSD, understanding the prevalence of anger and the relations between anger and PTSD in current service members is important.

Furthermore, military service members are at risk of PTSD not just from deployment-related traumas, but also from traumas they may experience outside of deployment, such as car accidents or violent crimes. In a meta-analysis by Orth and Wieland (2006) examining the correlation between anger and PTSD in studies of traumatized adults, the authors found a stronger correlation between anger and PTSD in samples with military war experience compared to any other type of trauma. However, they noted that it was impossible to ascertain whether this increased association was due to trauma event type or due to pre-event differences in sample populations. Understanding the role of the context of the triggering traumatic event on the association between anger and PTSD within an all-military population will help guide appropriate interventions with service members who experience trauma and its sequelae in either context.

To improve our understanding of anger in military service members, we estimated the prevalence of anger in a random, representative sample of male and female National Guard and Reserve soldiers. Previous research is limited because it has been based on treatment-seeking military populations. Second, we estimated the association between anger problems and PTSD among men and women. While there is a sizable body of research documenting the association between PTSD and anger in men, there is limited research on women. Third, we estimated the association between anger problems and PTSD separately for PTSD due to deployment- vs. civilian-related traumas. We hypothesized that the association between anger and PTSD would be stronger in those with deployment-related PTSD compared to those with only civilian-related PTSD.

2. Materials and methods

The U.S. Army Medical Command's Congressionally Directed Medical Research Programs Unit, the Human Research Protection Office at the U.S. Army Medical Research & Materiel Command, and the Institutional Review Boards at both the Uniformed Services University of the Health Sciences and Columbia University approved the study protocol. Verbal informed consent was obtained from all participants.

2.1. Study population

We obtained contact information for a stratified random sample of National Guard ($N = 10{,}000$) and Reserve ($N = 10{,}000$) soldiers who were serving in the military as of June 2009 through the Defense Manpower Data Center (DMDC) from which we began to recruit participants into a cohort study. A random sample of 9751 (4788 National Guard, 4963 Reserves) soldiers were selected to participate and mailed information about the study along with an opt-out letter. After excluding incorrect/non-working telephone numbers (2866/9751 or 29.4%), 6885 working numbers (71%) remained as viable for participant recruitment. We excluded 324 (3%) who were not eligible (e.g. no longer enrolled or retired), and disqualified 61 (1%) because they either did not speak English above an 8th grade level or had hearing problems; 1097 (11%) did not wish to participate, and 3386 (35%) had not yet been contacted when we reached our target sample size. A total of 2003 service personnel were interviewed at baseline, with an overall cooperation rate of 68.2% (2003 + 324+61/6885−3386), defined as the number of participants who consented regardless of eligibility (2003 + 324+61 = 2388) divided by the number of working numbers we successfully contacted (6885−3386 = 3499). The overall response rate was 34.1% (2327/6824); defined as the number of participants who completed a survey or consented but were ineligible, divided by the number of working numbers minus those that were disqualified (2003 + 324/6885-61). Consent to participate in the study began in January 2010 and ended July 2010. Participants were compensated for their time with $25 for an approximately 50 min interview. A second wave of data collection beginning in January 2011 and ending in November 2011 attempted to reach 1996 of the wave 1 participants (7 of the original participants declined further participation at the end of the first interview). We were able to resolve 1428 (72%) of the telephone numbers (251/1996 or 13% were incorrect/non-working telephone numbers and 317/1996 or 16% remained unresolved after up to 60 attempts). We excluded 3 individuals due to hearing or other health problems and 132 (7%) declined to participate. The remaining 1293 participants completed this second wave survey. The cooperation rate was 91% (1293 + 3/1393 + 132 + 3) and the response rate was 74% (1293 + 3/1745 − 3). Participants who were interviewed at baseline were eligible to be interviewed in the second wave regardless of whether they had retired or separated from the Reserve or National Guard between waves 1 and 2. Interviews in the second wave averaged 37 min and participants were paid a $25 stipend for participating in the survey. For the present study, data on gender and race was obtained from the first wave of data; all other variables were obtained from the second wave of data.

2.2. Interviews

In each wave of data collection, participants were administered a telephone survey using a computer-assisted telephone interview

(CATI). The survey included questions on military history and experiences, deployment-related and civilian psychopathology, health status, mental health service use, health-risk behaviors, and demographic characteristics. The second wave data also included questions about problems experienced with anger.

2.3. Measures

2.3.1. Traumatic events

To assess deployment history and traumatic events experienced during the most recent deployment, we used items adapted from the Deployment Risk and Resilience Inventory (DRRI) (King et al., 2006). In addition, we assessed exposure to PTSD criterion A events using a list of traumatic events developed by the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 1989). This series captures both civilian traumas and traumas that occurred during a military deployment. Participants were offered an opportunity to describe any other traumatic event that they reported was the "worst" trauma they had experienced. Participants were asked after each item when the event occurred and whether the event occurred in relation to their most recent deployment. Participants were asked about traumatic events experienced in their lifetime at the first wave and asked about events occurring since the first wave during the second wave of the study.

2.3.2. Anger

Anger was measured using a four-item scale developed from questions in the Dimensions of Anger (DAR) scale (Forbes et al., 2004). The DAR is a brief instrument that has been used in several studies of military populations (Forbes et al., 2004; Hawthorne et al., 2006; Nederlof et al., 2009). The four items assessed the frequency, intensity, antagonism, and impairment involved with the respondent's experience of anger in the past 12 months. Example items include "My anger prevents me from getting along with people as well as I'd like to", and "When I get angry at someone, I want to clobber the person." Respondents rated how much they disagreed or agreed with each statement on a 5-point Likert scale, ranging from strongly disagree to strongly agree. A factor analysis on this scale found one factor, with loadings ranging from 0.64–0.69. Cronbach's alpha for the scale was good at 0.78 with item-test correlations ranging from 0.76 to 0.80. Participants were coded as having a problem with anger if they responded that they "agreed" or "strongly agreed" with any of the four statements.

2.3.3. Posttraumatic Stress Disorder (PTSD)

To assess PTSD, we asked participants about their experience of symptoms consistent with DSM-IV criteria for PTSD. We used the PTSD Checklist-C (PCL) to evaluate these symptoms (Keen et al., 2008; Weathers et al., 1993). The PCL-C has been widely used in military populations and was more appropriate for this study than the PCL-M because we also sought to capture civilian events. The PCL has good psychometric properties. In one military population, the scale was shown to have an internal consistency of 0.97 and consistency within subscales ranging from 0.92 to 0.93. Test–retest reliability was 0.96. The PCL was highly correlated with other PTSD scales, including the Mississippi Scale of Combat Related PTSD (coefficient: 0.93) (Weathers et al., 1993). Keen et al. have reported very similar psychometric properties for the scale in other combat veteran populations (Keen et al., 2008). While the PCL is structured to solicit symptoms in the past month, we asked participants to answer with respect to symptoms they experienced within the last 12 months, which allowed us to better map our screening to the DSM-IV definition of PTSD.

Participants were administered the PTSD scale if they endorsed any of the traumatic experiences described above during either the first or second wave of the survey. Each participant had an opportunity to be administered the scale twice, once with respect to what they identified as the "worst" trauma related to their most recent deployment and once with respect to the "worst" trauma that occurred at any point other than during their most recent deployment. Using data on the nature of the trauma and on previous deployment dates, we determined whether the "worst" trauma not related to their most recent deployment was related to a prior deployment or whether it was experienced as a civilian. Participants were reminded of their previously identified "worst" trauma from wave 1 and were administered the scale with respect to what they identified currently as their "worst" trauma in each category. Thus, participants reported on symptoms experienced within the past 12 months, while the trauma could have happened at any time during their lifetime.

Among participants who experienced a traumatic event, participants were classified dichotomously as having PTSD or not having PTSD. To be classified as having PTSD, participants had to meet criterion B (at least one symptom of reexperiencing), criterion C (at least three symptoms of avoidance), criterion D (at least two symptoms of hyperarousal), criterion E (duration of symptoms of at least one month), and criterion F (significant impairment) (Keen et al., 2008). To meet criterion F, participants had to respond "very difficult" or "extremely difficult" to either of the following questions: "How difficult did these problems make it for you to do your work, take care of things at home, or get along with other people?" or "When you had several of these bad moods, feelings, and memories, how distressing was it for you?" Criterion A2 was dropped based on the draft DSM-V classification criteria statement and recent research in veteran populations indicating the criterion is not helpful for diagnosing PTSD (Adler et al., 2008; American Psychiatric Association DSM-5 Development; Friedman et al., 2011; Osei-Bonsu et al., 2012).

Participants could be classified in one of four ways: 1) No PTSD, 2) PTSD stemming from a deployment-related event only, 3) PTSD stemming from a civilian-related event only, or 4) PTSD stemming from both deployment- and civilian-related events. We also conducted analyses using the standard PCL cut off score of 50 for criteria B, C, and D (Weathers et al., 1993). As the results were essentially the same with both measures, we present results only for the criteria described above. Participants who experienced a traumatic event were separately given a PTSD symptom severity score for symptoms related to either a civilian trauma or a deployment trauma. PTSD symptom severity was measured using a continuous score of symptoms in criteria B, C, and D (Keen et al., 2008). The Cronbach's alpha for this sample was 0.94 for civilian-related PTSD and 0.97 for deployment-related PTSD.

2.4. Statistical methods

We constructed weights to account for the sample design, nonresponse, and participant sociodemographic characteristics relative to those of the overall Reserve and National Guard population. These weights have been applied to all analyses, thus results can be interpreted as applicable to the Reserve and National Guard population as of July 2009. We assessed the prevalence of problems with anger and the prevalence of anger by demographic characteristics and by PTSD status (no PTSD, only civilian-related PTSD, only deployment-related PTSD, and both civilian- and deployment-related PTSD). We used log Poisson regression models with robust standard errors to examine the association between problems with anger and PTSD and PTSD symptom severity. This approach has been shown to reliably estimate adjusted prevalence ratios (Zou,

Table 1
Characteristics of study participants by gender.

	Men				Women			
	No. (%)	Problems with anger (No. (%))	Civilian-related PTSD (No. (%))	Deployment-related PTSD (No. (%))	No. (%)	Problems with anger (No. (%))	Civilian-related PTSD (No. (%))	Deployment-related PTSD (No. (%))
Total	1036 (81.8)	519 (53.0)	29 (2.4)	39 (3.9)	257 (18.2)	117 (51.3)	13 (5.5)	4 (0.8)
Age								
18–24 years	160 (26.4)	90 (55.0)	5 (2.5)	2 (0.7)	46 (34.3)	23 (51.9)	3 (6.2)	0 (0)
25–34 years	345 (36.7)	179 (52.7)	11 (2.1)	12 (3.9)	92 (40.3)	42 (52.6)	1 (1.1)	0 (0)
35–44 years	280 (22.3)	143 (57.8)	9 (2.5)	17 (6.8)	68 (16.1)	30 (42.1)	4 (7.9)	0 (0)
>45 years	236 (14.6)	104 (45.2)	4 (3.3)	8 (5.8)	49 (9.3)	20 (54.5)	5 (18.2)	4 (9.1)
Race								
White	778 (85.2)	378 (50.0)	18 (2.6)	28 (4.0)	159 (69.6)	79 (56.4)	7 (4.4)	2 (0.6)
Non-White	152 (14.8)	75 (52.2)	5 (2.1)	6 (3.4)	73 (30.4)	29 (45.6)	4 (7.4)	0 (0)
Education								
High school or less	151 (25.5)	91 (61.2)	7 (3.7)	5 (3.7)	20 (15.6)	12 (62.2)	1 (2.7)	0 (0)
Some college	307 (39.6)	154 (51.2)	13 (2.4)	18 (5.0)	70 (40.8)	32 (48.5)	3 (4.1)	0 (0)
College or more	578 (35.0)	274 (49.1)	9 (1.6)	16 (2.9)	167 (43.7)	73 (50.0)	9 (7.7)	4 (1.9)
Rank								
Enlisted	702 (95.7)	371 (53.5)	25 (2.7)	31 (4.1)	155 (97.6)	82 (52.4)	11 (5.8)	2 (0.5)
Officer	233 (4.3)	100 (35.7)	1 (0.0)	2 (2.4)	74 (2.4)	21 (20.0)	1 (0.0)	1 (0.0)
Marital status								
Married	626 (51.0)	293 (50.1)	15 (2.2)	24 (5.3)	113 (35.7)	50 (52.9)	2 (3.5)	3 (0.0)
Not married	410 (49.0)	226 (55.2)	14 (2.7)	15 (2.5)	144 (64.3)	67 (50.3)	11 (6.5)	1 (1.3)

Raw numbers and weighted percentages are presented.

2004). We examined the associations between anger and PTSD and anger and PTSD symptom severity by type of trauma (civilian- and/or deployment-related) by restricting analyses to only those with one type of trauma (e.g. examining the association between anger and deployment-related PTSD restricted to those without civilian-related PTSD) and by using an interaction term to capture a possible interaction between civilian- and deployment-related PTSD. We examined these relations separately among men and women where we had statistical power to do so.

3. Results

The characteristics of this sample are presented in Table 1. Group differences in the prevalence of anger, civilian-related PTSD, and deployment-related PTSD were examined by demographic characteristics and gender. The prevalence of anger was similar among women and men (51.3% in women, 53.0% in men, $p = 0.6$). Civilian-related PTSD in the past year was documented among 3.0% of participants; deployment-related PTSD in the past year was documented among 3.4% of participants. Men had lower prevalence of civilian-related PTSD (2.4% for men vs. 5.5% for women, $p = 0.01$) and higher prevalence of deployment-related PTSD (3.9% for men vs. 0.8% for women, $p = 0.02$) compared to women. The prevalence of anger, civilian-related PTSD, and deployment-related PTSD did not vary significantly within demographic sub-groups, with the exception of the prevalence of anger by education ($p = 0.006$) and rank ($p = 0.02$) in men, and the prevalence of both types of PTSD by age in women ($p = 0.01$) and deployment-related PTSD by age in men ($p = 0.003$). The mean number of deployments in this population was 2.8 (SD = 0.29); 27.6% of participants had not yet been deployed. Of those deployed, 76% had deployed to a warzone. The mean number of deployment-related traumas experienced during a participant's lifetime was 3.2 (SD = 0.11); mean number of civilian-related traumas experienced during a participant's lifetime was 4.6 (SD = 0.10). At wave 2, 9.6% of the baseline participants had left the Reserve or National Guard force.

Table 2
Prevalence of anger by PTSD status and gender.

PTSD status	Men		Women	
	Total (No.)	Problems with anger (No. (%))	Total (No.)	Problems with anger (No. (%))
No PTSD	976	465 (51.5%)	243	104 (48.9%)
Civilian-related PTSD only	18	15 (88.3%)	10	9 (90.9%)
Deployment-related PTSD only	27	24 (90.9%)	1	1 (100%)
Both civilian- and deployment-related PTSD	11	11 (100%)	3	3 (100%)

Raw numbers and weighted percentages are presented.

Table 2 presents the prevalence of anger by PTSD status in men and women. There is a markedly higher prevalence of anger among those with PTSD related to either civilian or deployment-related trauma compared to those without PTSD ($p < 0.01$). Among those with PTSD related to both civilian and deployment-related traumas, all service members reported problems with anger. Notably, in the absence of PTSD, 51.5% of women and 48.9% of men report problems with anger.

In regression analyses controlling for confounders, service members with deployment-related PTSD had a higher prevalence of anger problems compared to service members without PTSD (prevalence ratio (PR) = 1.85, 95% CI: 1.62–2.12) (model excluded those with civilian-related PTSD) (see Table 3). Service members with civilian-related PTSD were also at higher risk of anger problems compared to those without PTSD (PR = 1.77, 95% CI: 1.52–2.05) (model excluded those with deployment-related PTSD). For those with PTSD stemming from both types of trauma, the prevalence ratio was 1.97 (95% CI: 1.79–2.16). As we found no evidence of effect measure modification by gender, these analyses were conducted pooling men and women to increase our precision.

We finally examined the association between PTSD symptom severity and anger problems (Table 4). In regression analyses controlling for confounders, among men without civilian-related PTSD, for each standard deviation higher level of deployment-related PTSD symptom severity, the prevalence of problems with anger was 1.21 times higher (95% CI: 1.16–1.27). A similar association was found for each standard deviation higher level of civilian-related PTSD symptom severity (among those without deployment-related PTSD) (PR = 1.27, 95% CI: 1.21–1.33). Results in women were similar: the PR for a standard deviation higher level of

Table 3
Adjusted prevalence ratio of anger problems by PTSD type.

	Adjusted prevalence ratio (95% CI)[a]
No PTSD	–
Deployment-related PTSD	1.85 (1.62–2.12)*
Civilian-related PTSD	1.77 (1.52–2.05)*
Both types of PTSD	1.97 (1.79–2.16)*

* Significant at the 0.001 level.
[a] Model weighted and adjusted for age, education, race, marital status, rank, and race.

deployment-related PTSD symptom severity was 1.55 (95% CI: 1.19–2.03); the PR for a higher level in civilian-related PTSD symptom severity was 1.35 (95% CI: 1.23–1.47).

4. Discussion

In a representative national sample of Reserve and National Guard soldiers, we found that half of all soldiers reported problems with anger within the past year. The prevalence of anger in this population is comparable to recent veteran populations (Pew Research Center, 2011; Sayer et al., 2010; Wheeler, 2007), suggesting problems with anger likely precede separation from the military. While no studies have examined the effectiveness of treatment for anger problems in current service members and only a few have examined these treatments in veterans, there is general support for the effectiveness of anger treatment in reducing anger problems (Taft et al., 2012). Given that anger is a problem for half of Guard and Reserve members, treatment opportunities should be made available to current service members.

This is the first study we know of to assess the prevalence of anger among men and women service members. We found that there was no statistically significant difference in the prevalence of anger by gender. This is consistent with several studies in the general population that have found little difference between men and women's frequency or experience of anger (Averill, 1983; Buntaine and Costenbader, 1997; Kopper, 1993; Kopper and Epperson, 1991, 1996; Stoner and Spencer, 1987). Yet this finding is in contrast to popular portrayals of veterans in the news media, where stories of male veterans who perpetrate violence and female veterans who are victims of violence abound (Worthen et al., 2013). These stories, however, highlight violent behavior, not anger, which may have different gendered manifestations. In the general population, women have been found to direct anger inward more than men, who tend to direct anger outward (Dittmann, 2003). Further research is needed to understand whether anger manifests similarly for men and women service members; any gender differences in the expression of anger will be important to understand in order to provide appropriate resources to help these service members address their anger.

Table 4
Adjusted prevalence of anger by PTSD symptom severity.

	Men	Women
	Adjusted prevalence ratio (95% CI)[a]	Adjusted prevalence ratio (95% CI)[a]
Deployment-related PTSD symptom severity	1.21 (1.16–1.27)*	1.55 (1.19–2.03)*
Civilian-related PTSD symptom severity	1.27 (1.21–1.33)*	1.35 (1.23–1.47)*

* Significant at the 0.001 level.
[a] Model weighted and adjusted for age, education, race, marital status, rank, and race.

The prevalence of civilian-related PTSD in the past year was 3.0%, which is similar to the prevalence of PTSD in the past 12 months in the general population (Kessler et al., 2005). Deployment-related PTSD in the past year was 3.4%, which is consistent with rates of PTSD from the Millennium Cohort (Smith et al., 2008). Among both men and women, we confirmed a strong positive association between anger and PTSD.

We found that anger was also a problem for about half of men and women who do not have PTSD. To our knowledge, no previous studies have examined the prevalence of anger in a population of service members or veterans in the absence of PTSD. However, these figures are consistent with population-level estimates of anger problems with post 9/11 veterans. In a population-based survey conducted by the Pew Research Center (2011), 47% of post 9/11 veterans reported frequent outbursts of anger, and in a study of post 9/11 combat veterans using VA care, 57% of veterans reported problems controlling anger (Sayer et al., 2010). Again, it is worth noting that the high prevalence of anger does not mean a high prevalence of violent behavior. Further research should seek to understand the extent and importance of anger problems in the absence of PTSD.

While for both men and women anger was slightly more common among those with deployment-related PTSD than civilian-related PTSD, both civilian- and deployment-related PTSD were more strongly associated with anger in women than in men. However, none of these results were statistically significantly different from one another. Given the low prevalence of either type of PTSD in this population, it may be that the failure to find a statistically significant difference between these associations is a result of limited power. These results are in contrast to Castillo et al., (2002) conclusions that anger is more strongly associated with PTSD in men than in women. This difference is likely due to Castillo's sample including both women service members and wives of service members, whereas our sample included only women who were service members themselves.

Consistent with Kulkarni et al.'s (2012) research with treatment-seeking male veterans, we found that anger was significantly associated with PTSD symptom severity. Yet while Kulkarni et al. assert that anger may be a particular problem for male veterans because of the consistency of anger with a traditional male gender role, our research suggests that anger is as common a problem among women as among men, and that the association between anger and PTSD is just as robust in women as it is in men. This is consistent with qualitative research with male and female veterans that has demonstrated anger is a problem for veterans of both genders as they reintegrate into civilian society, and that women may experience greater social isolation as a result of their problems with anger than men because of gendered stereotypes of about anger (Worthen and Ahern, 2013). We recommend that clinicians assess whether anger is a problem for women service members and veterans with the same diligence that they do for men. Further research should continue to explore the mechanism of effect in the relationship between anger and PTSD in women and men and should seek to determine whether anger treatments differ in their effectiveness for men and women in order to improve treatment outcomes for both groups.

Our final aim was to investigate whether the association between anger and PTSD differed depending on whether the PTSD was associated with a civilian- or deployment-related trauma. In adjusted models, we found that the association between anger and PTSD was similar regardless of whether the triggering traumatic event was experienced as a civilian or while on a deployment. This was consistent for men and women and when we examined PTSD using DSM criteria or a continuum of PTSD symptom severity, which included individuals who experienced symptoms not

reaching the level of PTSD. The low prevalence of PTSD in this population may have made it difficult to detect any difference in the magnitude of the association between PTSD and anger based on the type of trauma should such a difference exist.

Orth and Wieland's (2006) meta-analysis examining the association between anger and PTSD in traumatized adults found a stronger association between anger and PTSD in military populations than in civilian populations. In this all-military population, anger problems were only slightly more common among those with deployment-related traumas than civilian-related traumas and the magnitude of the associations between anger and PTSD were similar for PTSD stemming from either deployment-related or civilian-related traumas. This suggests that the context of the trauma (military vs. civilian) may not be an important factor in the association between anger and PTSD in an all-military population. Further research is needed to tease out the role of the context of the trauma (military vs. civilian) in the relationship between anger and PTSD.

Some limitations to our study are worth noting. First, our baseline response rate was relatively low, although it is similar to response rates obtained in other longitudinal studies with current service members (Riddle et al., 2007). In order to address the possible selection bias that this low response rate could introduce, we calculated weights to account for non-response and applied these weights to all analyses. Second, the present analysis was cross-sectional in nature and thus we are unable to establish whether anger problems developed after PTSD or whether anger problems pre-existed exposure to trauma or the development of PTSD. This is a limitation in common with most of the research examining anger and PTSD in military populations, which tends to focus on these two factors' co-occurrence rather than focusing on establishing a causal relationship (Taft et al., 2012). As there is some question in the literature about the temporality of how anger problems impact the phenomenology of PTSD (e.g. Andrews et al., 2009; Ehlers et al., 2003; Forbes et al., 2008; Hawkins and Cougle, 2011), it would be useful to follow a military cohort to assess pre-trauma anger levels and to ascertain trajectories of anger response and PTSD symptomatology over time. Finally, we had a relatively small number of women participants compared to men. While we found similar associations between anger and PTSD among men and women, further research is needed among women to give more precision to estimates of the association.

5. Conclusion

These findings contribute valuable information about the prevalence of anger and the nature of the association between anger and PTSD in military service members. We established that anger is a common problem for current service members, in addition to veterans, and that anger is equally common among men and women in contrast to the perception that anger is a larger problem for men. We also found that the relations between anger and PTSD are similar for men and women, in contrast to previous research. Further research should explore whether the mechanisms of effect are similar for men and women. We found that the association between anger and PTSD was strong regardless of whether the triggering traumatic event was civilian- or deployment-related.

Based on these findings, we suggest that treatment for anger problems be made widely available to current service members, in addition to veterans. As anger problems are nearly as common in women as in men, clinicians should assess anger problems irrespective of gender and develop psycho-education materials specifically targeting women service members and veterans. Research examining the effectiveness of anger treatment protocols should be designed to include both male and female service members and veterans, and investigate whether there are differences in treatment effectiveness by gender.

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Contributors

Drs. Ursano, Gifford, Fullerton, and Galea designed the study and wrote the protocol. Drs. Worthen and Ahern developed supplementary procedures for the protocol. Mr. Cohen and Ms. Sampson manage the study data and assisted in statistical analysis. Drs. Rathod, Worthen, and Ahern undertook statistical analyses. Dr. Worthen wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflicts of interest

None of the authors have any conflicts of interest to disclose.

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