

# Anger in the UK Armed Forces

## *Strong Association With Mental Health, Childhood Antisocial Behavior, and Combat Role*

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**Abstract:** We assessed the strength of the association of several mental health problems, childhood difficulties, and combat role with anger, as well as the contribution of these factors to explain anger assessed by population attributable fraction (PAF). A total of 9885 UK service personnel, some of them deployed to Iraq and Afghanistan, participated in the study. There was a strong or intermediate association between cases and subthreshold cases of symptoms of posttraumatic stress disorder, psychological distress, multiple physical symptoms and alcohol misuse, having a combat role, childhood adversity, and childhood antisocial behavior with anger. The PAF for any mental health problem and combat role and childhood difficulties was 0.64 (95% confidence interval [CI], 0.56–0.70) and increased to 0.77 (95% CI, 0.69–0.83) if subthreshold cases were included. Anger is a frequent component of mental disorders; health care professionals need to be aware of the interference of anger in the management of mental illness and that anger infrequently presents as an isolated phenomenon.

**Key Words:** Posttraumatic stress disorder, alcohol misuse, childhood behavior, population attributable fraction

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Anger is a common symptom in military personnel who often present comorbid with posttraumatic stress disorder (PTSD), alcohol abuse, and head injuries (Beckham et al., 1997; Elbogen et al., 2010; Jakupcak et al., 2007; Lasko et al., 1994; Macmanus et al., 2012a, 2013; Orcutt et al., 2003). It has been found to be associated with combat exposure (Orcutt et al., 2004), stressful childhood experiences (Begic and Jokic-Begic, 2001; Elbogen et al., 2010), younger age, and male sex (Novaco et al., 2012). Anger can lead to hostility with a tendency to violent behavior; thus, it could be considered a predisposing factor for delinquency and family conflict including domestic violence.

Two meta-analyses have shown the association between anger and PTSD and other anxiety disorders (Olatunji et al., 2010; Orth et al., 2006). A large proportion of studies used in that analysis were based on military samples. There is less information in relation to alcohol misuse, depression, and somatization in military personnel. Although it is clear that anger is a frequent feature of alcohol dependence (Demirbas et al., 2011; Tivis et al., 1998), there are contrasting results with depression (Jackson et al., 2011), some suggesting a negative association (Balsamo, 2010; Luotonen, 2007) and others, a positive association (Hawkins and Cogle, 2011; Moscovitch et al., 2008), and likewise for somatization (Dietrich et al., 2004; Koh et al., 2005; Liu et al., 2011). So far, few studies have presented an overview of the association

between anger and the most common mental health problems (Hawkins and Cogle, 2011), and none in military samples. We do not know the relative effect sizes of the association of each of the mental health problems with anger in military personnel.

This study investigates the relationship of anger with PTSD, alcohol misuse, psychological distress, multiple physical symptoms (MPSs), and mild traumatic brain injury (mTBI) in a cohort of UK military personnel. The purpose was to assess the relative strength of the association of each of these disorders with anger and the combined contribution of several disorders and demographic and service variables to anger in a representative sample of the UK military. We also assessed the attributable fraction (AF), that is, the proportion of anger that can be attributed to each mental disorder, and the population AF (PAF), that is, the proportion of anger in the population that can be attributed to each disorder.

## METHODS

The data for the study comes from a longitudinal cohort study of the UK Armed Forces. Data collection was carried out between 2004 and 2006 (phase 1) and again between 2007 and 2009 (phase 2). Phase 1 included a random sample of personnel deployed to Iraq in 2003 and another randomly selected group of personnel who had not deployed at that time. The phase 2 sample included those who completed the questionnaire at phase 1 and who gave permission for future contact (the follow-up sample). Another two samples were added at phase 2: a random sample of those deployed to Afghanistan between April 2006 and April 2007 to ensure sufficient statistical power to explore issues related to deployment to Afghanistan and a random sample of personnel who joined the military and were trained between April 2003 and April 2007 (replenishment sample) to ensure that the demographic characteristics of the current UK Armed Forces were reflected in the study. Regular and reserve personnel were included. The response rate at phase 2 was 6429 (68.4%) for the follow-up sample, 896 (50.1%) for the Afghanistan sample, and 2665 (40.2%) for the replenishment sample, altogether 9990 (56%). Only phase 2 participants were included in the current study, and 105 participants did not respond to the questions on anger, so the total available sample was 9885. We have shown that mental health status and multiple symptom status at phase 1 was not associated with participation at phase 2 of the study (Fear et al., 2010). Further details are available elsewhere (Fear et al., 2010).

## Measurements

The selected sample was asked to complete a self-administered questionnaire, which was extensively piloted for understanding and acceptability. The main outcome measure for this study was the response to two questions of anger from a four-item anger/aggression questionnaire used by Walter Reed Army Institute of Research (Wilk et al., 2013) based on the Interpersonal Conflict Scale (Spector and Jex, 1998) and State/Trait Anger scale (Spielberger, 1999): “During the last month, how often did you get angry at someone and yell or shout at

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them” and “During the last month, how often did you get angry with someone and kick or smash something, slam a door, punch the wall, etc.” Responders were offered five options for each question: never, once, twice, 3 to 4 times, or 5 or more times, scored as 0, 1, 2, 3, or 4, respectively. The sum of the responses to the two items ranged from 0 to 8, and a combined score of 5 or more (top decile denoting severity above the norm) was defined as an anger case. The other two items of the questionnaire were not included because they corresponded more to aggressive behavior than to anger.

The independent variables were as follows: PTSD was assessed using the PTSD Checklist–Civilian version (PCL-C) with one item (feeling irritable and having angry outbursts) removed, possible PTSD was defined as a score of 47 or above (range, 16–80) and subthreshold PTSD was defined as a score of 28 to 46 (Blanchard et al., 1996); symptoms of psychological distress were measured by the General Health Questionnaire 12 (GHQ-12) (Goldberg et al., 1997), with cases defined as individuals with a score of 4 or above (range, 0–12) and subthreshold as a score of 2 or 3; mTBI was assessed using a modified version of the Brief Traumatic Brain Injury Screen (Iverson et al., 2009); MPSSs were assessed using a checklist of 53 symptoms, but a question on anger/irritability was removed, with cases defined as individuals reporting 18 or more symptoms and subthreshold cases reporting 14 to 17 symptoms; and a score of 16 or more (range, 0–40) was used to define alcohol misuse and 12 to 15 was used to define a subthreshold case using the 10-item World Health Organization Alcohol Use Disorders Identification Test (AUDIT) (Babor et al., 2001). Childhood adversity and childhood antisocial behavior based on a 16-item scale were categorized following previous studies (Iverson et al., 2007; Macmanus et al., 2012b). Other variables collected were sex, age, education level, marital status, service, rank, enlistment status (regular or reserve), role in the parent unit, deployment to Iraq and/or Afghanistan, and serving status (serving or discharged).

## Analysis

Logistic regressions were carried out to assess risk factors associated with anger in the last month. In the unadjusted and adjusted models, anger (score of  $\geq 5$ ) was compared with a reference group scoring four or lower. We carried out analyses including cases and subthreshold cases for each mental disorder, that is, PTSD, psychological distress, MPSSs, and alcohol misuse. The possible confounders in the adjusted model were sex, age, marital status, education, rank, service, and enlistment status. Odds ratios (OR) less than 2 were considered small; 2 to 4, intermediate; and greater than 4, strong. A multinomial regression analysis was carried out to assess the robustness of our logistic analysis finding. In the multinomial analysis, anger was divided into three groups: no anger (score, 0), low level of anger (score, 1–4), and high level of anger (score,  $\geq 5$ ). The reference group was no anger. We estimated AF as the percentage of the occurrence of anger in the individuals with each of the characteristics: possible mental disorder, mTBI, combat role, childhood adversity, and childhood antisocial behavior. PAF was estimated as the percentage of anger in the population that could be explained by the presence of the characteristic studied adjusted for age, sex, marital status, education, rank, service, and enlistment status, using the algorithm developed by Newson for STATA, which is a generalization of the maximum-likelihood estimates (Greenland and Drescher, 1993). In a separate analysis, we assessed the percentage of anger in the PAF explained by at least one mental disorder in combination with childhood adversity, childhood antisocial behavior, and role in parent unit.

Weights were created to account for sampling fractions and to account for response rate differences at phase 2. All data analyses were conducted in STATA v 11.2. Analyses presented here used the survey commands. Weighted percentages and ORs are presented in the tables with unweighted cell counts.

## RESULTS

The percentage of anger cases was higher among men, younger participants, those with lower rank, Army personnel, those who had served in Iraq, those having a combat role, those with a higher childhood adversity score, and those who reported antisocial behavior as a child (Table 1). Likewise, there was an increased percentage of cases of PTSD, MPSSs, psychological distress, high AUDIT score, and self-reported mTBI in the anger group compared with the group defined as noncases of anger (Table 1). The differences in percentage between the anger and the reference groups were particularly large for each of the mental health measures.

In the multiple logistic regression analyses, the levels of associations with anger compared with the reference group after adjustment were intermediate or small for men, the younger age group, and for those with lower ranks, combat role, childhood adversity, and antisocial behavior, with ORs between 1.7 and 4.1 (Table 2). Deployment to Iraq or Afghanistan was unrelated to anger (OR, 1.06; 95% confidence interval [CI], 0.88–1.21). Anger was strongly associated with PTSD, psychological distress, MPSSs, alcohol misuse, and having at least one of these, whereas the associations were small or intermediate for subthreshold mental disorders outcomes. The association of anger with mTBI was intermediate (Table 2).

In our multinomial analysis, a low level of anger (score, 1–4) was not significantly associated with sex; age, except in those 40 years or older, who were less likely to have low level of anger; having left service; and deployment to Iraq or Afghanistan or both. Lower rank (Non Commissioned Officer (NCO) and other ranks), having a combat role, and childhood adversity were associated with low-level anger, but the ORs were low. Mental health outcomes, cases or subthreshold cases, were associated at an intermediate level with low-level anger. High-level anger was associated with all the independent variables in Table 2, but the ORs were higher (table not shown but is available from authors). In summary, changing the threshold of the reference group made little difference from the results reported in Table 2.

The associations found between anger and mental health problems, having a combat role in the parent unit, childhood adversity, and childhood antisocial behavior are supported by the high AF for each of these variables, from 0.38 for childhood adversity score to 0.80 for PTSD. The AF decreased slightly when both cases and subthreshold cases of mental health problems were included (Table 3). This indicates that anger is a significant feature of each of the mental health problems in our study. Psychological distress is the principal contributor to PAF (a proportion of 0.43) when the cases and subthreshold cases are included owing to its high prevalence in the military population. It is worth noting that the PAF for PTSD cases was relatively modest (0.12), but it markedly increased to 0.34 when the subthreshold PTSD cases were added to the estimate. The contributions of MPSSs and alcohol misuse are also meaningful, but the impact on anger among those who reported mTBI is low. As expected, given the collinearity between the mental disorders in the study, the PAF for each mental disorder greatly decreased when adjusted for the other mental disorders: psychological distress decreased to 0.22 (95% CI, 0.17–0.26); PTSD, to 0.04 (95% CI, 0.02–0.07); MPSSs, to 0.11 (95% CI, 0.08–0.15); and AUDIT, to 0.15 (95% CI, 0.11–0.18). The PAF for childhood antisocial behavior slightly decreased when adjusted for mental health problems (0.16; 95% CI, 0.12–0.20) and for having a combat role in parent unit (PAF, 0.11; 95% CI, 0.06–0.15).

Nearly half of the anger cases in this population seemed to be a component of the mental health problems in our study, increasing to 0.65 when subthreshold cases are included (Table 4). The fact that the PAF for caseness or subthreshold caseness on at least one mental disorder is well below that for the sum of each individual mental disorder emphasizes the marked overlap between our mental health measures. When combat role in parent unit, childhood adversity, or childhood

**TABLE 1.** Variables in the Analysis According to Anger Status

	Anger Noncase (n = 8777)	Anger Case (n = 1108)	Total (N = 9885)
Sex			
Male	7687 (89.19)	1024 (93.85)	8711 (89.72)
Female	1090 (10.81)	84 (6.15)	1174 (10.28)
Age at questionnaire completion, yrs			
<25	1320 (11.48)	336 (24.80)	1656 (12.99)
25–29	1713 (19.20)	254 (26.08)	1967 (19.98)
30–34	1440 (16.48)	176 (16.84)	1616 (16.52)
35–39	1564 (19.19)	176 (17.14)	1740 (18.96)
≥40	2740 (33.66)	166 (15.14)	2906 (31.55)
Rank			
Officer	2128 (21.63)	76 (5.47)	2204 (19.79)
NCO	4792 (60.63)	627 (62.33)	5419 (60.82)
Other rank	1857 (17.75)	405 (32.20)	2262 (19.39)
Service			
Naval Services	1371 (16.87)	161 (14.45)	1532 (16.60)
Army	5576 (62.20)	831 (75.32)	6407 (63.69)
RAF	1830 (20.93)	116 (10.23)	1946 (19.71)
Enlistment status			
Regular	7226 (88.80)	975 (92.70)	8201 (89.24)
Reserve	1551 (11.20)	133 (7.30)	1684 (10.76)
Serving status			
Serving	6820 (73.88)	817 (69.65)	7637 (73.39)
Left service	1944 (26.12)	289 (30.35)	2233 (26.61)
Deployed theater			
No deployment	4466 (54.97)	480 (45.81)	4946 (53.93)
Iraq only	2103 (25.11)	353 (34.44)	2456 (26.17)
Afghanistan only	1274 (11.39)	162 (10.95)	1436 (11.34)
Iraq and Afghanistan	934 (8.54)	113 (8.79)	1047 (8.57)
Role in parent unit			
Noncombat	6782 (77.93)	674 (61.07)	7456 (76.02)
Combat	1895 (22.07)	421 (38.93)	2316 (23.98)
Childhood adversity score			
0 or 1	5644 (66.11)	564 (51.89)	6208 (64.51)
2–8	2879 (33.89)	493 (48.11)	3372 (35.49)
Childhood antisocial behavior			
No	7507 (85.91)	667 (60.26)	8174 (83.02)
Yes	1155 (14.09)	414 (39.74)	1569 (16.98)
GHQ			
Not a case (score 0–1)	6043 (69.34)	408 (36.64)	6451 (65.62)
Subthreshold case (score 2–3)	1248 (14.26)	196 (18.54)	1444 (14.75)
Case (score 4–12)	1402 (16.39)	493 (44.82)	1895 (19.63)
PCL			
Not a case (score 17–27)	7568 (86.65)	599 (53.56)	8167 (82.90)
Subthreshold case (score 28–46)	962 (10.92)	317 (30.46)	1279 (13.14)
Case (score 47–85)	191 (2.43)	178 (15.98)	369 (3.96)
MPSs			
Not a case (score 0–13)	7620 (86.87)	674 (60.91)	8294 (83.93)
Subthreshold case (score 14–17)	522 (6.18)	134 (12.19)	656 (6.86)
Case (score 18–52)	562 (6.95)	287 (26.90)	849 (9.22)
AUDIT			
Not a case (score 0–11)	6507 (75.94)	518 (46.72)	7025 (72.65)
Subthreshold case (score 12–15)	1235 (13.87)	202 (18.72)	1437 (14.42)
Case (score 16–38)	941 (10.19)	366 (34.56)	1307 (12.94)
Case on any health outcome—usual threshold			
Case on none	6476 (73.95)	390 (34.06)	6866 (69.42)
Case on at least one	2299 (26.05)	718 (65.94)	3017 (30.58)
mTBI			
No	3900 (96.72)	524 (88.66)	4424 (95.66)
Yes	144 (3.28)	59 (11.34)	203 (4.34)

Data are presented as n (%).  
RAF indicates Royal Air Force.

**TABLE 2.** Association Between Anger Status and Variables in the Analysis (N = 9885)

Variable	n (%)	OR (95% CI)
Sex		
Male	1024 (11.89)	1.00 (ref)
Female	84 (6.80)	0.57 (0.43–0.76)
Age at questionnaire completion, yrs		
<25	336 (21.70)	1.00 (ref)
25–29	254 (14.84)	0.74 (0.59–0.93)
30–34	176 (11.59)	0.61 (0.47–0.80)
35–39	176 (10.28)	0.57 (0.43–0.76)
≥40	166 (5.46)	0.35 (0.26–0.48)
Rank		
Officer	76 (3.14)	1.00 (ref)
NCO	627 (11.65)	2.90 (2.04–4.10)
Other rank	405 (18.88)	4.06 (2.73–6.01)
Service		
Naval Services	161 (9.90)	0.73 (0.58–0.91)
Army	831 (13.44)	1.00 (ref)
RAF	116 (5.90)	0.43 (0.33–0.56)
Enlistment status		
Regular	975 (11.81)	1.00 (ref)
Reserve	133 (7.71)	0.68 (0.52–0.88)
Serving status		
Serving	817 (10.79)	1.00 (ref)
Left service	289 (12.97)	1.49 (1.24–1.80)
Role in parent unit		
Support	674 (9.11)	1.00 (ref)
Combat	421 (18.41)	1.65 (1.39–1.97)
Childhood adversity score		
0 or 1	564 (9.04)	1.00 (ref)
2–8	493 (15.24)	1.68 (1.43–1.97)
Childhood antisocial behavior		
No	667 (8.16)	1.00 (ref)
Yes	414 (26.32)	2.88 (2.42–3.42)
GHQ		
Not a case (score 0–1)	408 (6.35)	1.00 (ref)
Subthreshold case (score 2–3)	196 (14.30)	2.56 (2.05–3.20)
Case (score 4–12)	493 (25.98)	5.26 (4.38–6.32)
PCL		
Not a case (score 17–27)	599 (7.32)	1.00 (ref)
Subthreshold case (score 28–46)	317 (26.27)	4.03 (3.33–4.88)
Case (score 47–85)	178 (45.68)	9.55 (7.18–12.69)
MPSs		
Not a case (score 0–13)	674 (8.23)	1.00 (ref)
Subthreshold case (score 14–17)	134 (20.15)	3.10 (2.38–4.03)
Case (score 18–52)	287 (33.10)	5.89 (4.78–7.27)
AUDIT		
Not a case (score 0–11)	518 (7.25)	1.00 (ref)
Subthreshold case (score 12–15)	202 (14.65)	1.83 (1.48–2.28)
Case (score 16–38)	366 (30.13)	4.00 (3.30–4.84)
Case on any health outcome—usual threshold		
Case on none	390 (5.58)	1.00 (ref)
Case on at least one	718 (24.51)	4.78 (4.05–5.64)
mTBI		
No	524 (12.11)	1.00 (ref)
Yes	59 (34.16)	3.09 (2.06–4.64)

Model adjusted for sex, age, marital status, education, rank, service, and enlistment type.

**TABLE 3.** Anger AF and PAF for Factors Most Strongly Associated With Outcome

Exposure	AF in Exposed	Adjusted PAF
Role in parent unit		
Combat	0.50 (0.44–0.56)	0.13 (0.08–0.18)
Childhood adversity score		
Score ≥2	0.38 (0.30–0.45)	0.17 (0.12–0.22)
Antisocial behavior in childhood		
Yes	0.69 (0.65–0.72)	0.22 (0.18–0.26)
GHQ		
Score ≥4	0.71 (0.67–0.74)	0.30 (0.26–0.34)
Score ≥2	0.69 (0.66–0.73)	0.43 (0.38–0.48)
PCL		
Score ≥47	0.80 (0.77–0.82)	0.12 (0.10–0.14)
Score ≥28	0.76 (0.73–0.78)	0.33 (0.29–0.37)
MPSs		
≥18 symptoms	0.73 (0.70–0.76)	0.19 (0.16–0.22)
≥14 symptoms	0.71 (0.68–0.74)	0.27 (0.23–0.30)
AUDIT		
Score ≥16	0.70 (0.66–0.73)	0.21 (0.17–0.24)
Score ≥12	0.64 (0.60–0.73)	0.30 (0.25–0.35)
mTBI		
Yes	0.59 (0.49–0.68)	0.06 (0.04–0.09)

The values represent fractions (or proportions), that is the proportion of anger that can be attributed to each characteristic in the case of AF and the proportion of anger in the population that can be attributed to each characteristic in the case of PAF.

Adjusted for sex, age, marital status, education, rank, service, and enlistment type.

antisocial behavior was added to caseness on at least one health outcome (full case threshold), the PAF increased to 0.64, a meaningful increase of 35% (Table 4). Likewise, the addition of combat role, childhood disadvantage, or childhood antisocial behavior to subthreshold caseness on at least one outcome increased the PAF from 0.65 to 0.77 (Table 4).

### DISCUSSION

Anger was strongly associated with PTSD, psychological distress, MPSs, and alcohol misuse in our study. Using the usual threshold

for caseness, anger was substantially accounted for by mental ill health; anger was also associated with subthreshold scores for each of the mental health problems. The strong association of each of these conditions with anger is caused partly by the overlap of these conditions within an individual. The AF of anger due to mental disorders was high whether or not subthreshold cases were included. The PAF, the fraction of anger that could be prevented if mental health problems were eliminated in the military population, was high, nearly a half, increasing to two thirds if subthreshold cases were included. In addition, having a combat role in the parent unit and having a background of childhood antisocial behavior or childhood adversity, which may partly represent personality traits, made an independent contribution to anger. Indeed, if these factors were added to having at least one mental health problem, including subthreshold cases, the PAF increased to 0.77.

### Anger and Mental Disorder

The association between mental disorder and anger was unsurprising as there is evidence for the association of anger with PTSD and other anxiety disorders (Elbogen et al., 2010; Jakupcak et al., 2007; Olatunji et al., 2010; Orth et al., 2008, 2006), with depression (Hawkins and Cougle, 2011; Jackson et al., 2011; Koh et al., 2005; Moscovitch et al., 2008; Novaco et al., 2012), and, to a more limited extent, with somatization (Koh et al., 2005; Liu et al., 2011) and alcohol misuse (Jakupcak et al., 2007; Tivis et al., 1998). Some researchers suggest that alcohol misuse could explain the relationship between PTSD and anger (McFall et al., 1999; Savarese et al., 2001), although another reported a lack of an association between alcohol misuse and anger when adjusting for confounders (Elbogen et al., 2010). Our study makes a contribution by unambiguously demonstrating that the associations with anger persist for each of our measures of mental disorder at subthreshold levels, an issue that has been assessed before only for PTSD (Jakupcak et al., 2007). Our finding shows that anger is associated with PTSD, psychological distress, MPSs, and alcohol misuse both as full and subthreshold cases. We had sufficient statistical power to show these associations, a condition not fulfilled in most papers included in two recent meta-analyses (Olatunji et al., 2010; Orth et al., 2006). We also found an association between mTBI and anger, but the level of the association was weaker than for overt mental health problems. The possibility that mTBI may increase the level of aggressiveness in those deployed to Iraq and Afghanistan has been postulated, but empirical data are lacking (Elbogen et al., 2010).

In our study, PTSD was associated with anger despite omitting the anger item from the PCL, a finding also noted elsewhere (Novaco et al., 2012). Some researchers have recently suggested that anger

**TABLE 4.** Cumulative PAF for the Factors Most Highly Associated With Anger

Exposure	Adjusted PAF
Usual threshold for case status on each health outcome	
Case on at least one mental health outcome	0.47 (0.42–0.52)
Case on at least one mental health outcome or combat role	0.56 (0.50–0.61)
Case on at least one health outcome or childhood antisocial adversity	0.57 (0.51–0.62)
Case on at least one health outcome or childhood adversity	0.55 (0.49–0.61)
Case on at least one health outcome or combat role or antisocial behavior or childhood adversity	0.64 (0.56–0.70)
Lower threshold for case status on each health outcome	
Case on at least one health outcome	0.65 (0.59–0.70)
Case on at least one health outcome or combat role	0.72 (0.65–0.77)
Case on at least one health outcome or childhood antisocial behavior	0.72 (0.66–0.77)
Case on at least one health outcome or childhood adversity	0.69 (0.62–0.75)
Case on at least one health outcome or combat role or antisocial behaviour or childhood adversity	0.77 (0.69–0.83)

Adjusted for sex, age, marital status, education, rank, service, and enlistment type.

may not be part of the PTSD array of symptoms because the association between anger and PTSD disappears after adjustment for depression (Hawkins and Cogle, 2011; Moscovitch et al., 2008). In our assessment of PAF, we also found that after adjusting for psychological distress, the independent contribution of PTSD was small, but still significant. However, our explanation for such a finding is that our measure of psychological distress includes symptoms common to many mental disorders, including PTSD. It is infrequent to find cases of PTSD that are not also cases for psychological distress as measured by the GHQ-12. We would discourage analytical approaches that adjust PTSD for other anxiety conditions and depression because the symptoms of these conditions markedly overlap.

### Anger, AF, and PAF

A distinct advantage of our study is its population-based sampling, a necessary condition for studying PAF. The AF in our study illustrates that mental health problems contribute substantially to anger, with little variation between each disorder (proportion varied from 0.71 for alcohol misuse to 0.8 for PTSD cases). However, there were variations in PAF. From a population perspective, the most important contributor to anger was psychological distress (PAF, 0.30), and the contribution was intermediate for MPSs (PAF, 0.19) and alcohol misuse (PAF, 0.21) and lowest for PTSD (PAF, 0.12). It is worth emphasizing that a clinician in a one-to-one situation with a patient will more frequently find anger as a component of PTSD than of psychological distress, but as clinicians will see more patients with depression, anxiety, and adjustment disorder than with PTSD, a larger number of patients with anger will be found in those presenting with depression or anxiety than in those with PTSD. When the subthreshold cases were included in the assessment, the differences in contribution between conditions decreased, especially between psychological distress and PTSD, probably because the impact of each of these conditions on anger is related to their prevalence in the population.

Our measure of PAF for any one mental health problem suggests that the inclusion of other disorders moderately increases the PAF, demonstrating the colinearity between mental disorders. Important messages from our study are that PAF greatly increases when subthreshold cases of mental disorder were included and that important contributors to anger in the military population are childhood antisocial behavior and childhood adversity, which could represent preexisting anger problems, and having a combat role, which could be related to more recent events. These findings would suggest that many of the cases of anger in the population will be found in individuals who are not sufficiently symptomatic to seek health care for mental illness.

### Anger and Other Variables

Our study shows that anger is related to rank, having a combat role, childhood adversity, childhood antisocial behavior, age, sex, service branch, enlistment status, and having left service. Other reports show similar associations of anger with rank and education (Elbogen et al., 2010; Lasko et al., 1994; Novaco et al., 2012) and age and sex (Lasko et al., 1994; Novaco et al., 2012), with some exceptions (Elbogen et al., 2010). Our association of childhood antisocial behavior and childhood adversity with anger is consistent with reports of an association between family childhood dysfunction, childhood antisocial behavior, and domestic violence in a study based on Vietnam veterans (Orcutt et al., 2003) and another study assessing the correlates of violence based on the same sample used in this study (Macmanus et al., 2012a; 2013). There is also evidence that anger may be associated with family history of severe mental illness (Elbogen et al., 2010), poor social support during adolescence, and having been a victim of violence (Mahon et al., 2010). A combat role in the parent unit was associated with anger, but the strength of the association was low. We used combat role in parent unit rather than a combat role during deployment in the

analysis because it allowed us to include personnel who had not been deployed. There is a high level of agreement between having a combat role in the parent unit and during deployment. This association has not been found by those who have studied combat exposure scales in relation to anger (Elbogen et al., 2010; Lasko et al., 1994), but it has been found in relation to domestic violence (Orcutt et al., 2003). A fact worth mentioning is that deployment per se was not associated with anger either in the logistic or multinomial analyses.

### Strengths and Weaknesses

This is one of the few studies assessing correlates of anger based on a large representative military population that covers several possible mental disorders. Our assessments of mental disorder are not clinically based, so due care is recommended in the interpretation of our results despite the use of validated measures of mental disorder. We defined anger as the upper decile of the score distribution; therefore, we could not assess the prevalence of anger. However, this seemingly arbitrary definition of anger was robust given that a multinomial analysis comparing low anger score or high anger score to zero anger score did not change the interpretation of our findings, although some ORs were of course higher given that comparisons were made for two extremes groups, those with an anger score of 0 and those with a score of 5 or higher. The threshold of anger could have been lowered, but this would not have changed the reported findings. Another limitation is the possibility of response bias because the assessment was based on a self-administered questionnaire, so the responses may be distorted by the characteristics of the responders. Our study may be subjected to non-response bias because the response rate was 56%, and those not responding may be different from those completing the questionnaire. We have, however, carried out analyses weighting for response rate differences at phase 2 of the study and have shown that although completing a questionnaire may be related to demographic characteristics, the responders are not more or less likely to participate according to their mental health status (Fear et al., 2010). We were able to explore only outwardly expressed anger. It would have been helpful to be able to assess whether suppressed or controlled anger is related in a different way with our independent factors. We focus on anger in this article, but we acknowledge that anger and aggressive impulses (not included in our analysis) may provide a different profile of associations, as these variables have a correlation of 0.5, which, although meaningful, would imply that our results for anger should not be extrapolated to aggressive impulses and by extension violence. It is customary to consider that a cross-sectional analysis is less appropriate for inference in comparison with a longitudinal design, but for the purpose of this study, which assessed anger as a clinical component of mental disorders, our study is appropriate, except in relation to information about events that occurred long ago, such as adversity in childhood, which is subject to memory distortion and also possible reluctance of some participants to be truthful in their answers. It is difficult to know if these limitations are randomly distributed by assessment groups or contributed to bias. In relation to other independent variables in the analysis, significant associations do not necessarily imply causality.

### Implications

As a large proportion of anger can be attributed to mental disorders and subthreshold symptoms of mental illness, it is important to consider that anger is not an isolated feature in an individual and that its management needs to take into account the wider mental health status of the patient. Likewise, given the frequency of anger and aggressive behavior, practitioners ought to explore symptoms of anger in patients presenting with psychological distress, PTSD, alcohol misuse, and somatization because comorbid anger can lead to the worsening of symptoms and further impairment of functioning and can jeopardize the efficacy of interventions for the underlying conditions (Feeny et al., 2000; Foa et al., 1995). A meta-analysis demonstrated intermediate to

large efficacy effects in the treatment of anger (DiGiuseppe and Tafra, 2003; Taft et al., 2012), but as most studies were not based on randomized control trials, there is uncertainty on the reported effect sizes. It is important to note that anger was associated with combat role independently of mental disorder and it was also a feature of subthreshold levels of PTSD, psychological distress, somatization, and alcohol misuse. These findings suggest that many cases of anger in serving and ex-serving military personnel may not present in a clinical setting but may benefit from assessment by a clinician. Of course, within a military population background, risk factors for anger are important, as highlighted by the independent contribution of premilitary antisocial behavior to PAF; a developmental perspective can therefore be helpful.

In conclusion, our study suggests that clinicians and other medical staff should be aware that anger is a common component of mental illnesses in military personnel and needs thorough assessment.

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The study received ethical approval from the UK Ministry of Defence's Research Ethics Committee and King's College Hospital Local Research Ethics Committee.

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