

# Women in novel occupational roles: mental health trends in the UK Armed Forces

Roberto J Rona,\* Nicola T Fear, Lisa Hull and Simon Wessely

**Accepted** 8 November 2006

**Background** There is uncertainty about whether women in the military have more psychological symptoms than men and whether psychological symptoms have increased over time. The aims of this study were to assess changes in psychological symptoms in military women over time, to compare them with men, and assess the effect of deployment.

**Methods** Two cross-sectional studies based on random samples of the Armed Forces were used to assess the effects of deployment to the Gulf and Iraq Wars. We selected for the analyses all the women and a 20% random sample of men who completed a questionnaire stratified by rank. We assessed psychological distress, number of symptoms, post-traumatic stress reaction (PTSR), chronic fatigue and alcohol misuse.

**Results** There has been an increase in psychological symptoms, including alcohol misuse, in those not deployed to the Gulf or Iraq Wars, especially in women. The odds ratios for PTSR [5.82 (95% CI: 1.27–26.71)], multiple symptoms [8.49 (1.97–36.65)] and alcohol misuse [6.20 (2.09–18.37)] were higher in women than in men in the non-deployed samples. Psychological distress and chronic fatigue was more common in women, and alcohol misuse, was more common in men. In women, psychological symptoms were positively associated with deployment in the Gulf War, but not the Iraq War.

**Conclusion** Psychological symptoms in the Armed Forces have increased over time regardless of gender, in those not deployed. The association between gender and psychological symptoms has not changed over time. The deployment effect in women is similar to that described in men.

**Keywords** Military; psychological health, women, trends, alcohol misuse

## Introduction

Until 1970 women made up only 1% of the total military strength in both the USA and Britain. This has now risen to 9% in the UK and 20% in the US,<sup>1,2</sup> and looks likely to rise further.<sup>3</sup>

There are few studies that have focused on women's psychological health in the military and most deal with the experience following the 1991 Gulf War,<sup>2–9</sup> the relative effect of length of deployment in peace keeping missions<sup>10</sup> or particular stressors.<sup>11</sup> Some reports of the mental disorders in the military have shown them to be more common in women,<sup>4,10,11</sup> whereas other reports show them to be equally common in women

or men or are inconsistent.<sup>6,8,11</sup> Reports from civilian populations have shown women to have a higher prevalence of psychological symptoms than men,<sup>12–14</sup> with one exception.<sup>15</sup>

A study of women in traditionally male dominated occupations, such as senior managers, reported that women have higher adrenaline levels<sup>16</sup> and endure more stress than men.<sup>17</sup> This could be explained by the dual roles at work and home that women may have to fulfil. There is little evidence that women fare worse than men in terms of psychological health in these types of occupations.<sup>17</sup> Challenging work may serve as a stress buffer rather than a risk factor for developing a mental disorder.<sup>18</sup> The military may offer a mixture of challenging activities, uncertainty and boredom, especially during deployment. Women in the military may also experience discrimination, sexual harassment and role uncertainty.<sup>11,19,20</sup> Although direct combat roles are restricted to males in the

King's College London, King's Centre for Military Health Research, Weston Education Centre, Cutcombe Road, London SE1 9RJ.

\* Corresponding author. King's College London, King's Centre for Military Health Research, Weston Education Centre, Cutcombe Road, London SE1 9RJ. E-mail: Roberto.rona@iop.kcl.ac.uk

military, the Iraq War has demonstrated that the separation between combat and support roles have been blurred in recent operations.

Another aspect that deserves attention is the assessment of the possible effect of deployment on psychological symptoms in women. It has been well documented in Britain and elsewhere that deployment to the Gulf War was associated with an excess of psychological symptoms in men and women.<sup>21,22</sup> We have reported that the health effect of deployment to the Iraq War, in contrast to the US experience, has been minimal in a random sample of the three services.<sup>23,24</sup> Although the British study included women in the analysis, none of the results assessed whether deployment to the Iraq War had a particular impact on women's psychological health. The percentage of women in the total sample was 9%, and a specific effect on women could have been missed.

None of the studies published so far has looked at the psychological symptoms of women in the military over time. We do not know whether there have been changes in the prevalence of psychological symptoms within the military. It is possible that the characteristics of women who join the military have changed, with more of them now taking up functions and trades that were not previously open to them. We have carried out two main studies: one following the 1991 Gulf War and another shortly after the initiation of the 2003 Iraq War.<sup>21,23</sup> We were in a position to assess trends in psychological symptoms because we used the same tests to assess psychological distress, fatigue, physical symptoms and self-perception of health in the Gulf and Iraq Wars studies, and we assessed units of alcohol consumed per week in both studies. Our studies also used similar sampling strategies.

The aims of this study were 3-fold: to assess whether there were differences in the pattern of psychological symptoms in women and men stratified by deployment in the Gulf and Iraq Wars, to assess trends in psychological symptoms between the two study periods in women and men by deployment, and to assess the effect of deployment in women in the Gulf and Iraq Wars.

## Methods

### Design and sampling

Two cross sectional studies based on random samples of the military stratified by deployment status were carried out. The first was based on the 1991 Gulf War and took place in 1997 (Gulf War Study). The second was following the start of the 2003 Iraq War and took place between June 2004 and March 2006 (Iraq War Study). The 1997 sample included: 4000 personnel deployed to the Gulf War, 4000 deployed to Bosnia and 4000 Era personnel who were not deployed to the Gulf War. An extra 250 women were over sampled in each of the three samples bringing the total number sampled to 12 746, four less than planned.<sup>21</sup> The samples were stratified by Service [Royal Navy and Royal Marines (RN), Army, Royal Air Force (RAF)], age, enlistment type (regular or reserve), rank. However, the Bosnia sample included only Army personnel, as the other Services did not participate in this deployment.

The sampling frames in the Iraq War Study were personnel deployed to the Iraq War between January 18 and April 28, 2003

(Operation TELIC 1) and for comparison, personnel serving in the Armed Forces on March 31, 2003 (Era group) who had not deployed to Iraq. Sampling was stratified by service and enlistment type. A total of 17 650 personnel were selected: 7695 including 1400 reservists represented Operation TELIC 1, and 10 003 personnel including 1811 reservists formed the Era group.<sup>23</sup> The Era group was over sampled to take into account personnel who subsequently deployed to Iraq and for the 10% of regular military personnel who were medically downgraded (less than fully fit and employable for medical reasons at any one time).<sup>23</sup> As hostilities continued after the end of the major combat phase of the Iraq War, April 28, 2003 (TELIC 1), those deployed later on TELIC operations were included in the deployed group.

We selected for analysis all the women who completed a questionnaire in the Gulf and Iraq War Studies and a 20% random sample of men who completed a questionnaire, stratified by rank for each study because the proportion of commissioned officers was approximately three times higher in women than in men. We chose 20% of the total sample of men to decrease the prevailing proportion of men in the analysis whilst still maintaining adequate statistical power.

### Measures used

The main outcome measures in our two studies were the General Health Questionnaire-12 (GHQ-12), a widely used measure of psychological distress,<sup>25</sup> a physical symptoms scale that included 50 symptoms common to the two studies, a measure of somatization;<sup>21,23</sup> the Chalder fatigue scale, a measure of physical and mental fatigue symptoms;<sup>26</sup> and self-perception of health from the short form-36 (SF-36).<sup>27</sup> In the Iraq War Study, we included the post-traumatic stress disorder checklist (PCL-C checklist) which has been validated,<sup>28</sup> but not in the Gulf War Study. We were able to build a scale common to both studies based on one item on intrusive thoughts, two on avoidance, three on arousal, one on irritability and seven items on associated symptoms. We called this scale post-traumatic stress reaction (PTSR) to distinguish it from the PCL-C checklist.<sup>8,28</sup>

Cutoff points were the same as those described by Hotopf *et al.*<sup>23</sup> The GHQ-12 and the Fatigue Scale were scored dichotomous for each question, and the physical symptoms as number of symptoms. The cutoff points used were at least 4 out of 12 items for GHQ-12 and fatigue, 18 or more for 50 symptoms and endorsing poor or fair for general health perception. The cutoff for the PTSR was at least one positive answer for each dimension, plus at least two of the associated symptoms. The assessment of alcohol misuse was slightly different in the two studies. In the Gulf War Study, it was based on one question asking number of units of alcohol consumed in a week while in the Iraq War Study, it was calculated from the units of alcohol drunk in a typical day  $\times$  the frequency of alcohol use in a week.

Information on the following factors was used in the current analysis: age (at deployment and at questionnaire completion), marital status, educational level, enlistment type, rank, deployment status, combat role, involvement in direct incidents such as coming under small arms fire and handling bodies.

## Statistical analysis

We carried out multiple logistic regression analyses comparing each psychological health outcome for men and women for the Era and the deployed groups separately in the two studies, adjusting for age, rank, educational status, enlistment type and marital status. We carried out the analyses separately because we were aware of the deployment effect on mental health in the Gulf War.<sup>8,21</sup> In these two analyses, we looked for interaction between gender and study on each psychological outcome because of the possibility that changes were restricted to one gender or the magnitude of the change differed by gender. We also looked at the risk factors associated with women only in relation to the two wars. Analyses were performed using the statistical software package STATA 9.0 (Stata Corporation, College Station, TX, USA).

## Results

### Sample characteristics

Altogether, 3358 men and 1678 women were included in these analyses. Women and men in the Iraq War Study were older

at the time the conflict started, had a higher educational level, despite having proportionally fewer officers, had a higher representation from the reserve (expected due to over-sampling) and a larger number were married or living with a partner than those in the Gulf War Study (Table 1). The relative frequency of military personnel with a combat role was the same in the two studies. Few women reported having a direct combat role. Although among deployed personnel more women in the Gulf War than the Iraq War endorsed the statements 'came under fire' and 'contact with seriously hurt personnel', a large percentage of personnel were exposed to these events in the two conflicts with the relative frequency being higher in men. More women were drawn from the reserves in both conflicts and were younger than men.

### Psychological health between sexes

Scoring positively for GHQ-12 or fatigue was seen more frequently in women than in men, but alcohol misuse was more common in men than in women in the Era groups in the two studies (Table 2).

**Table 1** Demographic characteristics of the sample in the Gulf War Study and the Iraq War Study by gender

	Men		Women	
	Gulf War Study No. (%)	Iraq War Study No. (%)	Gulf War Study No. (%)	Iraq War Study No. (%)
<b>Age (years)</b>				
<20	118 (7.8)	90 (4.9)	42 (6.5)	60 (5.8)
20–29	833 (55.3)	569 (30.8)	435 (67.8)	495 (47.9)
30–39	380 (22.2)	784 (42.4)	121 (18.8)	359 (34.8)
≥40	174 (11.6)	405 (21.9)	44 (6.9)	119 (11.5)
<b>Marital status</b>				
Married/living with partner	1127 (74.6)	1285 (80.6)	341 (52.9)	636 (67.2)
Single	268 (17.8)	217 (13.6)	228 (35.4)	246 (26.0)
Divorced/separated/widowed	101 (6.7)	91 (5.7)	70 (10.9)	64 (6.8)
<b>Education levels</b>				
No qualifications	199 (13.2)	114 (7.2)	39 (6.1)	22 (2.3)
Ordinary levels or equivalent <sup>a</sup>	679 (45.0)	568 (35.6)	293 (45.4)	332 (35.1)
Advanced levels or equivalent <sup>b</sup>	288 (19.1)	448 (28.1)	139 (21.6)	234 (24.7)
College degree or equivalent	305 (20.2)	381 (23.9)	153 (23.7)	287 (30.3)
Officer rank status <sup>c</sup>	592 (39.2)	462 (29.0)	253 (39.2)	274 (29.0)
Enlistment type regular	1429 (94.6)	1347 (84.5)	583 (83.3)	675 (71.4)
Deployed (Gulf/Bosnia/Iraq)	1001 (66.3)	706 (44.3)	453 (70.2)	395 (41.8)
<b>Role and exposure report of those deployed</b>				
Combat	192 (22.4)	164 (23.4)	3 (0.7)	7 (1.0)
Combat support	75 (8.7)	80 (11.4)	35 (8.6)	28 (7.1)
Combat service support	392 (45.6)	387 (55.2)	330 (81.0)	326 (83.1)
Other	200 (23.3)	70 (10.0)	40 (6.2)	31 (7.9)
Came under small arms fire	315 (60.1)	51 (26.3)	369 (35.5)	84 (15.7)
Came under mortar/artillery fire	380 (61.8)	558 (53.7)	147 (49.8)	212 (39.6)
Saw seriously hurt personnel	542 (72.4)	467 (44.9)	211 (59.1)	200 (37.3)

<sup>a</sup> Usual exam after finalising secondary examination.

<sup>b</sup> Usual required examination to enter University education.

<sup>c</sup> Samples by study were stratified by rank (see text).

Some variables do not reach 100% because of missing information.

**Table 2** Psychological health by gender restricted to the Era sample in the two studies adjusted for rank, education, marital status, enlistment type and age group

	Gulf War Study		Iraq War Study		Total OR (95% CI)
	Prevalence	OR (95% CI)	Prevalence	OR (95% CI)	
<b>Post-traumatic stress reaction</b>					
Men	14 (2.8)	1.00	40 (5.0)	1.00	1.00
Women	2 (1.1)	0.28 (0.06–1.44)	21 (4.2)	0.81 (0.45–1.47)	0.79 (0.46–1.36)
<b>GHQ-12 (<math>\geq 4</math>)</b>					
Men	69 (13.8)	1.00	146 (18.4)	1.00	1.00
Women	39 (21.2)	1.81 (1.11–2.94)	112 (22.8)	1.33 (0.98–1.82)	1.54 (1.19–1.99)
<b>Fatigue score (<math>\geq 4</math>)</b>					
Men	81 (16.1)	1.00	226 (28.4)	1.00	1.00
Women	45 (24.2)	2.02 (1.27–3.21)	179 (36.7)	1.44 (1.10–1.88)	1.72 (1.37–2.16)
<b>Physical symptoms (<math>\geq 18</math>)</b>					
Men	19 (3.9)	1.00	66 (8.2)	1.00	1.00
Women	3 (1.7)	0.32 (0.07–1.45)	47 (9.5)	1.36 (0.88–2.10)	1.30 (0.87–1.94)
<b>Alcohol intake (<math>\geq 21</math> units a week)</b>					
Men	61 (12.0)	1.00	208 (26.7)	1.00	1.00
Women	5 (2.6)	0.13 (0.04–0.38)	52 (11.1)	0.23 (0.16–0.34)	0.28 (0.20–0.39)
<b>General health perception</b>					
Men	30 (9.7)	1.00	87 (10.9)	1.00	1.00
Women	13 (9.9)	1.18 (0.53–2.61)	62 (12.6)	1.08 (0.73–1.58)	1.15 (0.82–1.62)
<b>Total</b>					
Men	509		808		
Women	192		497		

Note: Missing information in 3.7% staff personnel in study 1 and 12.3% in study 2.

The analysis based on the deployed groups also showed an increased prevalence in relation to GHQ-12 and fatigue, albeit non-significant, in women in comparison with men, but a lower prevalence of alcohol misuse in women than in men (Table 3). There was some evidence of an increase in multiple symptoms when the two studies were considered together.

### Psychological symptoms over time by gender

#### *The Era group*

In both sexes, there was an increase in the prevalence of caseness over time. There was an increase in the odds ratios (OR) for most health outcomes in women and a more moderate increase in men (Table 4). In spite of the greater increase of psychological symptoms over time in women than in men, the interactions between gender and study, Gulf or Iraq, on PTSD, multiple symptoms and alcohol misuse were not significant ( $P=0.361$ ,  $P=0.066$  and  $P=0.915$ , respectively).

#### *The deployed groups*

There was some evidence of an increase in multiple symptoms when the two studies were considered together. In contrast to the Era analysis, there was a decrease in prevalence between the two studies for most health outcomes, except alcohol misuse (Table 4). This decrease was statistically significant for men (for most health outcomes) and was of borderline significance in women, with the exception of health perception. There was an interaction between sex and study for alcohol

misuse ( $P=0.03$ ), with a greater increase in alcohol misuse in men than in women.

### Mental health in women

Women who were deployed to the Gulf War had significantly higher OR compared with the Era sample for all psychological assessments except alcohol misuse (Table 5). The effect size for deployment in the Gulf War Study varied from moderate for GHQ-12 (OR=2.53) to high for multiple symptoms (OR=21.7). In the Iraq War Study, there was a positive association between deployment and PTSD and a borderline non-significant association ( $P=0.058$ ) between deployment and multiple symptoms.

#### *PTSD and PTSD scores in the Iraq War Study*

We compared our results for PTSD using PTSD scores based on the PCL-C checklist for participants in the Iraq War Study to ensure that the effects, or lack of them, observed for PTSD did not correspond to an artefact related to an insufficiently validated measure. The PCL-C checklist assessment decreased the prevalence of PTSD by ~40% in comparison with our PTSD measure. The OR for the PCL-C checklist in females in comparison with males was 1.25 (95% CI: 0.61–2.55) in the Era sample, and 0.82 (95% CI: 0.43–1.56) in the deployed sample. The association between deployed and Era sample in females became non-significant [OR 0.91 (95% CI: 0.45–1.88)].

**Table 3** Psychological health by gender restricted to the deployed sample in the two surveys (excluding those deployed to Bosnia) adjusted for rank, education, marital status, enlistment type, age group and deployment status

	Gulf War Study		Iraq War Study		Total OR (95% CI)
	Prevalence	OR (95% CI)	Prevalence	OR (95% CI)	
<b>Post-traumatic stress reaction</b>					
Men	50 (9.2)	1.00	74 (7.1)	1.00	1.00
Women	27 (12.0)	1.29 (0.72–2.28)	45 (8.4)	1.28 (0.84–1.97)	1.30 (0.92–1.83)
<b>GHQ-12 (<math>\geq 4</math>)</b>					
Men	140 (26.4)	1.00	202 (19.8)	1.00	1.00
Women	84 (37.5)	1.49 (1.02–2.17)	140 (26.7)	1.57 (1.19–2.07)	1.58 (1.27–1.97)
<b>Fatigue score (<math>\geq 4</math>)</b>					
Men	200 (38.6)	1.00	348 (34.3)	1.00	1.00
Women	110 (50.7)	1.48 (1.03–2.13)	202 (38.7)	1.19 (0.94–1.52)	1.31 (1.08–1.61)
<b>Physical symptoms (<math>\geq 18</math>)</b>					
Men	80 (15.5)	1.00	125 (12.0)	1.00	1.00
Women	44 (20.0)	1.28 (0.79–2.08)	70 (13.1)	1.26 (0.89–1.79)	1.32 (1.00–1.75)
<b>Alcohol intake (<math>\geq 21</math> units a week)</b>					
Men	84 (15.5)	1.00	310 (30.7)	1.00	N/A <sup>a,*</sup>
Women	4 (1.8)	0.06 (0.02–0.21)	65 (12.6)	0.25 (0.18–0.35)	
<b>General health perception</b>					
Men	87 (17.2)	1.00	112 (10.9)	1.00	1.00
Women	47 (21.2)	1.11 (0.69–1.80)	64 (12.2)	1.27 (0.88–1.83)	1.25 (0.94–1.67)
<b>Total</b>					
Men	546		1040		
Women	226		536		

<sup>a</sup> Not applicable.

\* Interaction study and gender on alcohol use  $P=0.03$ .

**Table 4** Trends in psychological health by gender for Era and deployed samples separately adjusted for rank, education, marital status, enlistment type and age group

	Men		Women	
	Era OR (95% CI)	Deployed OR (95% CI)	Era OR (95% CI)	Deployed OR (95% CI)
Post traumatic stress reaction	1.66 (0.81–3.41)	0.52 (0.35–0.76)	5.82 (1.27–26.71)	0.71 (0.46–1.12)
GHQ-12 ( $\geq 4$ )	1.42 (0.99–2.05)	0.51 (0.40–0.66)	1.30 (0.81–2.07)	0.79 (0.59–1.06)
Fatigue score ( $\geq 4$ )	1.99 (1.42–2.78)	0.66 (0.53–0.83)	1.97 (1.27–3.04)	0.76 (0.58–1.00)
Physical symptoms ( $\geq 18$ )	1.77 (0.99–3.19)	0.51 (0.37–0.71)	8.49 (1.97–36.65)	0.72 (0.49–1.04)
Health perception	1.13 (0.68–1.88)	0.41 (0.30–0.57)	1.90 (0.94–3.85)	0.57 (0.38–0.83)
Alcohol use ( $\geq 21$ units a week)	3.22 (2.25–4.61)	4.33 (3.22–5.82)	6.20 (2.09–18.37)	1.39 (0.93–2.08)

Note: The OR (95% CI) in the table are those in the Iraq War study in comparison with the reference group which is Gulf War appropriate sample.

## Discussion

We found a marked increase over time in the prevalence of mental health outcomes in women and men in the Era group, but the opposite trend in the deployed group. The difference in trends between the Era and deployed groups in our study was due to the increase of psychological symptoms among those deployed to the Gulf War, but to the lack of such an increase among those deployed to the Iraq War, with the exception of the reservists.<sup>8,21,23</sup> Scoring positively for GHQ-12 and fatigue complaints was more common in women than in

men in the Era and deployed groups in the Gulf War Study, but this was less obvious in the Iraq War Study. However, there were no differences between the sexes in prevalence of fair or poor general health perception; PTSD; and physical symptoms, a proxy measure of somatization, regardless of study or group. Deployed women in the Iraq War had a moderate increase in PTSD in comparison with the Era sample, which disappeared when using the better validated PCL-C checklist. As expected, alcohol misuse was less common in women than men. In the deployed groups, there has been a greater increase of alcohol misuse in men than in women.



**Table 5** Psychological health in women by deployment status in the two studies adjusted for rank, education, marital status, engagement type and age group

	<b>Gulf War Study (No = 645)</b>		<b>Iraq War Study (No = 1033)</b>	
	Prevalence	OR (95% CI)	Prevalence	OR (95% CI)
<b>Post traumatic stress reaction</b>				
Era	2 (1.1)	1.00	21 (4.2)	1.00
Gulf War or Iraq War	27 (12.0)	13.80 (3.13–60.78)	45 (8.4)	2.08 (1.19–3.64)
Bosnia	5 (2.2)	1.98 (0.37–10.58)	–	–
<b>GHQ-12 (<math>\geq 4</math>)</b>				
Era	39 (21.2)	1.00	112 (22.8)	1.00
Gulf War or Iraq War	84 (37.5)	2.53 (1.56–4.11)	140 (26.7)	1.20 (0.88–1.62)
Bosnia	50 (22.1)	0.97 (0.58–1.62)	–	–
<b>Fatigue score (<math>\geq 4</math>)</b>				
Era	45 (24.2)	1.00	179 (36.7)	1.00
Gulf War or Iraq War	110 (50.7)	3.49 (2.18–5.59)	202 (38.7)	1.06 (0.81–1.39)
Bosnia	61 (27.5)	1.16 (0.72–1.87)	–	–
<b>Physical symptoms (<math>\geq 18</math>)</b>				
Era	3 (1.7)	1.00	47 (9.5)	1.00
Gulf War or Iraq War	44 (20.0)	21.70 (5.05–93.19)	70 (13.1)	1.48 (0.98–2.23)
Bosnia	11 (4.9)	3.61 (0.77–16.93)	–	–
<b>Alcohol intake (<math>\geq 21</math> units a week)</b>				
Era	5 (2.6)	1.00	52 (11.1)	1.00
Gulf War or Iraq War	4 (1.8)	0.69 (0.12–3.99)	65 (12.6)	1.17 (0.76–1.80)
Bosnia	11 (4.9)	1.96 (0.58–6.55)	–	–
<b>General health perception</b>				
Era	13 (9.9)	1.00	62 (12.6)	1.00
Gulf War or Iraq War	47 (12.2)	2.57 (1.23–5.40)	64 (12.1)	0.85 (0.58–1.27)
Bosnia	8 (5.9)	0.38 (0.34–1.05)	–	–

### Gender differences related to psychological outcomes

The greater prevalence of psychological symptoms in women, commonly reported in civilian populations,<sup>29</sup> was shown for GHQ-12 and fatigue score, but not for PTSD and physical symptoms. Increased prevalence of psychological symptoms has been reported in the US studies,<sup>4,9,10,11</sup> with one exception.<sup>6</sup> Our group reported previously that psychological symptoms were equally common in women and men in the military,<sup>8</sup> but we confirm this result only for PTSD and multiple symptoms. This inconsistency between studies could be due to the previous lack of adjustment in the Gulf War Study, especially for rank, as the proportion of officers was three times larger in women than in men and psychological symptoms are less common in officers.<sup>8</sup> The small or moderate effect sizes of the gender effect in our results could be explained by personality traits of women in the Armed Forces or by their reluctance to acknowledge psychological symptoms. It is problematic to endorse the second explanation because if the UK military women were more reluctant to admit psychological symptoms, we would have expected a distinct increase in physical symptom reporting by women in comparison with men,<sup>30</sup> rather than increased GHQ-12 positive score. Contrary to other reports in the military,<sup>4,7,9,10</sup> we did not find a gender difference for PTSD in either of the studies or PTSD (PCL) in the Iraq War Study.

### Trends in psychological outcomes

We were aware of the marked effect of the Gulf War deployment on psychological symptoms, and suspected based on our recent article that deployment to the Iraq War would not have such a marked effect.<sup>23</sup> We focused our assessment of trend of psychological symptoms on the Era sample because that group would not have been affected by deployment that could greatly alter the underlying trend of psychological symptoms. There is a scarcity of reports on trends of psychiatric morbidity in the military, except that the trend for a decrease in hospital admission for most conditions is less marked for mental disorders in the USA.<sup>31</sup> We were able to assess trends over time of common psychological symptoms based on the same population, using a similar sampling strategy and the same types of assessment. We showed a marked increase in alcohol misuse in both genders, regardless of deployment status, in contrast to the data from the General Household Survey for the period 1998–2004, which showed very little change regardless of gender.<sup>32</sup> A note of caution regarding our results is that the questions on alcohol intake although equivalent were not the same in the two studies. Notwithstanding this limitation, our results are important because it would indicate that the increase in alcohol misuse seen in the military may not follow a general cultural shift in society. We were able to exclude, as a possible explanation

of our results, the differential gap between assessment and return from deployment, shorter in the Iraq War study than the Gulf War Study, because the increase was consistent in both the Era and deployed groups.

In the Era groups, there was consistent evidence of an increase in mental disorders for most psychological assessments, although this was less compelling for GHQ-12. Psychiatric morbidity surveys in the civilian population found negligible changes in the prevalence of neurotic disorders in women and a small increase in males between 1993 and 2000.<sup>33</sup> Although the instruments used in our study and by the Office for National Statistics (ONS) are different, our results suggest that the pattern of psychological symptoms in the military might not be the same as for the civilian population. Another difference worth noting is that the changes between the Gulf War and Iraq War Studies were greater in women than in men, albeit the interactions of gender and study on psychological outcomes were not significant.

We hypothesized that service women who enlisted when it was less common to do so, would have better psychological health than women who enlisted when it was a more common occurrence. This would be due to the differences in the characteristics of women choosing to join the military when it was less common. However, this could have been off-set by the uncertainty of roles and the difficulty in finding other women in whom to confide. The percentage of women in the UK military increased from 6.4% in 1991 to 8.7% in 2003, ~36%. This increase in the percentage of women in the military does not seem to have increased the rate of psychological symptoms in women in a different way to men, although we showed a tendency towards a greater increase of psychological symptoms in women than men. Thus the erosion of a hypothetical pioneer effect in the military leading to worse mental health as the occupation became more common remains unresolved.

### Deployment effect

The lack of a deployment effect on psychological symptoms in the Iraq War for this is consistent with the results reported for the UK Armed Forces for the total sample but is in contrast to the US studies.<sup>23,24</sup> The main factors linked to psychological symptoms during deployment are the intensity and length of combat, and unit cohesion.<sup>34</sup> The distribution of roles of those deployed was similar in the Gulf and the Iraq Wars, but the exposure to enemy fire and handling injured or dead personnel was more commonly reported in those who were deployed to the Gulf War than those deployed to the Iraq War. As the questions were drafted in a slightly different manner and the time gap between deployment and completion of the questionnaire in the

two studies differed, we need to be cautious in the interpretation of these results. We will explore in a separate article the stressors and protective factors in women. This may be related to length of deployment, previous experience of deployment,<sup>9,10</sup> prophylactic measures<sup>35,36</sup> and issues related to unit cohesion and support.<sup>11</sup> To date, the US studies on the deployment effect on women in the Iraq War are absent as the US reports did not distinguish between men and women.<sup>24,37</sup>

### Bias as an explanation of the results

The response rate in the Gulf War Study was only slightly higher (6%) than in the Iraq War Study.<sup>21,23</sup> As the demographic variables related to response rate were similar in the two studies, it is unlikely that our results could be explained by response bias. We believe that our two studies are free of design bias because we used a random sampling strategy in the two studies. Information bias may have influenced our results due to the time gap between the war and completion of the questionnaires.<sup>8,21,23</sup> Wartime experiences years after deployment may affect reporting of mental disorder as shown in the post-Vietnam studies.<sup>34,38</sup> We are going to carry out a follow-up of the Iraq War sample that will allow us to assess the effect of time on the perception of mental disorders.

In conclusion, our study shows a distinct increase in psychological symptoms in both sexes based on those who were not deployed to the Gulf War or the Iraq War. Such an increase has not been shown in the civilian population in Britain.<sup>32,33</sup> Women have a higher prevalence of GHQ-12 positive score and fatigue and less alcohol misuse. In contrast to the Gulf War Study, we could not identify a specific mental disorder effect in deployed women compared with Era women in the Iraq War study. The operations in Iraq are still continuing, and delayed sequelae cannot be excluded. Our results highlight the importance of surveillance to ascertain whether the increase in psychological symptoms is just a blip or a consistent trend.

### Acknowledgements

We thank the UK Ministry of Defence for their cooperation; in particular we thank the Defence Medical Services Department, the Defence Analytical Services Agency, the Armed Forces Personnel Administration Agency and the Veteran's Policy Unit. The Gulf War Study was supported by the US Department of Defense, and the Iraq War Study was funded by the UK Ministry of Defence.

#### KEY MESSAGES

- The prevalence of psychological distress and fatigue are consistently higher in women than in men in the UK military, but such a difference is not seen for physical symptoms or post-traumatic stress reaction.
- There has been an increase in psychological symptoms from 1997 to 2005 in the UK military, but the trend is more marked in women.
- A deployment effect on psychological symptoms in women in the military was marked in relation to the Gulf War and non-existent in the Iraq War following the same pattern reported for the Armed Forces.

**Conflict of interest:** Simon Wessely is Honorary Civilian Consultant Advisor to the British Army. All other authors declare that they have no conflict of interest.

## References

- <sup>1</sup> DASA (Ministry of Defence). UK Defence Statistics 2005. A National Statistics Publication. London, UK: The Stationery Office, P61.
- <sup>2</sup> Goldzweig CL, Balekian TM, Rolon C, Yano EM, Shekelle PG. The state of women's veterans' health research. Results of a systematic literature review. *J Gen Int Med* 2006;**21**:S82–92.
- <sup>3</sup> Murphy F, Browne D, Mather S. Women in the Persian Gulf War: health care implications for active duty troops and veterans. *Mil Med* 1997;**162**:656–60.
- <sup>4</sup> Hourani LL, Yuan H. The mental health status of women in the navy and marine corps: preliminary findings from the perceptions of wellness and readiness assessment. *Mil Med* 1999;**164**:174–81.
- <sup>5</sup> Pierce P. Physical and emotional health of Gulf War veteran women. *Aviation Space Environ Med* 1997;**68**:317–21.
- <sup>6</sup> Rosen LN, Wright K, Marlowe D, Bartone P, Gifford RK. Gender differences in subjective distress attributable to anticipation of combat among US Army soldiers deployed to the Persian Gulf during operation desert storm. *Mil Med* 1999;**164**:753–57.
- <sup>7</sup> Stretch RH, Knudson KH, Durand D. Effects of pre-military and military trauma on the development of post-traumatic stress disorder symptoms in female and male active duty soldiers. *Mil Med* 1998;**163**:466–70.
- <sup>8</sup> Unwin C, Hotopf M, Hull L, Ismail K, David A, Wessely S. Women in the Persian Gulf: lack of gender differences in long-term health effects of service in the UK Armed Forces in the 1991 Persian Gulf War. *Mil Med* 2002;**167**:406–13.
- <sup>9</sup> Wolfe J, Brown PJ, Kelly JM. Reassessing war stress: exposure and the Persian Gulf War. *J Soc Issues* 1993;**49**:15–31.
- <sup>10</sup> Adler AB, Huffman AH, Bliese PD, Castro CA. The impact of deployment length and experience on the well-being of male and female soldiers. *J Occup Health Psychol* 2005;**10**:121–37.
- <sup>11</sup> Vogt DS, Pless AP, King LA, King DW. Deployment stressors, gender, mental health outcomes among Gulf War 1 veterans. *J Traumatic Stress* 2005;**18**:115–27.
- <sup>12</sup> Goldberg D, Clifford K, Thompson L. Psychiatric morbidity in general practice and the community. *Psychol Med* 1977;**11**:565–69.
- <sup>13</sup> Kroenke K, Price RK. Symptoms in the community, prevalence, classification and psychiatric comorbidity. *Arch Intern Med* 1993;**153**:2474–80.
- <sup>14</sup> Nathanson CA. Sex, illness, and medical care. A review of data, theory, and method. *Soc Sci Med* 1975;**11**:13–25.
- <sup>15</sup> Macintyre S, Ford G, Hunt K. Do women 'over-report' morbidity? Men's and women's responses to structured prompting on a standard question on long standing illness. *Soc Sci Med* 1999;**48**:89–98.
- <sup>16</sup> Lundberg U, Frankenhaeuser M. Stress and workload of men and women in high-ranking positions. *J Occupat Health Psychol* 1999;**4**:142–51.
- <sup>17</sup> Tomiak M, Gentleman JF, Jette M. Health and gender differences between middle and senior managers in the Canadian Public Service. *Soc Sci Med* 1997;**45**:1589–96.
- <sup>18</sup> Barnett RC, Marshall NL, Sayer A. Positive-spillover effects from job to home: a closer look. *Women Health* 1992;**19**:13–41.
- <sup>19</sup> Fontana A, Rosenheck R. Focus on women: duty related and sexual stress in the etiology of PTSD among women veterans who seek treatment. *Psychiatr Serv* 1998;**49**:658–62.
- <sup>20</sup> Suris A, Lind L, Kashner M, Borman PD, Petty F. Sexual assault in women veterans: an examination of PTSD risk, health care utilization. *Psychosomatic Med* 2004;**66**:749–56.
- <sup>21</sup> Unwin C, Blatchley N, Coker W *et al.* Health of UK servicemen who served in Persian Gulf War. *Lancet* 1999;**353**:169–78.
- <sup>22</sup> Barrett DH, Gray GC, Doebbeling BN, Clauw DJ, Reeves WC. Prevalence of symptoms and symptom-based conditions among Gulf War veterans: current status of research findings. *Epidemiol Rev* 2002;**42**:218–27.
- <sup>23</sup> Hotopf M, Hull L, Fear NT *et al.* The health of UK military personnel who deployed to the Iraq war: a cohort study. *Lancet* 2006;**367**:1731–41.
- <sup>24</sup> Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *N Engl J Med* 2004;**351**:13–22.
- <sup>25</sup> Goldberg D, Williams P. *A users guide to the General Health Questionnaire*,. NFER-Nelson: Windsor, 1988.
- <sup>26</sup> Chalder T, Berelowitz G, Pawlikowska T *et al.* Development of a fatigue scale. *J Psychosomatic Med* 1993;**37**:147–53.
- <sup>27</sup> Ware J, Snow K, Kosinski M *et al.* *SF-36 health survey manual and interpretation guide*,. Boston, MA: The Health Institute, New England Medical Centre, 1993.
- <sup>28</sup> Blanchard EB, Jones-Alexander J, Buckley TC *et al.* Psychometric properties of the PTSD Checklist (PCL). *Behav Res Ther* 1996;**34**:669–73.
- <sup>29</sup> Linzer M, Spitzer R, Kroenke K *et al.* Gender, quality of life, and mental disorders in primary care: results from the PRIME-MD 1000 study. *Am J Med* 1996;**101**:526–33.
- <sup>30</sup> Gijbbers van Wijk CMT, Kolk AM. Sex differences in physical symptoms: the contribution of symptom perception theory. *Soc Sci Med* 1997;**45**:231–46.
- <sup>31</sup> Hoge CW, Lesikar SE, Guevara R *et al.* Mental disorders among US military personnel in the 1990s: association with high levels of health care utilization and early military attrition. *Am J Psychiatry* 2002;**159**:1576–83.
- <sup>32</sup> Goddard E, Green H. General Household Survey 2004. Smoking and drinking among adults, 2004. London, UK: Office for National Statistics, 2005.
- <sup>33</sup> Singleton N, Bumpsted R, O'Brien M, Lee A, Meltzer H. *Office for National Statistics. Psychiatric morbidity among adults living in private households, 2000*. London: The Stationery Office, 2001.
- <sup>34</sup> Shephard B. *A war of nerves: soldiers and psychiatry 1914–1994. A war of nerves*,. London: Jonathan Cape, 2000.
- <sup>35</sup> Cherry N, Creed F, Silman A *et al.* Health and exposure of United Kingdom Gulf war veterans. Part II: The relation of health and exposure. *Occup Environ Med* 2001;**58**:299–306.
- <sup>36</sup> Hotopf M, David A, Hull L, Ismail K, Unwin C, Wessely S. Role of vaccination as risk factors for ill health in veterans of the Gulf war: cross sectional study. *Br Med J* 2000;**320**:1363–67.
- <sup>37</sup> Hoge CW, Auchterlonie JL, Milliken CS. Mental health problems, use of mental health services after returning from deployment from Iraq and Afghanistan. *JAMA* 2006;**295**:1023–32.
- <sup>38</sup> King DW, King LA, Gudanoski DM, Vreven DL. Alternative representations of war zone stressors: relationships to posttraumatic stress disorder in male and female Vietnam veterans. *J Abnormal Psychol* 1995;**108**:164–70.