

# Mental health among commando, airborne and other UK infantry personnel

J. Sundin<sup>1</sup>, N. Jones<sup>1</sup>, N. Greenberg<sup>1</sup>, R. J. Rona<sup>2</sup>, M. Hotopf<sup>2</sup>, S. Wessely<sup>2</sup> and N. T. Fear<sup>1</sup>

<sup>1</sup>Academic Centre for Defence Mental Health, Department of Psychological Medicine, Institute of Psychiatry, King's College London, London SE5 9RJ, UK, <sup>2</sup>King's Centre for Military Health Research, Department of Psychological Medicine, Institute of Psychiatry, King's College London, London SE5 9RJ, UK.

Correspondence to: J. Sundin, Academic Centre for Defence Mental Health, King's College London, Weston Education Centre, 10 Cutcombe Road, London SE5 9RJ, UK. Tel: +44 (0)20 7848 5344; fax: +44 (0)20 7848 5397; e-mail: Josefin.sundin@kcl.ac.uk

<b>Background</b>	Despite having high levels of combat exposure, commando and airborne forces may be at less risk of mental ill-health than other troops.
<b>Aims</b>	To examine differences in mental health outcomes and occupational risk factors between Royal Marines Commandos (RMCs), paratroopers (PARAs) and other army infantry (INF).
<b>Methods</b>	Three groups of personnel (275 RMCs, 202 PARAs and 572 INF) were generated from a UK military cohort study of personnel serving at the time of the 2003 Iraq war. Participants completed a questionnaire about their mental health and experiences on deployment. Differences in mental health outcomes between the groups were examined with logistic regression and negative binomial regression analyses.
<b>Results</b>	Both RMCs and PARAs were less likely to have multiple physical symptoms or to be fatigued, and RMCs also had lower levels of general mental health problems and lower scores on the Post-traumatic Checklist than INF personnel. Differences were not explained by the level of unit cohesion.
<b>Conclusions</b>	The effect of warfare on troops' well-being is not universal across occupational groups. A possible explanation for this difference is that the high level of preparedness in RMCs and PARAs may lessen the psychological impact of war-zone deployment experiences.
<b>Key words</b>	Airborne forces; commando forces; marines; PTSD; UK.

## Introduction

Most military forces utilize commando and airborne infantry troops who are subject to a more rigorous selection process and undergo more arduous training compared with other infantry troops; in the UK armed forces, these include Royal Marines Commandos (RMCs) and airborne forces such as paratroopers (PARAs) [1–2]. These forces often undertake more hazardous military duties, such as deploying to newly established and uncertain theatres of operations. The RMCs are the amphibious infantry of the UK armed forces and are a core component of the UK rapid deployment force. Their role requires them to be ready to deploy at short notice and they are trained to fight in any terrain; they are the UK armed forces' specialists in cold weather and mountain warfare [1]. The PARAs are the airborne infantry element of the British Army; their role is to operate with minimal, or no support, potentially behind enemy lines and against superior

forces. Like RMCs, PARAs are highly trained to enable them to operate independently for long periods and under harsh conditions [2].

Since commando and airborne forces are likely to be exposed to traumatic situations more frequently, it follows that they should be at increased risk of ill-health. However, research does not support this view. Recent UK studies have shown that the prevalence of post-traumatic stress disorder (PTSD) tends to be low in commando and airborne forces, such as RMCs and PARAs [3–4], but the lack of a non-commando or airborne forces control group in the study by Hacker Hughes *et al.* [4] limits their conclusions. Similar findings of resilience in marines compared with army and navy personnel have been reported in US studies [5–7].

The role of unit cohesion is of growing interest for studies of psychological health in military personnel. Several studies and meta-analyses have examined and demonstrated a positive relation between unit cohesion and

performance [8]. There is also support for a relationship between improved well-being and readiness with higher levels of unit cohesion, and unit cohesion may serve as a resilience factor for PTSD and combat stress reactions [3,9,10]. Recent research has also shown that there is an association between unit cohesion and excessive alcohol use, with heavy drinking being associated with moderate to high levels of comradeship in theatre [11]. There is also some evidence to suggest higher levels of individual and unit morale among US marines compared to US Army soldiers [5].

This study examines differences in mental health outcomes and occupational risk factors between RMCs, PARAs and other army infantry (INF). We hypothesized that RMCs and PARAs would show fewer adverse mental health outcomes and higher levels of unit cohesion as compared to other INF.

## Methods

Data were utilized from a study of UK military personnel who were in service during March 2003 and who participated in the first wave of a prospective cohort study [12,13]. Invited participants were from a random sample stratified by service, enlistment type (regular or reserve personnel) and deployment status. Reserve personnel were over-sampled by a ratio of 2:1. Data were collected through postal surveys and visits to military bases. The cohort comprised of 4722 personnel who had deployed on Op TELIC 1 (the military code name for the first phase of the 2003 Iraq war) and 5550 personnel who were not deployed on TELIC 1 (referred to as Era). Personnel in the Era group may have deployed on later phases of TELIC or on other major deployments.

The response rate was 61%. Analysis of non-responders showed that age, rank, gender, ethnic group and enlistment type differed between responders and non-responders, but there were no differences in fitness to deploy [14]. Weighting for non-response had little effect on the relative risks, which indicates that bias was small.

The study received approval from the Ministry of Defence (MOD) research ethics committee and the King's College Hospital local research ethics committee.

Analyses were made on a subsample of respondents who had deployed on a major operation since 2000, and who were RMCs ( $n = 275$ ), PARAs ( $n = 202$ ) or members of other INF regiments ( $n = 572$ ). The sample was identified through information on Service branch (i.e. Royal Navy, Royal Marines, British Army and Royal Air Force) and parent unit, obtained from the cohort study questionnaire and from the Defence Analytical Services Agency. RMCs were identified by their service numbers and included personnel who served in a Royal Marines infantry or support unit. PARAs (defined as personnel who belonged to three airborne combat units and

two airborne support units of artillery and engineers) and other INF were identified through information on parent unit. N.J. (a serving member of the Defence Medical Services) advised on the generation of these groups. Only regular male personnel were studied due to the small numbers of females and reserve personnel in the RMCs and PARAs groups.

Participants provided information on socio-demographic and military characteristics, deployment experiences and current health. Childhood adversity was assessed as a composite score of 16 questions on childhood experiences [14]. Information on deployment experiences included the area of deployment, time spent in a forward area and potentially adverse experiences on deployment (coming under small arms fire, coming under mortar or artillery attack and seeing personnel wounded or killed). Two questions assessed appraisals of deployment experiences: thinking one might be killed and whether work in theatre matched trade and experiences (perceived preparedness).

Unit cohesion was conceptualized as a construct based on seven variables that assessed comradeship, leadership and whether personnel felt well informed during deployment (Table 1). Four of the items were taken from a section asking personnel about their perceptions of their deployment and were measured on a five-point scale from 'strongly disagree' to 'strongly agree'. The other three items were part of a question on what aspects of their deployment personnel felt were most and least rewarding. For each item, personnel had the option of ticking most rewarding, least rewarding or neither. All seven items were recoded on a binary scale, with the 'neither' category coded as missing.

The scale reliability was acceptable (Cronbach's  $\alpha = 0.77$ ). The unit cohesion construct was generated through principal component analysis (PCA) of a tetrachoric correlation matrix, which is appropriate for binary data [15]. The PCA resulted in a two-factor solution with one general factor that explained 61.0% of the total variance. The factor loadings ranged between 0.47 and 0.86 and the standardized factor loadings were used to generate the unit cohesion construct.

PTSD was measured with the 17-item National Centre for PTSD Checklist (PCL-C) [16], with cases defined as those scoring  $\geq 50$ . Due to insufficient numbers of PTSD cases in the RMC and PARA groups, the PCL-C score was used as outcome measure in the multivariate analyses. The score was recoded from 17–85 to a range from 0–68 for the purpose of the multiple variable analyses. Alcohol use was measured with the alcohol use disorders identification test [17], with cases defined as those scoring  $\geq 16$ . Fatigue was measured with the Chalder fatigue scale [18], with cases defined as those scoring  $\geq 4$ . Symptoms of common mental disorder were measured with the General Health Questionnaire 12 (GHQ-12) [19] with cases defined as those scoring  $\geq 4$ . Physical

**Table 1.** Variables and response scale of the seven items included in the unit cohesion construct

Variables	Response scale
How much do you agree or disagree with the following statements:	
I felt a sense of comradeship (or closeness) between myself and other people in my unit.	1 Strongly disagree 2 Disagree 3 Neither 4 Agree 5 Strongly agree
I could have gone to most people in my unit if I had a personal problem.	
My seniors were interested in what I did or thought.	
I felt well informed about what was going on.	
What if any were the three most rewarding and three least rewarding aspects of your service on Op TELIC:	
Quality of leadership of senior chain of command was among the three most/least rewarding aspects of service.	1 Most rewarding 2 Least rewarding
Quality of leadership of immediate commanders was among the three most/least rewarding aspects of service.	
Teamwork/Comradeship was among the three most/least rewarding aspects of service.	

symptoms were assessed with a checklist of 53 common symptoms, with cases defined as individuals endorsing  $\geq 18$  symptoms [12].

Socio-demographic characteristics, pre-deployment and combat experiences were compared between the three groups. Proportions were calculated and statistical significance was assessed with Pearson's  $\chi^2$  statistic.

Associations between group membership and mental health outcomes were assessed with odds ratios (OR), calculated with binary logistic regression, and incidence-rate ratios (IRR), calculated with negative-binomial regression [20]. We adjusted for variables that were related to both group membership and the mental health outcomes. For all models, the socio-demographic and pre-deployment variables were fitted first followed by the deployment and post-deployment risk factors. The cut-off for inclusion in the model was set at  $P$  values  $\leq 0.10$ . Differences in theatre of deployment were adjusted for in all models. Goodness-of-fit was assessed with the Hosmer–Lemeshow test [21] and fit was adequate for all models.

We examined stress reactivity with three interaction effects for group membership and combat exposure and also with two background factors (level of education and childhood adversity). Differences in theatre of deployment were adjusted for in all models.

A sensitivity analysis was carried out for personnel who had deployed on a TELIC operation ( $n = 874$ ) and all

mental health outcome analyses were repeated on this subsample.

## Results

The groups differed on several socio-demographic aspects (Table 2). Compared to the INF, PARAs were younger and had deployed for less time in the past 3 years. RMCs, compared with the INF, had higher educational attainment, were less likely to hold a rank of junior non-commissioned officer and had lower levels of childhood adversity. Compared with RMCs, PARAs were younger, had deployed for less time in the past 3 years and reported more childhood adversity.

PARAs and RMCs were more likely to have deployed on any phase of TELIC compared with the INF (Table 3). Time spent in a forward area differed between the groups, with PARAs and RMCs more likely to spend up to a month, while the INF tended to spend no time, or more than a month, in a forward area. Prevalence of combat exposures was high in all three groups. RMCs were more likely to have come under mortar or artillery fire and to have seen personnel wounded or killed compared to the INF. Personnel in the INF were more likely to have come under small arms fire compared with the PARAs.

There was no difference in levels of unit cohesion between PARAs and the INF. In contrast, RMCs had higher levels of unit cohesion compared with the other two groups.

There were differences in length of time between leaving theatre and completing the questionnaire. While PARAs and INF personnel averaged  $>500$  days between leaving theatre and completing the questionnaire, RMCs averaged  $>700$  days. However, time from leaving theatre to completing the questionnaire was not associated with any of the mental health outcomes for the RMCs.

RMCs had lower rates of all negative mental health outcomes except alcohol use, which was comparable to the rate for the INF (Table 4). Following adjustment, PARAs had lower rates of fatigue and physical symptoms than the INF. Low levels of unit cohesion were predictive of all mental health outcomes but did not account for differences between the groups. There were no differences between the RMCs and PARAs for these mental health outcomes (data not shown).

There was a significant interaction between childhood adversity and group membership on the GHQ score (INF versus PARAs:  $\chi^2(3) = 10.26$ ,  $P < 0.05$ ), with PARAs being less reactive to high levels of childhood adversity.

The proportion of cases reporting PTSD symptoms was similar for the INF and the PARAs. RMCs had significantly fewer cases of PTSD compared with the INF,  $P < 0.05$  (Fisher's exact test), but not compared with the PARAs (not significant).

**Table 2.** Socio-demographic characteristics of the INF, PARAs and RMCs

Socio-demographic and pre-deployment variables	INF ( <i>n</i> = 572) <sup>a</sup>	PARAs ( <i>n</i> = 202) <sup>a</sup>	RMCs ( <i>n</i> = 275) <sup>a</sup>	INF versus PARAs	INF versus RMCs	PARAs versus RMCs
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>P</i> value	<i>P</i> value	<i>P</i> value
Age (years)	29.9 (29.3–30.4) <sup>b</sup>	28.4 (27.5–29.2) <sup>b</sup>	30.4 (29.6–31.3) <sup>b</sup>	<0.05	NS	<0.001
Educational status <sup>c</sup>						
No qualifications	94 (17)	19 (10)	18 (7)	NS	<0.001	NS
GCSE or equivalent	289 (54)	107 (55)	129 (48)			
A-levels or equivalent	100 (19)	46 (24)	87 (32)			
Degree	56 (10)	22 (11)	37 (14)			
Rank						
Other rank	140 (25)	66 (34)	92 (34)	NS	<0.05	NS
Junior non-commissioned officer	227 (40)	72 (37)	85 (31)			
Senior non-commissioned officer	132 (23)	37 (19)	60 (22)			
Officer	65 (12)	22 (11)	34 (13)			
Had prior deployment experience	450 (79)	147 (73)	211 (78)	NS	NS	NS
Time deployed for in past 3 years						
≤6 months	148 (27)	67 (34)	65 (24)	<0.05	NS	<0.001
7–12 months	249 (45)	92 (34)	108 (40)			
>12 months	161 (29)	38 (19)	95 (36)			
Medically downgraded	45 (8)	9 (5)	20 (7)	NS	NS	NS
Number of childhood adversity factors						
0/1	97 (17)	40 (20)	57 (21)	NS	<0.001	<0.05
2/3	146 (26)	55 (27)	97 (35)			
4/5	122 (21)	35 (17)	67 (24)			
≥6	207 (36)	72 (36)	54 (20)			

Numbers (*n*), percentages (%), means (*M*) and 95% CIs are displayed together with *P* values for *t*-tests and  $\chi^2$  statistics. NS = not significant.

<sup>a</sup>Some categories do not add up to denominators because of missing data.

<sup>b</sup>Mean and 95% CI and corresponding *t*-test.

<sup>c</sup>General Certificate of Secondary Education (GCSEs) are examinations usually taken at age 16. A-levels are usually taken at age 18 and are required for entry to university.

The difference in PCL-C score between RMCs and the INF held after adjusting for socio-demographics, pre-deployment factors and experiences on deployment (Table 5). In contrast, after adjusting for covariates, the lower rates of PCL-C scores in PARAs compared with the INF were removed. After adjusting for covariates, RMCs also had lower PCL-C scores compared with the PARAs.

There were interactions between seeing personnel wounded or killed and group membership on PCL-C score, both for the comparison between PARAs and INF (IRR 0.43, 95% CI 0.25–0.74) and for the PARAs and RMCs comparison (IRR 2.66, 95% CI 1.30–5.44). PARAs were less stress-reactive to seeing personnel wounded or killed compared with the INF and RMCs.

Replication of the analyses on only TELIC-deployed participants showed that there was no effect of TELIC deployment on the comparisons between the RMCs or the PARAs with the INF or between the RMCs and the PARAs (data available from the authors).

## Discussion

Combat exposures were common in all three groups, but the prevalence of mental ill-health was generally low. Our hypotheses of lower rates of psychological distress and higher unit cohesion among RMCs and PARAs were only partially supported. Consistent with previous research, RMCs reported lower levels of mental ill-health and had higher levels of unit cohesion compared to the INF [5,6]. This was not the case for PARAs, who were comparable to the INF on levels of unit cohesion, general mental health problems and PCL-C scores. PARAs also had higher PCL-C scores than the RMCs. In contrast, both RMCs and PARAs were less likely to be fatigued or experience multiple physical symptoms compared with the INF.

Interactions between group membership and seeing personnel wounded or killed on PCL-C score indicated that PARAs were less stress-reactive to witnessing trauma to others than both the INF and RMCs. High levels of

**Table 3.** Deployment experiences of the INF, PARAs and RMCs

Deployment experiences variables	INF ( <i>n</i> = 572) <sup>a</sup>	PARAs ( <i>n</i> = 202) <sup>a</sup>	RMCs ( <i>n</i> = 275) <sup>a</sup>	INF versus PARAs	INF versus RMCs	PARAs versus RMCs
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>P</i> value	<i>P</i> value	<i>P</i> value
Any TELIC deployment	434 (76)	190 (94)	250 (91)	<0.001	<0.001	NS
Time spent in a forward area						
Not at all	153 (28)	35 (18)	55 (20)	<0.05	<0.001	NS
Up to 1 month	155 (28)	77 (40)	129 (48)			
>1 month	248 (45)	81 (42)	86 (32)			
Came under small arms fire	322 (56)	89 (44)	146 (53)	<0.05	NS	<0.05
Came under mortar or artillery fire	320 (56)	125 (62)	181 (66)	NS	<0.05	NS
Saw personnel wounded or killed	366 (65)	133 (66)	195 (71)	NS	<0.05	NS
Thought might be killed	383 (68)	126 (63)	174 (64)	NS	NS	NS
Work in theatre was generally outside experience/ability	67 (15)	30 (16)	31 (12)	NS	NS	NS
Unit cohesion (general factor)	0.11 (0.03–0.20) <sup>b</sup>	0.01 (–0.12, 0.15) <sup>b</sup>	0.25 (0.15–0.36) <sup>b</sup>	NS	<0.05 <sup>c</sup>	<0.05 <sup>c</sup>
Time (days) between leaving theatre and completing questionnaire	532.5 (490.7–574.3) <sup>b</sup>	515.3 (478.7–551.9) <sup>b</sup>	729.4 (693.7–765.1) <sup>b</sup>	NS <sup>c</sup>	<0.001 <sup>c</sup>	<0.001 <sup>c</sup>

Numbers (*n*), percentages (%), means (*M*) and 95% CIs are displayed together with *P* values for *t*-tests and  $\chi^2$  statistics. NS = not significant.

<sup>a</sup>Some categories do not add up to denominators because of missing data.

<sup>b</sup>Mean and 95% CI and corresponding *t*-test.

<sup>c</sup>*t*-test adjusted for unequal variances.

childhood adversity also had a smaller effect on PARAs compared to the INF for symptoms of common mental disorder. However, PARAs were equally reactive to INF and RMCs regarding coming under small arms fire, coming under mortar or artillery fire and thinking they might be killed.

These results fit with previous research that has compared mental health outcomes between US marines and other troops. Studies have shown that combat-deployed marines had lower rates of psychiatric disorders compared to both non-deployed marines and navy personnel [6] and that marines report fewer mental health, family and alcohol problems compared to army soldiers [5]. However, in the present study, alcohol problems were comparable between the three groups.

In contrast, a recent report of psychiatric morbidity among the UK armed forces [22] showed that RMCs had lower rates of any mental illness compared with the other services, but the rates of PTSD were higher among RMCs. However, these analyses were not adjusted for covariates, and young age, female gender and deployments to Iraq or Afghanistan were also shown to be predictors of PTSD and mental illness.

There is some evidence of low rates of PTSD in paratroopers [4] but the lack of a control group in that study limits the conclusions that can be drawn. The present study showed that PARAs had similar rates of symptoms of PTSD compared with the INF.

The RMCs had fewer pre-deployment risk factors compared with the INF, with higher levels of education and lower rates of childhood adversity. Previous studies have shown that high levels of childhood adversity increase the risk of developing PTSD symptoms [14,23,24] and other mental health problems, such as depression and anxiety, in military populations [25]. A US study of marines who had deployed to Iraq or Afghanistan showed that marines who had higher levels of education, measured as some college or a college degree, were at lower risk of screening positive for PTSD [26].

The lower rates of mental ill-health in RMCs may also be a result of stigma. Research on stigma in the military has shown that it is more prevalent among individuals who experience mental health problems [27]. Concerns regarding disclosure of psychiatric difficulties include being perceived as weak and not being trusted by peers [28].

**Table 4.** Unadjusted prevalence and logistic regression models comparing the PARAs and RMCs with other Army infantry (INF) on adverse health outcomes

		Cases, <i>n</i> (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	<i>N</i>
GHQ	INF	132 (24)			
	PARAs	36 (18)	0.73 (0.48–1.09)	0.81 (0.51–1.27) <sup>a</sup>	728
	RMCs	34 (13)	0.46 (0.31–0.70)	0.58 (0.36–0.93) <sup>b</sup>	659
Fatigue	INF	207 (37)			
	PARAs	48 (25)	0.55 (0.38–0.80)	0.51 (0.34–0.78) <sup>c</sup>	721
	RMCs	66 (24)	0.55 (0.40–0.76)	0.62 (0.43–0.89) <sup>d</sup>	811
Alcohol use disorders identification test	INF	147 (26)			
	PARAs	59 (30)	1.24 (0.87–1.78)	1.31 (0.85–2.02) <sup>e</sup>	630
	RMCs	72 (26)	1.02 (0.73–1.41)	1.38 (0.95–2.02) <sup>f</sup>	826
Physical symptoms	INF	92 (16)			
	PARAs	16 (8)	0.45 (0.26–0.78)	0.40 (0.22–0.72) <sup>g</sup>	727
	RMCs	19 (7)	0.39 (0.23–0.65)	0.36 (0.20–0.64) <sup>h</sup>	798

Number of cases (*n*), percentages (%), OR, 95% CIs are displayed together with numbers for the adjusted models (*N*).

<sup>a</sup>Adjusted for age, rank, childhood adversity, theatre of deployment, coming under small arms fire and unit cohesion.

<sup>b</sup>Adjusted for age, rank, childhood adversity, theatre of deployment, perception of work in theatre and unit cohesion.

<sup>c</sup>Adjusted for rank, childhood adversity, theatre of deployment, thought might be killed and unit cohesion.

<sup>d</sup>Adjusted for childhood adversity, theatre of deployment and unit cohesion.

<sup>e</sup>Adjusted for age, childhood adversity, time deployed for in past 3 years, theatre of deployment, unit cohesion and time between leaving theatre and completing the questionnaire.

<sup>f</sup>Adjusted for age, rank, childhood adversity and theatre of deployment.

<sup>g</sup>Adjusted for rank, time deployed for in past 3 years, theatre of deployment, saw personnel wounded or killed and unit cohesion.

<sup>h</sup>Adjusted for rank, childhood adversity, time deployed for in past 3 years, theatre of deployment, saw personnel wounded or killed and unit cohesion.

**Table 5.** Negative binomial regression models of PCL-C scores in the paratroopers (PARAs) and RMCs compared with other INF and comparing the PARAs and RMCs

PCL-C	Cases, <i>n</i> (%)	Unadjusted IRR	Adjusted IRR	<i>N</i>
INF	36 (6)			
PARAs	12 (6)	0.75 (0.58–0.96)	0.91 (0.70–1.18) <sup>a</sup>	622
RMCs	7 (3)	0.54 (0.43–0.67)	0.64 (0.52–0.79) <sup>b</sup>	800
PARAs	12 (6)			
RMCs	7 (3)	0.72 (0.52–1.00)	0.69 (0.49–0.98) <sup>c</sup>	456

Number of cases (*n*), percentages (%), IRR, and 95% CIs are displayed together with numbers for the final models (*N*).

<sup>a</sup>Adjusted for rank, childhood adversity, theatre of deployment, coming under small arms fire, thought might be killed, unit cohesion and time between leaving theatre and completing the questionnaire.

<sup>b</sup>Adjusted for rank, childhood adversity, theatre of deployment, coming under small arms fire, saw personnel wounded or killed and unit cohesion.

<sup>c</sup>Adjusted for childhood adversity, time deployed for in past 3 years, theatre of deployment, time spent in a forward area, saw personnel wounded or killed and unit cohesion.

Fear of a harmful effect on one’s career may lead to fewer disclosures of poor health in RMC and PARA personnel, who by the nature of their training and culture are more likely to favour resilience than regular troops. However, during recruitment for the study, all participants were informed that the study was conducted independently of

the UK MOD and that all personal information would be kept completely confidential.

Previous research has also suggested that the lower levels of PTSD symptom severity in RMCs is likely to be due to higher levels of group cohesion, fitness and general motivation [3]. While RMCs had higher levels of unit cohesion, there was no difference between PARAs and the INF. This may explain why there were no differences in general mental health problems or PCL scores between PARAs and the INF.

This study was based on data from a representative cohort with a good response rate (61%) and we have shown that response was not linked to health outcome [12,29], which suggests that response bias was unlikely. The study was limited by the data collected in the larger cohort study and therefore differences in the selection and training between the groups could not be assessed. Future research can expand on this study by examining these factors. The cross-sectional nature of this study means that caution should be exercised on the interpretation of the findings. All health outcomes were assessed with screening measures and represent probable mental illness, except for PTSD that was measured as PCL-C score.

A sensitivity analysis was carried out on only TELIC-deployed personnel, and the results support that the differences in health outcomes between the RMCs and PARAs compared to the INF were not due to the theatre of deployment.

We consider that our findings show that the effect of warfare on troops' well-being is not universal across occupational groups. Both PARAs and RMCs had fewer physical symptoms and were less fatigued compared with the INF, and RMCs were also less likely to have general mental health problems and had lower PCL-C scores. This effect appears to be independent of combat exposure and socio-demographic differences. A possible explanation for this difference is that the high level of preparedness in Royal Marine and airborne forces may lessen the psychological impact of war-zone deployment experiences.

This paper suggests that for combat troops, commanders should ensure, where possible, that initial and ongoing training is sufficiently arduous to ensure high levels of preparedness. It also suggests that UK armed forces' use of commando and airborne forces for the more difficult missions is justified. To ensure that troops are prepared for the demands and stressors of deployment, it is necessary for the military to deliberately stretch and test people. War is a stressful business, and it is best to come prepared [30].

### Key points

- The effects of combat exposures are not universal across military occupational groups.
- Despite high levels of combat exposures, Royal Marines Commandos and paratroopers had better self-reported mental health than other infantry personnel.
- Royal Marines Commandos also had higher levels of unit cohesion, but adjusting for unit cohesion did not explain the difference in health outcomes.

### Funding

UK MOD (R&T/1/0078); South London and Maudsley National Health Service Foundation Trust/Institute of Psychiatry National Institute of Health Research Biomedical Research Centre to M.H. and S.W.

### Acknowledgements

We thank the UK MOD for their cooperation; in particular we thank the Defence Analytical Services and Advice, the single Services, the Joint Personnel Administration, the Pensions Compensation and Veterans Unit and the HQ Surgeon General.

### Conflicts of interest

Neil Greenberg is a full-time active service medical officer, and Norman Jones is a full-time reserve member of Defence Medical Services, both seconded to the Academic Centre for Defence Mental Health, King's College London. Simon Wessely is Hon-

orary Civilian Consultant Advisor in Psychiatry to the British Army and a Trustee of Combat Stress, a UK charity that provides services and support for veterans with mental health problems. All the other authors declare that they have no conflict of interests.

### References

1. Allsopp AJ, Shariff A. Improving the selection of candidates for Royal Marine recruit training by the use of a combination of performance tests. *J R Nav Med Serv* 2004;**90**:117–124.
2. Wilkinson DM, Rayson MP, Bilzon JLJ. A physical demands analysis of the 24-week British Army Parachute regiment recruit training syllabus. *Ergonomics* 2008;**51**: 649–662.
3. Iversen A, Fear NT, Ehlers A *et al.* Risk factors for post-traumatic stress disorder among UK Armed Forces personnel. *Psychol Med*. 2008;**38**:511–522.
4. Hacker Hughes J, Cameron F, Eldridge R, Devon M, Wessely S, Greenberg N. Going to war does not have to hurt: preliminary findings from the British deployment to Iraq. *Br J Psychiatry* 2005;**186**:536–537.
5. Castro CA, McGurk D. The intensity of combat and behavioral health status. *Traumatology* 2007;**13**:6–23.
6. Larson GE, Highfill-McRoy RM, Booth-Kewley S. Psychiatric diagnoses in historic and contemporary military cohorts: combat deployment and the healthy warrior effect. *Am J Epidemiol* 2008;**167**:1269–1276.
7. Smith TC, Wingard DL, Ryan MAK *et al.* PTSD prevalence, associated exposures, and functional health outcomes in a large, population-based military cohort. *Public Health Rep* 2009;**124**:90–102.
8. Oliver LW, Harman J, Hoover E, Hayes SM, Pandhi NA. A quantitative integration of the military cohesion literature. *Mil Psychol* 1999;**11**:57–83.
9. McTeague L, McNally R, Litz B. Prewar, war-zone, and postwar predictors of posttraumatic stress in female Vietnam veteran health care providers. *Mil Psychol* 2004;**16**:99–114.
10. Rona RJ, Hooper R, Jones M *et al.* The contribution of prior psychological symptoms and combat exposure to post Iraq deployment mental health in the UK military. *J Trauma Stress* 2009;**22**:11–19.
11. Browne T, Iversen A, Hull L *et al.* How do experiences in Iraq affect alcohol use amongst male UK armed forces personnel? *Occup Environ Med* 2008;**65**:628–633.
12. Hotopf M, Hull L, Fear NT *et al.* The health of UK military personnel who deployed to the 2003 Iraq war: a cohort study. *Lancet* 2006;**367**:1731–1741.
13. Fear NT, Jones M, Murphy D *et al.* What are the consequences of deployment to Iraq and Afghanistan on the mental health of the UK armed forces? A cohort study. *Lancet* 2010;**375**:1783–1797.
14. Iversen A, Fear NT, Simonoff E *et al.* Influence of childhood adversity on health among male UK military personnel. *Br J Psychiatry* 2007;**191**:506–511.
15. Knol D, Berger M. Empirical comparison between factor analysis and multidimensional item response models. *Multivariate Behav Res* 1991;**26**:457–477.

16. Weathers F, Litz B, Herman D, Huska J, Keane T. *The PTSD Checklist—Civilian Version (PCL-C)*. Boston, MA: National Centre for PTSD, 1994.
17. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. *AUDIT: The Alcohol Use Disorders Identification Test*. 2nd edn. Geneva, Switzerland: World Health Organization, 2001.
18. Chalder T, Berelowitz C, Pawlikowska T. Development of a fatigue scale. *J Psychosom Res* 1993;**37**:147–154.
19. Goldberg D, Williams P. *A Users' Guide to the General Health Questionnaire*. Windsor: NFER-Nelson, 1988.
20. Gardner W, Mulvey EP, Shaw EC. Regression analyses of counts and rates: Poisson, overdispersed Poisson, and negative binomial models. *Psychol Bull* 1995;**118**:392–404.
21. Hosmer DW, Lemeshow S. *Applied Logistic Regression*. 2nd edn. New York: John Wiley & Sons, 2000.
22. Defence Analytical Services and Advice (DASA). *UK Armed Forces Mental Health Report (Previously known as Armed Forces Psychiatric Morbidity Report): Annual Summary 2007*. <http://www.dasa.mod.uk/applications/newWeb/www/index.php?page=48&thiscontent=1290&pubType=0&date=2009-03-23&disText=2007%20Summary&from=historic&topDate=2010-04-28&PublishTime=09:30:00> (date last accessed, 10 August 2010).
23. Cabrera O, Hoge C, Bliese P, Castro C, Messer S. Childhood adversity and combat as predictors of depression and post-traumatic stress in deployed troops. *Am J Prev Med* 2007;**33**:77–82.
24. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of post-traumatic stress disorder and symptoms in adults: a meta-analysis. *Psychol Bull* 2003;**129**:52–73.
25. King L, King D, Vogt D, Knight J, Samper R. Deployment risk, resilience. Inventory: a collection of measures for studying deployment-related experiences of military personnel and veterans. *Mil Psychol* 2006;**18**:89–120.
26. Booth-Kewley S, Larson GE, Highfill-McRoy RM, Garland CF, Gaskin TA. Correlates of posttraumatic stress disorder symptoms in Marines back from war. *J Trauma Stress* 2010;**23**:69–77.
27. 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.
28. Langston V, Gould M, Greenberg N. Culture: what is its effect on stress in the military? *Mil Med* 2007;**172**:931–935.
29. Tate SR, Norman SB, McQuaid JR, Brown SA. Health problems of substance-dependent veterans with and those without trauma history. *J Subst Abuse Treat* 2007;**33**:25–32.
30. Wessely S. Risk, psychiatry and the military. *Br J Psychol* 2005;**186**:459–466.