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# The impact of deployment length on the health and well-being of military personnel: a systematic review of the literature

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## ABSTRACT

To determine the current state of knowledge regarding the effects of deployment length and a 'mismatch' between the expected and actual length of deployments on the health and well-being of military personnel in order to draw relevant conclusions for all organisations that deploy personnel to conflict zones. A systematic review was conducted of studies measuring deployment length to theatres of operations and the issue of 'mismatch' between expected and actual tour lengths. The nine studies included were rated for quality. Of the nine studies reviewed, six were rated as high quality, two as moderate quality and one as low quality. Seven of these studies found adverse effects of longer deployments on health and well-being. The two studies that measured 'mismatch' found adverse effects on mental health and well-being when deployments lasted longer than personnel expected. There are a limited number of studies which have assessed the effects of deployment length and very few that have assessed the effects of 'mismatch' on health and well-being. However, this review suggests that, as deployment length increases, the potential for personnel to suffer adverse health effects also increases. Further research is required to investigate the effects of spending prolonged periods of time away from family and friends, especially when deployment lasts longer than expected by personnel. These results are important not only for the Armed Forces, but also for other organisations that place employees in similar working conditions. Taking account of these findings may allow better preparation for the potentially harmful effects that deployments can have on employees' health and well-being.

## INTRODUCTION

Recent operations in both Iraq and Afghanistan have required military personnel to spend considerable periods of time in highly hostile environments.<sup>1</sup> However, numerous non-military personnel also operate in war zones. For instance, many non-combat missions, such as convoys, are carried out by private security personnel.<sup>2-3</sup> Media companies, non-governmental organisations and the foreign offices of national governments regularly also send staff to conflict zones.<sup>4-7</sup>

Regardless of their occupation, those who deploy to operational theatres spend time away from their family, friends and usual home comforts. They may have to endure uncomfortable conditions with little privacy and encounter a variety of stressors

## What this paper adds

- ▶ It has been suggested that longer deployments, and a 'mismatch' between actual and expected deployment lengths, can increase the likelihood that military personnel and employees of other organisations that deploy to war zones will suffer from mental health problems.
- ▶ Currently, many organisations do not use scientifically derived evidence to inform their view on the ideal length for deployments. Also, there has been speculation about whether deployment length should be modified where deployments are especially arduous such as is currently the case in Afghanistan.
- ▶ This paper found that spending more than 6 months away from family and friends, and having these periods unexpectedly extended, can have adverse effects on deployed personnel's health and well-being, and on the well-being of their families. These effects are even greater for deployments lasting longer than a year.
- ▶ Policy makers and researchers should take account of, and investigate, whether deployments may affect personnel differently depending on their demographics, including gender, and role while deployed.
- ▶ All organisations whose staff experience chronic occupational stress while deployed for prolonged periods should prepare staff, and their families, for the challenges of separation and develop plans to ease the additional stress of unexpected extensions to these deployments.

such as boredom, uncertainty and threats to their health.<sup>8-9</sup> Longer tours can adversely affect morale, mental health status and relationships with family and friends, and are often cited as reasons for personnel to leave their employment earlier than they might have done otherwise.<sup>1-5-11</sup>

Many, but not all, Armed Forces provide guidance about what constitutes an 'optimum' deployment length, some of which is publicly available and some of which is not. Within the military, the length of deployments has been traditionally viewed by commanders in terms of a trade-off between utilising maximally experienced and operationally effective personnel, as well as

promoting group bonding and cohesion, set against the costs of mental and physical stress.<sup>12</sup>

With the recent conflicts in both Iraq and Afghanistan, issues of deployment length have again come to the fore. There is a range of opinions as to where the balance of the competing needs of the military and individual should lie. For instance, the UK Army routinely deploys personnel within the 'Land Harmony Guidelines' which indicate that soldiers should deploy for 6 months at a time and for no more than 12 months in every 36-month period (see table 1).<sup>13 14</sup> The former British Chief of the General Staff, General Sir Richard Dannatt, has proposed that the intensive fighting and operational difficulties of modern deployments make 6-month deployments ideal and has suggested that British personnel should not have the length of their deployments increased.<sup>15</sup> However, the US Army typically deploys personnel for 12 months at a time, every 2 years (see table 1).<sup>16</sup>

The purpose of this review is to establish the state of knowledge about the effects of deployment length upon the health and well-being of military personnel in order to draw conclusions for all organisations that deploy personnel to conflict zones. The review also aims specifically to explore the issue of 'mismatch'; this is the difference between the time troops expect to spend on deployment and the length of time that they are actually deployed. This issue is important because concerns have been expressed about the possible effects of 'mismatch' on mental health and well-being.<sup>17</sup>

## METHOD

### Searching and screening strategy

Articles were retrieved by performing searches of bibliographic databases: NCBI, Ovid MEDLINE (1950–present), EMBASE (1947–2009), PsycINFO (1806–2009), PsycARTICLES, Health and Psychosocial Instruments (1985–2009) and Social Policy and Practice. Searches included keywords: combat, military personnel, troops, soldiers, armed forces, service personnel, war, theatre, theatre of war, army, navy, marines, air force, or special forces, combined with: tour length, deployment length, deployment plan, surge capacity, length of deployment, length of tour, duration of tour, time in theatre, duration in theatre, time on deployment, optempo, operations tempo, perstempo or personnel tempo. Searches were limited to studies in the English language.

A total of 367 articles were retrieved from bibliographic searches, and their abstracts were read. From these abstracts, 131 articles were deemed to be either possibly relevant or relevant to the search criteria. These were read in full and judged against inclusion criteria. Hand searching was then conducted by screening all references cited in articles that met the inclusion criteria, and these subsequent articles were read in full and included in the review if they also met the inclusion criteria. This resulted in a total of nine articles being reviewed.

### Inclusion criteria

Articles were included in the review if: the study explicitly measured and stated the length of deployment (either at the level of individual personnel or at the level of the unit of personnel being studied), had at least one outcome in terms of physical or psychological health, or well-being, and collected data on outcomes postdeployment.

### Critical review and assessment

Each study meeting the inclusion criteria was independently reviewed as described below by two of the authors (JEB and JS),

with consultation with a third if needed (SW), to resolve any disagreements in ratings assigned and in information extracted for the purpose of the review.

Each study was summarised in tabular form, extracting information relating to the inclusion criteria and key findings relating to deployment length and 'mismatch' (table 2). Each study was then rated and scored in terms of quality and applicability to the review using criteria adapted from Smith *et al*<sup>18</sup> and the Cochrane Reviewer's Handbook (see table 3).<sup>19</sup>

## RESULTS

A total of nine articles were selected on the basis of the inclusion criteria. These articles were assessed for quality and reviewed. Of these studies, six were rated as either very high or high quality, two as moderate quality and one as low quality (table 4).

Two of the nine studies reported no significant effect of deployment, one of which was rated as high quality<sup>20</sup> and the other as moderate.<sup>21</sup> This latter study had a short mean deployment length and little variability, and focused only on post-traumatic stress disorder (PTSD) as a health outcome, which may have affected the ability of the study to assess the effects of deployment length on health. The remaining seven studies found adverse effects of deployment length, suggesting that, as the length of deployment increases, personnel report poorer health and well-being (physical, psychological and social). Of these seven studies, two found only weak effects of deployment length,<sup>22 23</sup> and one of them<sup>22</sup> found this effect only in male personnel but not in females. The remaining five studies found stronger effects of deployment length on health, including all three studies rated as very high quality.<sup>14 24 25</sup> One of the studies rated as very high quality found that, while longer deployments were associated with elevated levels of mental health symptoms and poorer well-being compared with shorter deployments, point estimates were not significantly elevated; however, there was strong evidence of a trend of severe alcohol problems increasing with increasing deployment length.<sup>14</sup>

Two studies measured the effects of 'mismatch' between the expected and actual length of deployments.<sup>14 26</sup> Both reported an effect of 'mismatch' on mental health and well-being, though not on physical health (see table 2).

These results are summarised in table 5.

## DISCUSSION

This paper reviewed a total of nine studies, each of which examined the relationship between the length of time that military personnel were deployed and their health and well-being. Seven of the studies reported adverse effects of deployment length on health, suggesting that as deployment length increases, personnel are more likely to report poorer physical and psychological health, take part in more negative health behaviours and report lower overall well-being. Only two of the nine studies examined 'mismatch' between expected and actual deployment length; both of these found that when 'mismatch' occurs, personnel report worse mental health and well-being.

**Table 1** Expected deployment lengths by country\* and service

	UK <sup>38</sup>	USA <sup>39</sup>
Army	6 months, or 12 months in every 36-month period	12–15 months
Navy & Marines	22 months in every 36-month period†	7 months
Air force	9.3 months in every 24-month period	4 months

\*Information was not available for the Indian Armed Forces.

†UK Royal Navy and Marines who deploy on land operations follow the UK Army guidelines; these guidelines refer only to personnel operating on warships and submarines.

**Table 2** Summary of studies meeting inclusion criteria and reviewed (studies ordered by rating of quality; see table 3)

Author and year of publication	Range/mean/modal deployment length/measured (months)	Population studied/country: service/branches percentage male	Health outcomes and (standardised measures used)	Brief summary of deployment length and 'mismatch' related findings
Rona <i>et al</i> <sup>14</sup>	Range: <5–≥13 months; mode: 5–8 months (cumulative totals over 3 years)	UK: All Services 93% Male	Psychiatric health and well-being (GHQ-12), PTSD (PCL-C), alcohol use (AUDIT), fatigue (Chalder Fatigue), physical symptoms (53-item physical symptoms scale)	A total of 13 or more months on deployment over the last 3 years compared with less than 13 months on deployment over the last 3 years was related to higher rates of caseness for PTSD (1.58 (1.07 to 2.32), caseness on the GHQ-12 (1.35 (1.10 to 1.63), more multiple physical symptoms (1.49 (1.19 to 1.87); however these associations were non-significant after adjusting for role in theatre, time spent in a forward area, problems at home, and type of deployment. Deployment length was also related to problems at home during (1.22 (1.00 to 1.48) but not after deployment (1.14 (0.93 to 1.40). The prevalence of severe alcohol problems was found to increase with duration of deployment (test for trend $p < 0.001$ ). Tours lasting longer than expected led to a significantly increased risk of caseness for PTSD (2.38 (1.21 to 4.65) (figures given as ORs (95% CIs), $n = 5547$ ).
Mansfield <i>et al</i> <sup>24</sup>	Split into 0–11 months and > 11 months, no measures of spread or descriptive statistics were available regarding deployment length	US: Army only 100% male	Mental health diagnoses (ICD-9 codes)	Compared with wives of personnel who were not deployed, women whose husbands were deployed for 1 to 11 months received more diagnoses of depressive disorders (27.4 (22.4 to 32.3) excess cases per 1000 women), sleep disorders (11.6 (8.3 to 14.8) excess cases per 1000), anxiety (15.7 (11.8 to 19.6) excess cases per 1000), and acute stress reaction and adjustment disorders (12.0 (8.6 to 15.4) excess cases per 1000). Deployment for more than 11 months was associated with 39.3 (33.2 to 45.4) excess cases of depressive disorders, 23.5 (19.4 to 27.6) excess cases of sleep disorders, 18.7 (13.9 to 23.5) excess cases of anxiety, and 16.4 (12.2 to 20.6) excess cases of acute stress reaction and adjustment disorders (figures given as rate differences (95% CIs), $n = 250626$ ).
McCarroll <i>et al</i> <sup>25</sup>	Range: 0–12 months	US: Army only 95.1% male	Marital conflict (Conflict Tactics Scale) spousal aggression	Soldiers deployed for 0–3, 3–6 and 6–12 months reported significantly higher probabilities of severe aggression towards their spouses relative to non-deployed soldiers (ORs (95% CIs): 0–3 months: 1.16 (1.14 to 1.18); 3–6 months: 1.26 (1.24 to 1.29); 6–12 months: 1.35 (1.32 to 1.37) ( $n = 26835$ ).
Hotopf <i>et al</i> <sup>20</sup>	Range: 0–17.1 months; mode: 3.1–4.7 months	UK: all services 89.4% male	Psychiatric health and well-being (GHQ-12) and post-traumatic stress reaction	Duration of deployment was not related to either stress syndrome (0–60 days: 1.0; 61–92 days: 1.2 (0.6 to 2.6); 93–144 days: 1.2 (0.6 to 2.5); 145–179 days: 1.0 (0.5 to 2.2); 180–521 days: 1.3 (0.6 to 2.7) or caseness on the GHQ-12 (0–60 days: 1.0; 61–92 days: 0.8 (0.6 to 1.2); 93–144 days: 1.1 (0.8 to 1.6); 145–179 days: 1.0 (0.7 to 1.5); 180–521 days: 1.0 (0.7 to 1.5) (all figures given as ORs (95% CIs), $n = 6699$ ).

Continued

Table 2 Continued

Author and year of publication	Range/mean/month deployment length/measured (months)	Population studied/country; service/branches percentage male	Health outcomes and (standardised) measures used	Brief summary of deployment length and 'mismatch' related findings
Adler <i>et al</i> <sup>22</sup>	Range: 1–12 months; mean: 6.5 months	US; all services 63.3% male	Depression (SDS-20) and PTSD (Post-traumatic Stress Scale)	Longer deployments were associated with an increase in depression ( $R^2 = 0.73$ , $F(7, 3250) = 36.43$ , $p < 0.001$ ) and PTSD ( $R^2 = 0.042$ , $F(7, 3103) = 19.25$ , $p < 0.001$ ). However, the relationship between deployment length and elevated distress was found only for male soldiers. When gender was added to the regression analysis, it explained an additional 1% of the variance in depression ( $\Delta R^2 = 0.01$ , $p < 0.01$ ) and less than 1% of the variance in post-traumatic stress ( $\Delta R^2 = 0.00$ , $p < 0.05$ ) ( $n = 3339$ ).
Ames <i>et al</i> <sup>23</sup>	Mean: 8.3 months over 3 years for men; 5 months over 3 years for women	US; Navy only 48.6% male	Alcohol use (how often and how many drinks typically consumed—self-reported interview)	Per 3-month increase, deployment length was associated with a significant increase in perceived peer approval for heavy drinking (in men: $\beta = 0.117$ , $t: 3.851$ , $p < 0.001$ ; in women: $\beta: 0.160$ , $t: 5.529$ , $p < 0.001$ ) and perceived number of drinks had by peers (in men: $\beta = 0.191$ , $t: 6.458$ , $p < 0.001$ ; in women: $\beta = 0.272$ , $t: 9.532$ , $p < 0.001$ ) ( $n = 2380$ ).
Grieger <i>et al</i> <sup>21</sup>	Mean: 5.0 (SD: 3.1)	US; Army only 95.9% male	PTSD (PCL-C), and depression (PHQ-15)	Longer deployments were not associated with more PTSD at 1, 4 & 7 months, or with later onset, nor more severe symptoms at 1 or 7 months ( $n = 613$ )*.
Steel-Fisher <i>et al</i> <sup>26</sup>	Range: 6.3–13.6 months (including expected time on deployment for those deployed at time of data collection)	US; Army only percentage male not stated	Spouse's well-being/mental health (feelings of depression, anxiety and loneliness), social health (effects on employment, ability to do household and other daily activities), perceptions of physical health	Tours lasting longer than expected resulted in the deployed partners' spouses reporting significantly poorer perceived mental health (feelings of depression ( $p < 0.000$ ), anxiety ( $p < 0.000$ ) and loneliness ( $p < 0.01$ )), negative impacts on employment (having to stop work or work fewer hours ( $p < 0.01$ )), problems with the house and car ( $p < 0.01$ ) and problems communicating with their deployed partner ( $p < 0.01$ ). There were no significant differences based on perceptions of physical health (approximately 20% had worse perceived physical health). Those who had their deployments extended were also deployed on average, longer than those who did not have their deployment extended. ( $n = 798$ )
Chaudhury <i>et al</i> <sup>27</sup>	Mean: 19.46 months (LIC areas); 19.88 months (other areas)	Indian; Army only 100% male	Psychiatric health and well-being (GHQ-12, alcohol (MAST), depression (CRSD)†	Soldiers serving less than 1 year in LIC areas reported significantly fewer cases on CRSD ( $\chi^2: 22.36$ , $p < 0.01$ ) GHQ-12 ( $\chi^2: 14.63$ , $p < 0.01$ ), MAST ( $\chi^2: 22.81$ , $p < 0.01$ ) compared with those serving more than 1 year in LIC areas

\*The authors were contacted for further data on effect sizes but were not able to supply these.

†Other outcomes were measured (stress and depression by PSD, anxiety by State and Trait Anxiety Scale, fatigue by MFI, satisfaction with life by SWLS and impact of events/distress by IES) but not in relation to deployment length. AUDIT, Alcohol use identification test; CRSD, Carroll rating scale for depression; GHQ-12, General health questionnaire-12 item version; ICD-9, International Classification of Diseases 9th Revision; IES, Impacts of events scale; LIC, light-intensity combat; MAST, Michigan alcohol screening test; MFI, Multidimensional fatigue inventory; PCL-C, Post-traumatic symptom checklist-civilian version; PHQ-15, Psychological health questionnaire—15 item version; PSD, Perceived Stress Questionnaire; PTSD, post-traumatic stress disorder; SDS-20, The Zung Self-Rating Depression Scale—20 item version; SWLS, Satisfaction with life scale.

**Table 3** Criteria and scoring method for rating quality of reviewed studies

Rating criteria	Scoring			
Type of Study	2: cohort, controlled observation or case-control	1: observation without control		
Selection method	2: random or representative sampling	1: non-random or non-representative sampling		
Aimed to assess tour length	1: yes	0: no		
Prospective	1: yes	0: no		
Appropriate control group	1: yes	0: no		
Method of health outcome assessment	3: clinical interview/assessment	2: self-report on standardised measures	1: self-report on non-standardised measures	
Sample size	3: >15000	2: 15000–5000	1: 5000–1000	0: <1000
Response rate >60%	1: yes	0: no or NA		
Adjustment for confounders of deployment length	1: yes	0: no		
Appropriate statistical tests used	1: yes	0: no		
Conclusions substantiated by the data	1: yes	0: no		
Overall quality	Very high: >14	High: 14–12	Moderate: 11–9	Low: <9

### Limitations

One difficulty in assessing the quality of the many studies of the psychological health of military personnel and those working in similar occupational settings is that only a few had measured the time that each individual employee was deployed. Therefore, the results of this review are based on limited data. Also, a variety of psychological health measures were used in the reviewed studies, and these measures were often completed long after personnel had returned from their deployments. Additionally, the studies considered a range of different populations, making generalisation of these results problematic. For example, some studies included personnel from a single service (eg, Army),<sup>21–27</sup> whereas others included personnel from all service branches (eg, Navy, Army, Marines and Air Force).<sup>14 20</sup> Several studies included both regular and reserve forces,<sup>14 20 22 25</sup> while others included only regular personnel.<sup>23 24 26 27</sup> This may be particularly problematic, as previously it has been suggested that there are substantial differences in the health of deployed reservists in comparison with deployed regulars.<sup>1</sup> Also, even though we were keen to examine the effects of ‘mismatch’ on health and well-being, only a few studies have examined this topic.

Another concern is that while some studies assumed that deployment length is, at least partially, a proxy for numerous in-theatre exposures associated with increased risk of subsequent health problems (such as seeing comrades killed or injured,

incurring mortar or rocket fire), this assumption is crude at best. While it is true that the longer personnel are in theatre, the greater their risk of exposure to such events, it may well be that time away from home itself or the greater risk of adverse events occurring back home may also have affected mental health outcomes. Ursano *et al*<sup>17</sup> propose that in order to accurately assess the effects of deployment length, studies should focus on real-time assessments of traumatic events, loss of coping and efficacy of social support, taking account for how stressful each deployment is likely to be for personnel. However, the practicalities of adopting this approach would be extremely challenging, and to date there appear to have been no studies which have attempted this approach. The outcome of this review suggests, however, that the adverse effect of long deployments may be related not only to in-theatre events but also to home-front stressors, such as concern for family members and difficulty in maintaining family relationships.<sup>14 23 26</sup>

### Effect on family, and marital stability

Extended deployment length is one of the principal causes of self-reported operational stress by personnel on deployment, and the source for this stress appears to be service members' concerns at being separated from their family.<sup>9 14 28 29</sup> The reviewed studies suggest that there is a greater likelihood of marital and family problems (including an increased likelihood of spousal aggression) on return home for those troops who were deployed

**Table 4** Rated quality of reviewed studies

	Rona <i>et al</i> <sup>14</sup>	Mansfield <i>et al</i> <sup>24</sup>	McCarroll <i>et al</i> <sup>25</sup>	Hotopf <i>et al</i> <sup>20</sup>	Adler <i>et al</i> <sup>22</sup>	Ames <i>et al</i> <sup>23</sup>	Grieger <i>et al</i> <sup>21</sup>	Steel-Fisher <i>et al</i> <sup>26</sup>	Chaudhury <i>et al</i> <sup>27</sup>
Type of study	2	2	2	2	2	2	2	2	2
Sampling method	2	1	2	2	2	2	1	2	1
Aimed to assess tour length	1	1	1	1	1	1	0	1	1
Prospective	1	0	0	0	0	0	1	0	0
Appropriate control group	1	1	1	1	0	0	1	1	1
Method of health outcome assessment	2	3	2	2	2	2	2	1	2
Sample size	2	3	3	2	1	1	0	0	0
Response rate greater than 60%	1	1	1	1	1	1	1	0	0
Adjusted for confounders of tour length	1	1	1	1	1	1	1	1	0
Appropriate statistical tests used	1	1	1	1	1	1	1	1	1
Conclusions substantiated by results	1	1	1	1	1	1	1	1	0
Quality Score	15	15	15	14	12	12	11	10	8
Overall quality in relation to tour length	Very High	Very High	Very High	High	High	High	Moderate	Moderate	Low

**Table 5** Number of studies reporting key deployment length and 'mismatch' effects.

	Post-traumatic stress disorder	General mental health problems	Alcohol	Family-related problems
Deployment-length effect	2 <sup>22 27</sup>	3 <sup>22 24 27</sup>	3 <sup>14 23 27</sup>	3 <sup>14 24 25</sup>
'Mismatch' effect	1 <sup>14</sup>	1 <sup>26</sup>	0	1 <sup>26</sup>
No effect	2 <sup>20 21</sup>	1 <sup>20</sup>	0	0

for the longest periods of time. This effect may be due to deployed military personnel having infrequent and irregular contact with family members, and thus having to deal with not only in-theatre difficulties but also the stress of missing key 'home-front' events such as children's birthdays, graduations and wedding anniversaries.<sup>28</sup> Long deployments can lead to difficulties for the spouses of deployed personnel, as they may struggle financially and practically in caring for children and making family decisions. Such problems can lead to spouses having to reduce their working hours, or even take leave from or quit their jobs in order to care for the family,<sup>26</sup> and longer periods of separation during deployments are associated with elevated rates of mental health problems for spouses themselves.<sup>24</sup> A lack of support from their deployed partner can also lead to deterioration in children's behaviour at home and/or at school.<sup>26</sup> In addition, long deployments can aggravate struggling interpersonal relationships, which may lead to an increased likelihood of infidelity, separation, divorce and difficulties 're-connecting' with their children when personnel return home.<sup>28</sup>

To our knowledge, there are only two studies that have examined the effects of 'mismatch' on health and well-being. However, both of these studies reviewed herein suggest that the difficulties associated with longer deployment lengths may be particularly pronounced when there is a 'mismatch' between expected and actual length of time spent on deployment.<sup>26</sup> This may be because tools which have helped families cope with the separation such as 'count-down calendars' (given to children so that they can keep a track of and be involved in their parent's return home) can be damaged. This might, in turn, lead to greater stress if the parent does not return on the previously stated date.<sup>28</sup>

### Effect on physical, mental and social health

Studies of UK and US military personnel deployed to Iraq support the association between both longer deployment length and 'mismatch,' and a greater number of mental and physical health complaints among personnel.<sup>1 14 28</sup> Of note, however, is that personnel who deployed within the UK Army's Land Harmony Guidelines showed no ill-effect related to deployment length, other than an increase in alcohol intake after returning home.<sup>14</sup> This finding suggests that there may be a floor effect below which deployment length, in itself, is not a significant stressor. In this sense, the Harmony Guidelines appear to work when they are adhered to.

A contrasting view derives from a study on US peacekeepers deployed to the Balkans during 2002. This study led to the development of a theoretical model which predicted a linear increase in mental health problems with an increase in deployment length.<sup>22</sup> Adler *et al*<sup>22</sup> propose that for mid-ranked, married, male soldiers, at 4 months into deployment there would be a 14.8% risk of their developing depression, at 6.5 months this risk would increase to 17.9%, and at 9 months this risk would be 21.6%.<sup>22</sup> However, this model does not factor in the risk of developing depression on deployments longer than 9 months; nor does it give ORs or percentages for developing other mental

health problems while on deployment. The model does, however, suggest that the longer average deployment length of US personnel serving in Iraq and Afghanistan, in comparison with their UK counterparts, may have contributed to the large differences in the prevalence of mental health problems (including PTSD) found in these populations in large cohort studies using the same measures of post-traumatic symptoms.<sup>1 16 30</sup>

### Ideal length of deployment

Rona *et al*<sup>14</sup> found that, with the exception of alcohol misuse, there was a threshold for deployment length, beyond which UK military personnel begin to report significantly more psychological problems. The results of the studies reviewed here appear to place this threshold at approximately 6 months, or deploying for more than 12 months within the last 3 years.<sup>9 14 22 24</sup> The one exception in the studies reviewed here is that Chaudhury *et al*<sup>27</sup> suggest this threshold is closer to 12 months rather than 6 months. However, given the cultural differences between the populations studied by Chaudhury *et al*<sup>27</sup> (the Indian military) and those studied by the other studies in this review (UK and US militaries), this finding may not be generalisable to 'Western' forces. Those serving in the Indian military as opposed to in the UK or US militaries are sent on deployment within or around their own country; they generally have a high level of support from the local population and, perhaps importantly, are able to keep in contact with their family more easily.<sup>27</sup>

### Implications of deployment length and mismatch findings

The results of this review suggest that military personnel who spend prolonged periods away from home can suffer from cumulative stress, which may become especially evident when they return home. This finding supports the current practice of most Armed Forces, which acknowledge that periods of rest between deployments may allow personnel to 're-connect' with family and friends and 're-adapt' to home life. Having this period of rest may indeed reduce the risk of developing longer-term health problems.<sup>14</sup> It is worth noting however, that to date, most studies and models examining the impact of deployments have been based solely on the study of male personnel; very few studies have examined the effects of long deployments separately for men and women. One study to do so found no effect of deployment length on the health and well-being of female personnel though a strong effect on the health and well-being of male personnel.<sup>22</sup> However, another study found similar effects of deployment length on the attitudes towards alcohol in both men and women.<sup>23</sup> Given the increasing number of women deployed in the military and their expanding roles in combat and combat support missions, the deployment experiences of female personnel need to be considered and studied more thoroughly before the full effects of deployment length and 'mismatch' can be generalised to the female military population.<sup>31</sup>

### Applicability to other occupational settings

The majority of the studies included in this review have focused on all military service personnel, although few have looked specifically at members of the Air Force, and few have included both regulars and reservists. It is increasingly common for personnel from all branches of the military to work closely together on combat and training missions, and for reservists and National Guard members (in the USA) to deploy alongside regular military personnel. Furthermore, it is not only those in the Armed Forces that deploy to operational theatres. An estimated 126 000 security contractor staff have been deployed in Iraq since the beginning of combat operations in 2003, with

a large number of national defence staff (civil-servants), journalists and other news media staff also working in operational theatres.<sup>4 7 8 27</sup> The majority of non-military personnel working in theatre appear to be security contractors who themselves are most often former members of the Armed Forces.<sup>6</sup> There may then be, some similarities between this subpopulation of personnel deployed alongside the Armed Forces and the deployed Armed Forces personnel themselves. Therefore, it may be important for security contractors to assess the effects of deployment length (and 'mismatch' if it occurs in these occupations, too) on the health and well-being of their employees.

The literature on the preparation of employees of non-military organisations for working abroad in what are likely to be challenging roles in stressful environments is sparse. However, much of this literature suggests that those who work away from their family for prolonged periods of time suffer from a higher proportion of mental, behavioural and social health problems compared with those who work in roles which allow them to see their family more often; subjectively, employees regard separation issues to be an important cause of occupational stress.<sup>32–37</sup> These findings support the results of this review, which suggest that, although periods of deployment may differ greatly from those in military occupations, it may be useful for other organisations whose employees experience chronic occupational stressors and spend long periods away from home and/or from family to gain a clearer understanding of their long-term impact. Such organisations would include national foreign offices, non-governmental organisations, charities, field research organisations, news media organisations, oil companies, those in the fishing and seafaring industry, and mining and excavation companies. Such an understanding may help organisations better prepare themselves, their employees and their employees' families for these situations and, as a result, help to mitigate any subsequent health problems suffered as a result of these working conditions.<sup>22</sup>

### Suggestions for further research

In order to better understand the effects of deployment length and 'mismatch' on health and well-being, future studies should (1) take an explicit measure of the time each individual has spent away from home, including tracking multiple deployments; (2) measure outcomes for both male and female personnel, and regular and reserve personnel, and assess these separately; (3) use prospective study designs so that causality can be assessed and to allow 'mismatch' to be measured thoroughly by recording expectations of deployment length (and analysis of how these expectations arise, what sources of information are used and so on) prior to the beginning of a deployment, as well as measuring the actual length of time an individual has spent away from home; (4) include relevant non-military personnel, such as private security contractors and NGOs.

### CONCLUSIONS

The results of this systematic review suggest that, as deployment length increases, the risk for personnel to suffer adverse health effects also increases. This review has also highlighted the deleterious effects on health and well-being of deploying for a longer-than-expected period of time. The results are based on a limited literature requiring further research into the impacts of deployment length and, in particular, of 'mismatch' for military personnel. There is a need for more research to determine the impact of working away from family and friends compared with the effects of difficult working conditions. Future research should investigate how long exposure to the different deployment stressors can be endured before problems begin to occur, as

well as the effects of unexpected extensions to planned periods away from home.

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