

Prevalence and severity of mental disorders in military personnel: a standardised comparison with civilians

S. Trautmann^{1*}, L. Goodwin², M. Höfler¹, F. Jacobi¹, J. Strehle¹, P. Zimmermann³ and H.-U. Wittchen¹

¹ Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden, Dresden, Germany

² Department of Psychological Medicine, King's Centre for Military Health Research, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

³ Centre for Psychiatry and Posttraumatic Stress, Federal Armed Forces Hospital Berlin, Berlin, Germany

Aims. Provision and need for mental health services among military personnel are a major concern across nations. Two recent comparisons suggest higher rates of mental disorders in US and UK military personnel compared with civilians. However, these findings may not apply to other nations. Previous studies have focused on the overall effects of military service rather than the separate effects of military service and deployment. This study compared German military personnel with and without a history of deployment to sociodemographically matched civilians regarding prevalence and severity of 12-month DSM-IV mental disorders.

Method. 1439 deployed soldiers (DS), 779 never deployed soldiers (NS) and 1023 civilians were assessed with an adapted version of the Munich Composite International Diagnostic interview across the same timeframe. Data were weighted using propensity score methodology to assure comparability of the three samples.

Results. Compared with adjusted civilians, the prevalence of any 12-month disorder was lower in NS (OR: 0.7, 95% CI: 0.5–0.99) and did not differ in DS. Significant differences between military personnel and civilians regarding prevalence and severity of individual diagnoses were only apparent for alcohol (DS: OR: 0.3, 95% CI: 0.1–0.6; NS: OR: 0.2, 95% CI: 0.1–0.6) and nicotine dependence (DS: OR: 0.5, 95% CI: 0.3–0.6; NS: OR: 0.5, 95% CI: 0.3–0.7) with lower values in both military samples. Elevated rates of panic/agoraphobia (OR: 2.7, 95% CI: 1.4–5.3) and posttraumatic stress disorder (OR: 3.2, 95% CI: 1.3–8.0) were observed in DS with high combat exposure compared with civilians.

Conclusions. Rates and severity of mental disorders in the German military are comparable with civilians for internalising and lower for substance use disorders. A higher risk of some disorders is reduced to DS with high combat exposure. This finding has implications for mental health service provision and the need for targeted interventions. Differences to previous US and UK studies that suggest an overall higher prevalence in military personnel might result from divergent study methods, deployment characteristics, military structures and occupational factors. Some of these factors might yield valuable targets to improve military mental health.

Received 27 October 2015; Accepted 22 March 2016; First published online 18 April 2016

Key words: Epidemiology, mental health, military psychiatry, posttraumatic stress disorder.

Introduction

Mental disorders are strongly related to disability and premature death across various nations (Whiteford *et al.* 2013). The identification of individuals at high risk for mental disorder is crucial to adequately inform public policy and health care strategies. Numerous studies have shown high rates of common mental disorders such as posttraumatic stress disorder (PTSD), major

depressive disorder and alcohol use disorders (AUD) in military personnel (Kang & Hyams, 2005; Gadermann *et al.* 2012; Sirtatt *et al.* 2012; Wittchen *et al.* 2013). However, there is still debate on whether military personnel can be considered as a high risk population, compared with other populations (Hoge *et al.* 2014; Kessler *et al.* 2014a). Although stressors related to military service have been linked to an increased risk for mental disorders (Jones *et al.* 2000; Hoge *et al.* 2004; Browne *et al.* 2007), selection and retention criteria could facilitate the selection of resilient individuals. Moreover, there is evidence that only specific subsamples with high-risk exposures such as combat experiences, serious accidents and childhood adversities are

* Address for correspondence: Dr S. Trautmann, Institute of Clinical Psychology and Psychotherapy, Chemnitz Str. 46, 01187 Dresden, Germany.
(Email: Sebastian.Trautmann1@tu-dresden.de)

at elevated risk for morbidity (Jones *et al.* 2013). In fact, some epidemiological studies suggest that rates of mental disorders in military personnel are comparable with those in the general population (Riddle *et al.* 2007; Klaassens *et al.* 2008; Fear *et al.* 2010). The interpretability of direct comparisons between military and general population studies, however, is restricted since methodology often differs between studies. Moreover, military samples are predominantly male, relatively young and by definition exclude unemployed individuals, which can lead to different prevalence estimates compared with the general population (Jacobi *et al.* 2014; Kessler *et al.* 2014b). Available data on mental disorders in comparable samples of soldiers and civilians using the same methodology is extremely limited. We are only aware of two studies that used comparable assessment methods as well as a rigorous calibration of military and civilian samples (by means of weighting procedures or statistical adjustments) taking at least differences in sex, age and employment status into account (Kessler *et al.* 2014b; Goodwin *et al.* 2015). The first found a generally higher risk for current mental disorders in a large representative US army sample compared with civilians (Kessler *et al.* 2014b). The second compared common mental disorders between UK serving military personnel and the general working population in the same age range and also observed higher rates in military personnel (Goodwin *et al.* 2015). These findings may not apply to other nations since there are cross-national differences in risk (e.g. experience of childhood adversities) and resilience factors (e.g. self-efficacy), but also in aspects of system culture (e.g. leadership) and perception of mental illness (e.g. stigmatisation). These factors might be related to mental health (Kessler *et al.* 1997; Maciejewski *et al.* 2000; Rüscher *et al.* 2005; Jones *et al.* 2012) and result in cross-national differences in rates of mental disorders found in military personnel (Hunt *et al.* 2014; Sundin *et al.* 2014). Moreover, it remains unclear whether the differences reported in the above-mentioned studies are attributable to military service in general or to previous deployments since comparisons were made with samples representative for the entire military including both previously deployed and never deployed soldiers (NS). This study presents data on the 12-month prevalence and severity of DSM-IV mental disorders from a sample of German DS, a comparable sample of NS and sociodemographically matched civilians.

Methods

Samples

Data for the DS and NS were taken from the Prevalence, Incidence and Determinants of Post

Traumatic Stress and Other Mental Disorders-study (Wittchen *et al.* 2012a). The DS sample was drawn from a reference population of 9617 soldiers who were deployed to Afghanistan as part of the 20th and 21st contingents of the German International Security Assistance force (ISAF) mission in 2010. Power calculations indicated that sufficient determination of prevalence rates could be achieved with a 36% ($n=3493$) sample of the total of 9617 soldiers, with assumed non-eligibility and refusal rates. The random sample was stratified, oversampling combat personnel as an assumed high-risk population. Of the 3493 DS, 1599 met eligibility criteria. To be classified as eligible, soldiers had to be at least 18 years old and had to be present at their home base location during the assessment periods. Moreover, only locations with a sufficient high number of eligible soldiers ($n=50$) could be considered due to logistical and financial constraints. Examination of medical records revealed no evidence that non-eligible subjects differed from those being eligible regarding the prevalence of mental health problems (Wittchen *et al.* 2012a). Of all eligible soldiers, 102 refused participation, seven did not show up at the scheduled assessment and seven provided incomplete data. The final DS sample consisted of 1483 soldiers (response rate 92.8%). For the NS sample, 1758 soldiers were drawn from the same home base locations. Eligibility criteria were being at least 18 years old (as in the DS sample) and having never been deployed. From 932 soldiers being eligible, 40 refused participation and seven provided incomplete data. The final NS sample consisted of 889 soldiers (response rate 95.4%). For this study, all female soldiers (DS: 44, NS: 110) were excluded because these low numbers would not allow meaningful analyses.

For the civilian sample, a subsample was taken from the mental health module of the German Health Interview and Examination Survey for Adults, a representative examination of physical and mental health in the German adult general population (age 18–79). Design and methods of the mental health module of this survey are described elsewhere (Jacobi *et al.* 2013). A total sample of 8152 was drawn for the main survey from local population registries. For the mental health module, 6027 met the eligibility criteria (aged between 18 and 79, completed assessment in the main survey, informed consent for the mental health supplement, sufficient language skills, being available during the assessment period). Of all eligible subjects, 527 refused participation, 197 could not be scheduled for assessment and 820 provided only partial information, resulting in a sample of 4483 subjects (response rate 74.4%). To assure comparability with the military samples, females, individuals older than

57 years and those not currently employed were excluded making a subsample of 1023 civilians available for analyses. Further adjustment of these samples according to sociodemographic variables is described below.

Data collection

In the military study, data were collected by non-military trained interviewers, dispatched to soldiers' home bases. Soldiers were informed about the study approximately 2 months in advance to arrival of the study team via personal written invitation. Participation was strictly voluntary and confidential. All eligible soldiers were released from their routine duty irrespective of willingness to participate. Thus, participation was solely decided by the individual soldier directly before the scheduled interview without knowledge of their leaders. DS and NS were examined in parallel at their home bases. In the general population survey, interviews were conducted by clinically trained interviewers either at the respondent's home, at local study centres or at another place of the participant's choice if neither home or study centre were suitable. Interviews were conducted in strict confidentiality. All participants provided informed consent and the study procedure was approved by the TUD Ethics Board (EK 72022010).

Diagnostic assessment

The Munich-Composite International Diagnostic Interview (DIA-X/M-CIDI) (Wittchen & Pfister, 1997) was used in both studies. The DIA-X/M-CIDI allows the standardised assessment of symptoms, syndromes and diagnoses according to the criteria of DSM-IV-TR (American Psychiatric Association, 2000). The reliability and validity of the study instrument has been demonstrated in various studies (Lachner *et al.* 1998; Reed *et al.* 1998; Wittchen *et al.* 1998). For the purposes of this study we reported 12-month internalising disorders and substance use disorders (SUD), of which some disorders were grouped together because of small case numbers. Internalising disorders included panic disorder/agoraphobia, PTSD, phobias (social phobia, specific phobia, other anxiety disorders (obsessive compulsive disorder (OCD), generalised anxiety disorder (GAD)) major depressive disorder and bipolar disorder. SUD included alcohol abuse, alcohol dependence and nicotine dependence. Other disorders were either not assessed (e.g. attention-deficit/hyperactivity disorder, intermittent explosive disorder) or were too rare in at least one of the studies to permit meaningful analyses (e.g. psychotic disorders, SUD

related to illicit or prescribed substances) (Wittchen *et al.* 2013; Trautmann *et al.* 2014).

Sociodemographic and military career variables

Sociodemographic variables that were assessed in both studies were age, marital status (married, unmarried), and education (low: 8th grade, middle: 10th grade, high: high school). Military career variables considered here to describe the military samples included rank (enlisted, non-commissioned officer, commissioned officer), unit (combat, medical, combat support) and number of deployments. The distributions of sociodemographic variables for the DS, NS and the civilian sample are shown in Table 1. For more detailed analyses in DS, the number of combat experiences was also assessed using the respective list of events of the Mental Health Advisory Team (Mental Health Advisory Team (MHAT IV), 2006) which includes 33 different events ranging from rather mild (e.g. seeing destroyed homes and villages) to severe events (e.g. being wounded or injured). DS experienced on average 6.9 (s.d. = 6.1) combat events. Detailed information on type and exposure for each single event is provided elsewhere (Wittchen *et al.* 2012b). DS were then categorised into DS with low combat exposure (three or less events, 38.2%) and DS with combat events (more than three events, 61.8%).

Severity of mental disorders

The presence of comorbid disorders and self-rated impairment (for internalising disorders), as well as the number of reported symptoms (for SUD), were used as measures of disorder severity. For the assessment of impairment, respondents rated how much their daily life and activities were impaired by the symptoms of the respective disorder on a five-point scale ranging from 0 (no impairment) to 4 (very severe impairment). This item was also used to represent the impairment criteria (at least moderate impairment) of several DSM diagnoses in the CIDI diagnostic algorithms. This resulted in a low variance of disorder severity. Thus, the threshold for impairment in the diagnostic algorithm was lowered (at least mild impairment) for all analyses including the severity of internalising disorders. The severity of AUD and nicotine dependence was defined as the total number of symptoms that were endorsed. This measure of severity of SUD is in accordance with the approach that was introduced in DSM-5 (Hasin *et al.* 2013).

Table 1. Distribution of sociodemographic and military career variables in DS, NS and civilians

	Military						Civilians		
	Deployed			Never deployed					
	(n = 1439)			(n = 779)			(n = 1023)		
	n	%	%w*	n	%	%w*	n	%	%w*
<i>Demographic</i>									
<i>Age</i>									
<25	383	26.6	19.4	423	54.3	27.8	82	8.0	19.7
25–29	537	37.3	37.1	237	30.4	37.1	82	8.0	35.2
30–39	342	23.8	27.3	59	7.6	18.7	239	23.4	28.8
>39	177	12.3	16.2	60	7.7	16.3	620	60.6	16.3
<i>Marital status</i>									
Married	445	30.9	36.2	132	16.9	29.1	604	59.0	30.3
Unmarried	994	69.1	63.8	647	83.1	70.9	419	41.0	69.7
<i>Education</i>									
Low	271	18.8	16.3	162	20.8	17.9	198	19.4	15.3
Middle	927	64.4	65.6	472	60.6	62.1	583	57.3	65.3
High	241	16.7	18.1	145	18.6	20.0	237	23.3	19.4
<i>Military career</i>									
<i>Rank</i>									
Enlisted	524	36.4	24.8	208	26.7	33.1			
Non-commissioned officer	767	53.3	62.1	497	63.8	55.7			
Commissioned officer	148	10.3	13.1	74	9.5	11.3			
<i>Unit</i>									
Combat	674	46.8	23.8	166	21.3	23.3			
Medical	61	4.2	5.9	55	7.1	8.0			
Combat support	704	48.9	70.3	558	71.6	68.7			

%w = weighted percentage.

*Weights were used to assure: (1) representativeness of the deployed sample for the reference population taking into account oversampling of combat units, eligibility and response according to rank, unit and location; (2) comparability of the deployed with the never deployed sample according to rank, unit, operational area, gender, age, educational level, number of years spent at school and having children; and (3) comparability of the general population sample with both military samples with regard to age, sex and marital status (individuals who were not employed were excluded from the general population sample).

Statistical analysis

We used weighting procedures to achieve: (a) the representativeness of the DS sample for the reference population ($N=9617$), (b) the comparability of the NS with the DS sample and (c) the civilian sample with the DS sample. The weighting procedure is described in detail in the online supplementary material.

For the comparison of both military samples with the civilian sample, logistic, multinomial logistic and linear regressions were applied for binary, multi-categorical and dimensional outcomes, respectively. For counted outcomes (i.e. the number of reported symptoms), negative binomial regressions were applied. Comparisons between DS and the civilian sample were always conducted for the total DS sample as well as separately for DS with low and high combat

exposure since there is evidence that DS with high combat exposure have a higher risk for mental disorders (Iversen *et al.* 2008; Jacobson *et al.* 2008). Since differences in demographic characteristics between the three comparison groups could not be neutralised completely (see Table 1), we conducted a sensitivity analysis where we re-analysed differences between groups adjusting for age and marital status. All regressions used the robust Huber–White sandwich estimator for statistical inference in weighted data (Royall, 1986). Associations were quantified with odds ratios (OR) for logistic and multinomial logistic and with incidence rate ratios (IRR) for negative binomial regressions. Statistical significance was assessed at the 5% level (two-sided tests). All analyses were conducted with Stata 12.1. (Stata Corp, 2012).

Results

Prevalence of 12-month mental disorders

The prevalence of any 12-month mental disorder was lower in NS (14.4%) compared with civilians (20.0%; OR: 0.7, 95% CI: 0.5–0.99) but was not significantly different in DS (16.6%). Compared with civilians, NS had a lower probability of meeting criteria for alcohol (OR: 0.2, 95% CI: 0.1–0.6) and nicotine dependence (OR: 0.5, 95% CI: 0.3–0.7) but there were no differences regarding the prevalence of internalising disorders. DS had a lower prevalence of any other anxiety disorder (OCD, GAD) (OR: 0.4, 95% CI: 0.2–0.6), alcohol (OR: 0.3, 95% CI: 0.1–0.6) and nicotine dependence (OR: 0.5, 95% CI: 0.3–0.6) compared with civilians. The prevalence of all other specific diagnoses did not differ significantly between the military samples and civilians (Table 2). When differences between DS and civilians were analysed separately for DS with low and high combat exposure, DS with high combat exposure had a higher prevalence of panic/agoraphobia (OR: 2.7, 95% CI: 1.4–5.3) and PTSD (OR: 3.2, 95% CI: 1.3–8.0), while DS without combat exposure had a lower prevalence of any mood disorder (OR: 0.5, 95% CI: 0.4–0.8) compared with civilians. All other patterns of results were similar for DS with low and high combat exposure (Table S1). A sensitivity analysis adjusting for age and marital status showed the same differences between the three groups and estimates of associations were almost identical (data available on request).

Severity of 12-month mental disorders

We analysed differences between military samples and civilians regarding comorbidity, self-rated impairment (for internalising disorders) and number of reported symptoms (for SUD) as measures of disorder severity (Table 3). For internalising disorders, logistic regressions revealed higher proportions of severe cases of anxiety disorders compared with civilians only among NS (OR: 5.4, 95% CI: 1.7–17.5). For SUD, the number of reported symptoms in individuals with ND was lower in both military samples (DS: IRR: 0.8, 95% CI: 0.7–0.8; NS: IRR: 0.7, 95% CI: 0.6–0.7) and it was also lower in individuals with AUD in the DS sample (IRR: 0.7, 95% CI: 0.6–0.9) compared with civilians. DS with low and high combat exposure showed a similar pattern of results compared with civilians regarding the severity of mental disorders except that DS with low combat exposure had a lower proportion of moderate cases of anxiety disorders compared with civilians (OR: 0.3, 95% CI: 0.1–0.9) which was not found for DS with high combat

exposure (Table S2). Adjusting for age and marital status did not affect these results.

Discussion

This study compared military personnel with and without a history of deployment and sociodemographically comparable civilians regarding the prevalence and severity of 12-month DSM-IV mental disorders. The study is among the few that have been able to conduct a standardised comparison of military and civilian samples across the same timeframe using identical assessment methods. We found rather similar rates for internalising disorders and lower rates for SUD in both military samples compared with civilians. The same pattern was observed for measures of disorder severity where we found a lower severity of SUD and a comparable severity of most internalising disorders. Elevated rates among military personnel compared with civilians were only found for DS with high combat exposure and this was restricted to panic/agoraphobia and PTSD.

These findings differ from the US and the UK comparisons which found overall higher rates of mental disorders in military personnel compared with civilians (Kessler *et al.* 2014b; Goodwin *et al.* 2015). Findings also differ from previous UK data suggesting higher rates of alcohol misuse in the military compared with the general population, although this study only stratified by gender and age (Fear *et al.* 2007). There are several possible reasons for these divergent findings.

First, there are noteworthy differences in design and methods employed in this study compared with those reported by Kessler *et al.* (2014b) and Goodwin *et al.* (2015). Military samples in these studies were representative of the serving military. The DS sample, which was used as reference for the calibration of both NS and civilians was only representative of two ISAF contingents. Selection mechanisms that led to the assignment to these contingents might have led to different prevalences of mental disorders than would have been observed in the entire serving military. Moreover, the UK study used a self-report instrument (General Health Questionnaire) and the US study used a self-administered version of the CIDI as well as the Posttraumatic stress disorder Checklist for the assessment of mental disorders instead of structured interviews that were employed in this study. However, this is unlikely to explain any cross-study differences since military and civilian samples were always assessed with the same instruments so potential bias would apply to both populations.

Second, there are differences in deployment characteristics and the military structure between

Table 2. Twelve-month prevalence of DSM-IV mental disorders in DS, NS and civilians

	Military samples			Differences	
	Deployed (<i>n</i> = 1439) % (95% CI)	Never deployed (<i>n</i> = 779) % (95% CI)	Civilians (<i>n</i> = 1023) % (95% CI)	Deployed <i>v.</i> civilians OR (95% CI)	Never deployed <i>v.</i> civilians OR (95% CI)
Any disorder ^a	16.6 (14.6–18.9)	14.4 (11–18.7)	20.0 (16.4–24.3)	0.8 (0.6–1.1)	0.7 (0.5–0.99)
No. of diagnoses ^a					
0	83.4 (81.1–85.4)	85.6 (81.3–89.0)	80.0 (75.7–83.6)	1.0	1.0
1	8.1 (6.7–9.7)	7.7 (5.1–11.6)	10.7 (8.0–14.1)	0.7 (0.5–1.1)	0.7 (0.4–1.2)
2	5.6 (4.4–7.1)	4.7 (3.1–7.2)	6.8 (4.6–9.9)	0.8 (0.5–1.3)	0.6 (0.4–1.2)
3	1.8 (1.2–2.7)	0.9 (0.3–2.1)	1.1 (0.5–2.2)	1.6 (0.7–3.8)	0.8 (0.2–2.4)
4	1.2 (0.7–2.0)	1.1 (0.4–2.5)	1.5 (0.7–3.2)	0.8 (0.3–2.0)	0.7 (0.2–2.1)
Internalising disorders					
Anxiety disorders					
Panic/agoraphobia	5.3 (4.2–6.7)	1.8 (0.9–3.4)	3.1 (1.7–5.5)	1.7 (0.9–3.3)	0.6 (0.2–1.4)
PTSD	2.8 (2.0–4.0)	1.2 (0.5–2.6)	1.4 (0.6–3.3)	2.0 (0.8–4.9)	0.8 (0.3–2.6)
Phobias	5.7 (4.5–7.1)	6.2 (4.3–9.0)	6.5 (4.5–9.4)	0.9 (0.5–1.4)	0.9 (0.5–1.7)
Other anxiety disorders	1.9 (1.2–2.8)	2.8 (1.3–5.8)	5.1 (3.4–7.6)	0.4 (0.2–0.6)	0.5 (0.2–1.3)
Any anxiety disorder	12.1 (10.3–14.1)	9.8 (7.1–13.5)	12.7 (9.8–16.3)	0.9 (0.7–1.3)	0.8 (0.5–1.2)
Mood disorders					
Major depressive disorder	3.4 (2.5–4.6)	2.2 (1.1–4.1)	4.2 (2.6–6.5)	0.8 (0.5–1.4)	0.5 (0.2–1.1)
Bipolar disorder	1 (0.6–1.8)	1.5 (0.4–5.0)	1.2 (0.5–3.0)	0.9 (0.3–2.5)	1.2 (0.3–5.9)
Any mood disorder	4.4 (3.4–5.8)	3.7 (2.0–6.8)	5.4 (3.6–8.0)	0.8 (0.5–1.4)	0.7 (0.3–1.5)
Substance use disorders					
Alcohol abuse	3.3 (2.5–4.5)	2.3 (1.3–3.9)	4.0 (2.4–6.8)	0.8 (0.4–1.5)	0.6 (0.3–1.2)
Alcohol dependence	1.4 (0.9–2.3)	1.1 (0.5–2.6)	4.6 (2.9–7.2)	0.3 (0.1–0.6)	0.2 (0.1–0.6)
Any alcohol use disorder	3.4 (2.6–4.6)	2.3 (1.3–4.0)	7.6 (5.3–10.8)	0.4 (0.3–0.7)	0.3 (0.1–0.6)
Nicotine dependence	10.7 (9.0–12.6)	11.4 (8.4–15.3)	20.9 (17–25.4)	0.5 (0.3–0.6)	0.5 (0.3–0.7)

Phobias: Social phobia, specific phobia; other anxiety disorders: GAD, OCD.

^aWithout nicotine dependence.

Weights were used to assure: (1) representativeness of the deployed sample for the reference population taking into account oversampling of combat units, eligibility and response according to rank, unit and location; (2) comparability of the deployed with the never deployed sample according to rank, unit, operational area, gender, age, educational level, number of years spent at school and having children; and (3) comparability of the general population sample with both military samples with regard to age and marital status (individuals who were not employed were excluded from the general population sample).

Germany, UK and the USA in terms of tour length, preparation and involvement in combat events (Wittchen *et al.* 2012b; Trautmann *et al.* 2013; Zimmermann *et al.* 2014) which might result in an overall lower degree of exposure to stressful experiences in German deployed personnel. This might explain why we found no elevated rates of mental disorders in deployed personnel compared with civilians. However, an overall effect of deployment on mental health only exists for the US but not for the UK military (Sundin *et al.* 2014) suggesting that these deployment characteristics might only explain the differences between the present study and the study of Kessler *et al.* (2014b) which included a high proportion of previously deployed personnel. Moreover, the US and UK

military might differ from the German forces in terms of recruitment, career mechanisms, regulations and the availability and accessibility of supportive resources including mental health services. In particular, the lower rates of SUD in the German military compared with civilians might be the result of strict regulations regarding substance use (at least for alcohol use) and earlier treatment seeking compared with civilians, probably mediated by disciplinary measures in case of substance-related offenses and the corrective influence of the military unit (Zimmermann *et al.* 2012). Alternatively, differences in cultures between militaries with regard to substance use might also be relevant.

Third, both Kessler *et al.* (2014b) and Goodwin *et al.* (2015) argue that predisposing vulnerability factors for

Table 3. Severity of 12-month DSM-IV mental disorders in recently DS, NS and civilians

	Internalising disorders		Substance use disorders	
	Anxiety disorder % (95% CI)	Mood disorder % (95% CI)	AUD Mean (s.d.)	ND Mean (s.d.)
<i>Recently deployed</i>				
Impairment				
Mild	48.1 (38.5–57.9)	25.7 (15–40.3)		
Moderate	42.9 (33.6–52.8)	56.6 (42.0–70.0)		
Severe	9.0 (4.7–16.5)	17.8 (9.6–30.5)		
No. of symptoms			4.4 (2.1) ^a	4.0 (1.4) ^a
<i>Never deployed</i>				
Impairment				
Mild	35.0 (19.8–54.0)	14.9 (3.1–49.1)		
Moderate	44.0 (27.1–62.4)	40.8 (16.2–71.1)		
Severe	21.0 (9.6–40.0) ^a	44.4 (18.1–74.1)		
No. of symptoms			5.8 (2.1)	3.5 (0.9) ^a
<i>Civilians</i>				
Impairment				
Mild	47.4 (31.5–63.8)	28.4 (13.1–50.9)		
Moderate	48.0 (31.8–64.5)	36.6 (19.1–58.5)		
Severe	4.7 (2.2–9.4)	35.1 (17.2–58.4)		
No. of symptoms			5.9 (3.3)	5.2 (1.4)

Anxiety disorder: any panic disorder, agoraphobia, posttraumatic stress disorder, social phobia, specific phobia, generalised anxiety disorder, obsessive compulsive disorder; mood disorders: any major depressive disorder, dysthymia; AUD, alcohol use disorder; ND, nicotine dependence.

^aSignificant difference compared with civilians ($p < 0.05$).

the development of mental disorders (e.g. parental psychopathology (Knappe *et al.* 2009), early adverse experiences (Kessler *et al.* 1997)) might be more common in military personnel compared with civilians which could be the result of self-selection processes (Kessler *et al.* 2014b; Goodwin *et al.* 2015). If this was the case, our findings would suggest that this self-selection of vulnerable individuals into military service might exist to a lesser extent in the German military or that military selection and attrition processes might counteract these effects.

Finally, divergent findings compared with previous studies might be the result of cross-national differences in occupational cultures in general. Nations vary considerably in occupational factors such as working conditions, occupational health and safety systems as well as prevention and compensation approaches to work-related health problems, which might be related to the prevalence of mental disorders in the working population (World Health Organization, 2012). Another specific occupational aspect might be an over-reporting of mental health symptoms in studies which have been specifically designed to target an individual occupational group such as military personnel (Goodwin *et al.* 2013, 2015). In addition to putative

effects of assessment procedures, which can impact on this response bias (self-report questionnaire *v.* structured interviews), one might speculate that German military personnel are less likely to endorse sensitive private information such as mental health symptoms than US and UK military personnel. This could be explained by perceived roles, stigmatisation or suspected disadvantages related to disclosure of mental disorder which could differ between the German military and other forces. In summary, there are several putative reasons for differences in military-civilian comparison between the present German study and recent US and UK findings, which might be fruitful targets for future research.

Beyond differences to previous US and UK comparisons we observed two more specific findings that might have implications for service provision and intervention. First, elevated rates of mental disorders among DS compared with civilians were only found for PTSD and panic/agoraphobia. This is in line with research showing particularly strong relations between traumatic event exposure and these mental disorders (Ayazi *et al.* 2014) which should be considered when screening for deployment-related mental health problems. Second, we found more severe

cases of anxiety disorders in the NS sample compared with civilians. This might reflect a reduced recognition and treatment allocation of at least some anxiety disorders in the population of NS which warrants further investigation.

This study has some limitations. The DS sample was representative for two contingents of DS and does not represent the entire deployed population in the German forces. However, we have no evidence that these contingents differ considerably from others. In addition, we cannot rule out the possibility of an underreporting, especially for SUD. However, this would only mask differences between soldiers and the general population if this occurred to a higher extent in soldiers. Besides, previous studies have shown that the used interview and its confidential administration allow a valid estimation of prevalence rates for SUD (Kessler *et al.* 1998; Lachner *et al.* 1998). We were also not able to assess females in this study because of the low number in the German military. Finally, interpretations regarding differences between military personnel and civilians have still to be done with caution since even a careful calibration of samples cannot consider all putatively relevant variables.

Conclusion

The findings of this study suggest that rates and severity of mental disorders are similar or even lower in the German military compared with sociodemographically matched civilians, irrespective of deployment. The concentration of available resources on an improved identification and care for high-risk subgroups, particularly among deployed personnel with high combat exposure, might therefore be the most appropriate strategy. Differences to comparisons from the USA and the UK, which observed higher rates of mental disorders in the military, might be explained by differences in study methods, deployment characteristics, military structures, self-selection processes and mental health in the working population. The findings of this study might apply to other nations (e.g. Netherlands, Australia) which report prevalence rates of mental disorders that are similar to those in the German military (Hodson *et al.* 2011; Reijnen *et al.* 2015). Whilst the suggested methodological explanations for divergent findings should be considered in the conduct and interpretation of future studies, differences in recruitment strategies, selection processes and disclosure of mental disorder might be promising targets for further investigation of these mechanisms and the role they may have in determining military mental health.

Supplementary material

The supplementary material for this article can be found at <http://dx.doi.org/10.1017/S204579601600024X>.

Acknowledgements

The military project was logistically supported by the staff of the 'Centre for Psychiatry and Posttraumatic Stress' in Berlin. The military project was also supported by an internal military Steering and Advisory Board of the German Armed Forces. Dr Sabine Schönfeld and Dr Clemens Kirschbaum contributed to the planning of the study design of the military study. Christin Thureau and Michaela Galle were involved in the logistical handling of the military project. Lucie Scholl was involved in the logistical handling of the general population study.

Financial Support

The study was funded by the German Defense Ministry and the Medical Office thereof (Project Funding number M/SAB X/9A004). The sponsor of the study had no role in the study design, sampling, analyses or interpretation. LG is part funded by the National Institute for Health Research (NIHR) Mental Health Biomedical Research Centre at South London and Maudsley NHS Foundation Trust and King's College London.

Conflict of Interest

HUW is member of advisory boards and received grant support and travel compensation by Servier, Lundbeck, Novartis, Pfizer and Sanofi which could be perceived as a potential conflict of interest. PZ is employed by the German Armed Forces. His employment had no influence on the study design; the collection, analysis and interpretation of data. All other authors declare that they have no conflict of interests.

Ethical Standard

The study was approved by the TUD Ethics Board (EK 72022010), after internal Bundeswehr approval, and was performed according to ICH-GCP (Good Clinical Practice) Guidelines.

References

- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn., text rev. American Psychiatric Association: Washington, DC.

- Ayazi T, Lien L, Eide A, Swartz L, Hauff E (2014). Association between exposure to traumatic events and anxiety disorders in a post-conflict setting: a cross-sectional community study in South Sudan. *BMC Psychiatry* **14**, 6.
- Browne T, Hull L, Horn O, Jones M, Murphy D, Fear NT, Greenberg N, French C, Rona RJ, Wessely S, Hotopf M (2007). Explanations for the increase in mental health problems in UK reserve forces who have served in Iraq. *British Journal of Psychiatry* **190**, 484–489.
- Fear NT, Iversen A, Meltzer H, Workman L, Hull L, Greenberg N, Barker C, Browne T, Earnshaw M, Horn O, Jones M, Murphy D, Rona RJ, Hotopf M, Wessely S (2007). Patterns of drinking in the UK Armed Forces. *Addiction* **102**, 1749–1759.
- Fear NT, Jones M, Murphy D, Hull L, Iversen AC, Coker B, Machell L, Sundin J, Woodhead C, Jones N, Greenberg N, Landau S, Dandeker C, Rona RJ, Hotopf M, Wessely S (2010). What are the consequences of deployment to Iraq and Afghanistan on the mental health of the UK armed forces? A cohort study. *Lancet* **375**, 1783–1797.
- Gadernann AM, Engel CC, Naifeh JA, Nock MK, Petukhova M, Santiago PN, Wu B, Zaslavsky AM, Kessler RC (2012). Prevalence of DSM-IV major depression among U.S. military personnel: meta-analysis and simulation. *Military Medicine* **177**, 47–59.
- Goodwin L, Ben-Zion I, Fear NT, Hotopf M, Stansfeld SA, Wessely S (2013). Are reports of psychological stress higher in occupational studies? A systematic review across occupational and population based studies. *PLoS ONE* **8**, e78693.
- Goodwin L, Wessely S, Hotopf M, Jones M, Greenberg N, Rona RJ, Hull L, Fear NT (2015). Are common mental disorders more prevalent in the UK serving military compared to the general working population? *Psychological Medicine*, 1–11.
- Hasin DS, O'Brien CP, Auriacombe M, Borges G, Bucholz K, Budney A, Compton WM, Crowley T, Ling W, Petry NM, Schuckit M, Grant BF (2013). DSM-5 criteria for substance use disorders: recommendations and rationale. *American Journal of Psychiatry* **170**, 834–851.
- Hodson SE, McFarlane AC, Van Hooff A, Davies C (2011). Mental Health in the Australian Defence Force – 2010 ADF Mental Health Prevalence and Wellbeing Study: Executive Report.
- Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New England Journal of Medicine* **351**, 13.
- Hoge CW, Warner CH, Castro CA (2014). Mental health and the army. *JAMA Psychiatry* **71**, 965–966.
- Hunt E, Wessely S, Jones N, Rona RJ, Greenberg N (2014). The mental health of the UK Armed Forces: where facts meet fiction. *European Journal of Psychotraumatology* **5**.
- Iversen AC, Fear NT, Ehlers A, Hughes JH, Hull L, Earnshaw M, Greenberg N, Rona R, Wessely S, Hotopf M (2008). Risk factors for post-traumatic stress disorder among UK Armed Forces personnel. *Psychological Medicine* **38**, 511–522.
- Jacobi F, Mack S, Gerschler A, Scholl L, Höfler M, Siegert J, Bürkner A, Preiss S, Spitzer K, Busch M, Hapke U, Gaebel W, Maier W, Wagner M, Zielasek J, Wittchen H-U (2013). The design and methods of the mental health module in the German Health Interview and Examination Survey for Adults (DEGS1-MH). *International Journal of Methods in Psychiatric Research* **22**, 83–99.
- Jacobi F, Höfler M, Siegert J, Mack S, Gerschler A, Scholl L, Busch MA, Hapke U, Maske U, Seiffert I, Gaebel W, Maier W, Wagner M, Zielasek J, Wittchen H-U (2014). Twelve-month prevalence, comorbidity and correlates of mental disorders in Germany: the Mental Health Module of the German Health Interview and Examination Survey for Adults (DEGS1-MH). *International Journal of Methods in Psychiatric Research* **23**, 304–319.
- Jacobson IG, Ryan MA, Hooper TI, Smith TC, Amoroso PJ, Boyko EJ, Gackstetter GD, Wells TS, Bell NS (2008). Alcohol use and alcohol-related problems before and after military combat deployment. *Journal of the American Medical Association* **300**, 663.
- Jones BH, Perrotta DM, Canham-Chervak ML, Nee MA, Brundage JF (2000). Injuries in the military: a review and commentary focused on prevention. *American Journal of Preventive Medicine* **18**, 71–84.
- Jones N, Seddon R, Fear NT, McAllister P, Wessely S, Greenberg N (2012). Leadership, cohesion, morale, and the mental health of UK Armed Forces in Afghanistan. *Psychiatry* **75**, 49–59.
- Jones M, Sundin J, Goodwin L, Hull L, Fear NT, Wessely S, Rona RJ (2013). What explains post-traumatic stress disorder (PTSD) in UK service personnel: deployment or something else? *Psychological Medicine* **43**, 1703–1712.
- Kang HK, Hyams KC (2005). Mental health care needs among recent war veterans. *New England Journal of Medicine* **352**, 1289.
- Kessler RC, Davis CG, Kendler KS (1997). Childhood adversity and adult psychiatric disorder in the US National Comorbidity Survey. *Psychological Medicine* **27**, 1101–1119.
- Kessler RC, Wittchen H-U, Abelson JM, McGonagle K, Schwarz N, Kendler KS, Knäuper B, Zhao S (1998). Methodological studies of the Composite International Diagnostic Interview (CIDI) in the US national comorbidity survey (NCS). *International Journal of Methods in Psychiatric Research* **7**, 33–55.
- Kessler RC, Nock MK, Schoenbaum M (2014a). Mental health and the army-reply. *JAMA Psychiatry* **71**, 967–968.
- Kessler RC, Heeringa SG, Stein MB, Colpe LJ, Fullerton CS, Hwang I, Naifeh JA, Nock MK, Petukhova M, Sampson NA, Schoenbaum M, Zaslavsky AM, Ursano RJ, Army STARRS Collaborators (2014b). Thirty-day prevalence of DSM-IV mental disorders among nondeployed soldiers in the US Army: results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry* **71**, 504–513.
- Klaassens ER, van Veen T, Weerts JMP, Zitman FG (2008). Mental health of Dutch Peacekeeping Veterans 10–25 years after deployment. *European Psychiatry* **23**, 486–490.
- Knappe S, Lieb R, Beesdo K, Fehm L, Low NCP, Gloster AT, Wittchen H-U (2009). The role of parental psychopathology and family environment for social phobia in the first three decades of life. *Depression and Anxiety* **26**, 363–370.

- Kurth T, Walker AM, Glynn RJ, Chan AK, Gaziano JM, Berger K, Robins JM (2005). Results of multivariable logistic regression, propensity matching, propensity adjustment, and propensity-based weighting under conditions of nonuniform effect. *American Journal of Epidemiology* **163**, 262–270.
- Lachner G, Wittchen HU, Perkonig A, Holly A, Schuster P, Wunderlich U, Turk D, Garczynski E, Pfister H (1998). Structure, content and reliability of the Munich Composite International Diagnostic Interview (M-CIDI) substance use sections. *European Addiction Research* **4**, 28–41.
- Maciejewski PK, Prigerson HG, Mazure CM (2000). Self-efficacy as a mediator between stressful life events and depressive symptoms. Differences based on history of prior depression. *British Journal of Psychiatry* **176**, 373–378.
- Mental Health Advisory Team (MHAT IV) (2006). *Operation Iraqi Freedom 05–07. Final Report*. Office of the Surgeon Multinational Force-Iraq and Office of the Surgeon General United States Army Medical Command.
- Reed V, Gander F, Pfister H, Steiger A, Sonntag H, Trenkwalder C, Sonntag A, Hundt W, Wittchen H-U (1998). To what degree does the Composite International Diagnostic Interview (CIDI) correctly identify DSM-IV disorders? Testing validity issues in a clinical sample. *International Journal of Methods in Psychiatric Research* **7**, 142–155.
- Reijnen A, Rademaker AR, Vermetten E, Geuze E (2015). Prevalence of mental health symptoms in Dutch military personnel returning from deployment to Afghanistan: a 2-year longitudinal analysis. *European Psychiatry* **30**, 341–346.
- Riddle J, Smith T, Smith B, Corbeil T, Engel C, Wells T, Hoge C, Adkins J, Zamorski M, Blazer D (2007). Millennium Cohort: the 2001–2003 baseline prevalence of mental disorders in the U.S. military. *Journal of Clinical Epidemiology* **60**, 192–201.
- Royall R (1986). Model robust confidence-intervals using maximum-likelihood estimators. *International Statistical Review* **54**, 221–226.
- Rüsch N, Angermeyer MC, Corrigan PW (2005). Mental illness stigma: concepts, consequences, and initiatives to reduce stigma. *European Psychiatry* **20**, 529–539.
- Sirratt D, Ozanian A, Traenkner B (2012). Epidemiology and prevention of substance use disorders in the military. *Military Medicine* **177**, 21–28.
- Stata Corp (2012). *Stata Statistical Software: Release 12.1*. Stata Corporation.
- Sundin J, Herrell RK, Hoge CW, Fear NT, Adler AB, Greenberg N, Riviere LA, Thomas JL, Wessely S, Bliese PD (2014). Mental health outcomes in US and UK military personnel returning from Iraq. *British Journal of Psychiatry* **204**, 200–207.
- Trautmann S, Schönfeld S, Höfler M, Heinrich A, Hauffa R, Zimmermann P, Wittchen H-U (2013). Posttraumatic stress disorder after deployment of German soldiers: does the risk increase with deployment duration?. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz* **56**, 930–940.
- Trautmann S, Schönfeld S, Behrendt S, Höfler M, Zimmermann P, Wittchen H-U (2014). Substance use and substance use disorders in recently deployed and never deployed soldiers. *Drug and Alcohol Dependence* **134**, 128–135.
- Whiteford HA, Degenhardt L, Rehm J, Baxter AJ, Ferrari AJ, Erskine HE, Charlson FJ, Norman RE, Flaxman AD, Johns N, Burstein R, Murray CJL, Vos T (2013). Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. *Lancet* **382**, 1575–1586.
- Wittchen H-U, Pfister H (1997). *DIA-X-Interviews: Manual für Screening-Verfahren und Interview; Interviewheft Längsschnittuntersuchung (DIA-X-Lifetime); Ergänzungsheft (DIA-X-Lifetime); Interviewheft Querschnittuntersuchung (DIA-X-Monate); Ergänzungsheft (DIA-X-Monate); PC-Programm zur Durchführung des Interviews (Längs- und Querschnittuntersuchung); Auswertungsprogramm*. Swets and Zeitlinger: Frankfurt.
- Wittchen H-U, Lachner G, Wunderlich U, Pfister H (1998). Test-retest reliability of the computerized DSM-IV version of the Munich Composite International Diagnostic Interview (M-CIDI). *Social Psychiatry and Psychiatric Epidemiology* **33**, 568–578.
- Wittchen H-U, Schoenfeld S, Thureau C, Trautmann S, Galle M, Mark K, Hauffa R, Zimmermann P, Schaefer J, Steudte S, Siegert J, Hoefler M, Kirschbaum C (2012a). Prevalence, incidence and determinants of PTSD and other mental disorders: design and methods of the PID-PTSD+3 study. *International Journal of Methods in Psychiatric Research* **21**, 98–116.
- Wittchen H-U, Schoenfeld S, Kirschbaum C, Thureau C, Trautmann S, Steudte S, Klotsche J, Hoefler M, Hauffa R, Zimmermann P (2012b). traumatic experiences and posttraumatic stress disorder in soldiers following deployment abroad how big is the hidden problem? *Deutsches Ärzteblatt International* **109**, 559–568.
- Wittchen H-U, Schönfeld S, Kirschbaum C, Trautmann S, Thureau C, Siegert J, Höfler M, Hauffa R, Zimmermann P (2013). Rates of mental disorders among German soldiers deployed to Afghanistan: increased risk of PTSD or of mental disorders in general? *Journal of Depression and Anxiety* **2**. doi:10.4172/2167-1044.1000133.
- World Health Organization (2012). *Country Profile of Occupational Health System in Germany*. WHO Regional Office for Europe: Copenhagen, Denmark.
- Zimmermann P, Kowalski J, Heinrich M, Willmund G, Heinz A (2012). Charakteristika der Alkoholerkrankung bei Bundeswehrsoldaten in der stationären Versorgung im Vergleich zu zivilen Patienten. *SUCHT – Journal of Addiction Research and Practice* **58**, 55–61.
- Zimmermann P, Höfler M, Schönfeld S, Trautmann S, Hauffa R, Kowalski J, Wittchen H-U (2014). Einsatzenerlebnisse und einsatzbedingte psychische Erkrankungen deutscher Soldaten – empirische Struktur und prädiktive Wertigkeit traumatischer Stressoren. *Zeitschrift für Klinische Psychologie und Psychotherapie* **43**, 180–191.