

Rates of Mental Disorders Among German Soldiers Deployed to Afghanistan: Increased Risk of PTSD or of Mental Disorders In General?

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Abstract

Background: Controversy exists regarding the prevalence of military mission-related PTSD and other mental disorders among deployed soldiers.

Methods: Based on a random stratified sample of n=1599 German soldiers (response rate (RR) 93%, n=1483), we assessed subjects 12 months after deployment to Afghanistan and compared findings to controls of n=932 never deployed soldiers (RR: 95%, n=889). Interviews were conducted by trained non-military clinical interviewers using the DSM-IV-TR-Composite International Diagnostic Interview (CIDI-military). Outcome measures were 12-month prevalence and incidence of PTSD, anxiety, depressive, substance use disorders and other DSM-IV-TR mental disorders.

Results: Deployed soldiers reported high rates of combat-related and other traumatic events. Compared to controls they had a higher 12-month incidence (OR: 4.3) and prevalence (OR: 2.4) of PTSD, anxiety (OR: 3.6, 1.4), and alcohol use disorders (OR: 3.5, 1.9). They also had higher rates of multiple diagnoses (MR: 1.72) and higher anxiety distress scores. Incidence of PTSD and other mental disorders were best predicted by prior lifetime mental disorders.

Conclusions: German soldiers deployed to Afghanistan are at increased risk of traumatic events and of mental disorders including PTSD as compared to never-deployed soldiers. The risk for other mental disorders subsequent to traumatic events such as anxiety, somatoform, and alcohol use disorders was substantially larger than the risk for PTSD. Prior mental disorders were found to be the strongest predictor of 12-month mental disorders and suggest that pre-mission psychopathological screening might be crucial to reduce mission-related mental health risks.

Keywords: Deployment; Mental disorders; PTSD; Prevalence; Incidence; Trauma

Introduction

Several studies have shown that exposure to stressful and traumatic events during military missions and combat is associated with an increased risk of post-traumatic stress disorder (PTSD) [1-5]. Rates of deployment-related PTSD, however, vary enormously between studies and countries, ranging from 1.5% to 31% in military personnel deployed to Iraq. Estimates in US samples vary between 4 and 17%. For UK, Dutch, Canadian and Australian samples substantially lower estimates of 3–6% were reported [6-8]. Recent critical reviews suggest that differences might be explained by methodological issues such as the diagnostic measures used (i.e. self-report scales vs. diagnostic interviews), sampling strategies and region, and other variables such as combat exposure, type of enlistment, preparation for deployment or number and duration of previous deployments [7-11]. The type of measurement appears to be particularly critical suggesting that studies relying on cost effective and time saving self-report measures have typically higher rates as compared to the few available studies using clinical diagnostic measures. The DSM-IV criteria require differential diagnostic considerations and the clinical and instrumental standard methods for such differential diagnostic considerations are established [12-15]. From a clinical diagnostic perspective, self-report approaches have also the disadvantage that they do neither allow the derivation of clinical diagnoses nor the consideration of differential clinical diagnostic rules. Thus, such studies do not allow to examine how frequently traumatic events during deployment might result not only in PTSD but also in anxiety disorders, depressive, somatoform and substance use disorders. Further pre-existing mental disorders in deployed soldiers were almost never considered or taken into account

suggesting indirectly that studies examining the deployment-related mental health risk might overestimate the frequency PTSD and neglect or underestimate other forms of mental disorders. This might be because similar or overlapping symptoms of other mental disorders or syndromes associated with combat experience, such as depression, suicidal tendencies, alcohol abuse, somatisation, or fatigue might be misdiagnosed as PTSD [6,16].

This paper tries to avoid such limitations by using standardised clinical diagnostic interviews administered by clinical interviewers. The aims are to examine:

1. The 12-month prevalence and post-mission incidence of a range of mental disorders including PTSD in random samples of German soldiers deployed to Afghanistan as part of the 2009/2010 ISAF (International Security Assistance Force) mission.

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2. Whether deployed soldiers have a greater risk of mental disorders than soldiers that were never-deployed (comparison group).
3. Patterns of comorbidity.
4. Socio-demographic, military and deployment characteristics as well as prior psychopathology as predictors of mental disorders.

Methods

Study design

The data presented here are part of an ongoing large-scale project, labelled “Prevalence, Incidence and Determinants of Post Traumatic Stress and Other Mental Disorders” (PID-PTSD+³) study. Background, methods and design of PID-PTSD+³, consisting of a cross-sectional study investigating deployment related mental disorders in the German military, and an on-going prospective-longitudinal study (not dealt with here) have been described in detail previously [11,17] following the guidelines of the STROBE checklist.

Participants

The PID-PTSD+³ cross-sectional study compares n=1483 deployed soldiers (DS) with a matched control group (CO) of n=889 soldiers that

were never deployed. The DS group is based on a stratified random sample of all German soldiers, who had been deployed to Afghanistan as part of the 20th and 21st contingent of the German ISAF-mission in 2010 (reference population: n=9617). The stratification took into account rank, unit, and location of deployment overweighting combat personnel. Results were accordingly weighted to reflect the different sampling probabilities (see below). Due to the logistically challenging and costly assessment procedure (see below) DS soldiers were only eligible for inclusion if serving and located at one of the 18 preselected military bases with at least 50 (including controls) other sampled personnel during the randomly selected assessment periods of 2-4 weeks. N=1599 deployed soldiers met eligibility criteria. Of these n=102 (6.4%), refused, n=7 (0.4%) did not give written informed consent, n=7 (0.4%) provided incomplete assessments. The total response rate was 92.8% (n=1483). There was no evidence that non-eligible subjects differed from those eligible [11]. Soldiers from the control group were sampled accordingly in the same home bases as deployed soldiers. Response rate in the CO group was 95.4% (n=889), n=40 refused and n=3 provided incomplete assessments.

Sample characteristics

The DS sample consisted of 1439 (94.8%) men and 44 females (Table 1). Mean age was 30.5 years. 15.9% had completed the mandatory basic

Characteristics	Controls (n=889)		Deployed (n=1483)		Controls Vs Deployed P value
	n	%w	n	%w	
Gender:					
Male	779	95.5	1439	94.8	0.499
Female	110	4.5	44	5.2	
Age (mean, SD)	30.5(8.4)		30.8(7.7)		0.102
18-24	419	20.2	320	15.6	0.018
25-29	328	42.4	595	39.3	
30-39	76	20.5	382	28.9	
>= 40	66	16.9	186	16.2	
Years of Education (mean SD)	11.0(1.4)		10.8(1.4)		0.103
Highest educational degree					0.391
Low	182	18.2	275	15.9	
Medium	541	62.1	961	66.2	
High	166	19.8	247	17.9	
Marital status					0.138
Unmarried	719	66.3	960	59.9	
Married	149	28.6	449	34.8	
Separated/divorced/widowed	19	5.1	74	5.3	
Length of service (years), mean (SD)	10.3 (8.5)		10.4 (7.7)		0.893
Rank					0.008
Enlisted	246	33.5	533	23.4	
Commissioned officer	565	55.5	799	62.7	
Warrant officer	78	11.0	151	12.8	
Unit					0.404
Combat	175	22.7	681	23.3	
Medical	106	9.9	76	7.3	
Others	608	67.4	726	69.3	
Length of deployment (months), mean (SD)*			3.7 (1.5)		
1-2 months			337	23.4	
3-5 months			975	64.1	
6+ months			171	12.5	

Missing values: years of education n=2 (0.1%) Marital status n=2 (0.1%)
 N=unweighted number, %w = weighted number and percentage; *Missing values imputed using Sociodemographical and soldier characteristics

Table 1: Demographic and military characteristics of deployed and controls

education (10 years), 17.9% completed higher education. 59.9% were never married, 34.8% were married, and 5.3% separated, widowed or divorced. 25.6% of the DS subjects had served less than 5 years (mean (SD): 10.4 (7.7)). 23.3% of the DS group were designated as “combat”, 69.3% combat support, and 7.3% as medical personnel, recruited from the following units: army (57.8%), air force (32.7%), medical service (6.7%), joint support service (2.8%), and navy (0.1%). For 43.2% of the deployed, the ISAF 2009/2010 mission was the first deployment, 37.1% had two to four and 19.9% five or more previous deployments. During the 2009/2010 mission, most of the deployed soldiers were stationed in Masar-e-Sharif (67.7%) or Kunduz (19.6%). The mean mission duration was 3.7 months (SD 1.5). (Table 1)

Data collection

Data were collected by a total of 65 non military clinical interviewers of the TUD, dispatched to soldiers’ home bases for several days up to two weeks dependent on number of participants per location. Soldiers were informed about the study about two months prior to the arrival of the study team via personal written invitation. Participation was strictly voluntary and confidential inviting all eligible subjects individually with personalised letters to the informed consent session first, before the interview was started. All eligible subjects, irrespective of willingness to participate were released from their routine duty. Thus, the individual soldier without knowledge of their seniors solely decided participation. Soldiers from both groups were examined in parallel at their home bases.

Procedures

The computer-assisted standardised clinical diagnostic, 12-month and lifetime military version of the Munich-Composite International Diagnostic Interview (DIA-X/M-CIDI) [18] was used. The DIA-X/M-CIDI allows for the standardised assessment and objective analyses of symptoms, syndromes and diagnoses of over 30 diagnoses grouped for the purpose of the present papers in six major groups (i.e., anxiety, PTSD, mood disorders) according to the criteria of DSM-IV-TR. The incremental reliability and validity of the CIDI lifetime and current assessment has been established [12-15]. The CIDI was supplemented by additional modules to determine incident disorders, to assess further relevant military characteristics, trauma/event descriptions and questions regarding help seeking and treatment. Assessment of mission-related events (MHAT-IV) [19] was embedded into the standard format of the PTSD section of the CIDI as well as measures such as the Hospital-Anxiety Scale [20]. Main outcome measures were: (a) the 12-month prevalence (=full threshold criteria for the respective diagnosis met during the past 12 months), and (b) 12-month mission incidence (first onset of the full criteria during the past 12 months). These measures were computed using the standard CIDI onset and recency information, provided by the subject. DSM-IV-TR trauma criteria (A1/A2) [21] were assessed as part of the CIDI - PTSD section.

Statistical analysis

Results are reported as unweighted n, weighted means, standard deviation (SD), % and odds ratios (OR) with 95% confidence intervals (95% CI). The weighting took into account the different sampling probabilities by rank, unit, and location of deployment (strata see above), eligibility, and response to match the original distribution of deployed soldiers [11]. Comparisons with the CO were further adjusted for sociodemographic, and military variables (i.e. rank, years serving). Differences in categorical variables were tested with a design-based modification of the Chi-squared test for independence [22]. For binary

dependent outcomes, logistic regressions with Odds Ratios (ORs) were used, for count outcomes (e.g., number of diagnoses), negative binomial regressions were fitted. All regressions used the robust Huber-White sandwich estimator for weighted data [23]. Stata 12.1 [24] was used and statistical significance was assessed at the 5% level (two-sided tests).

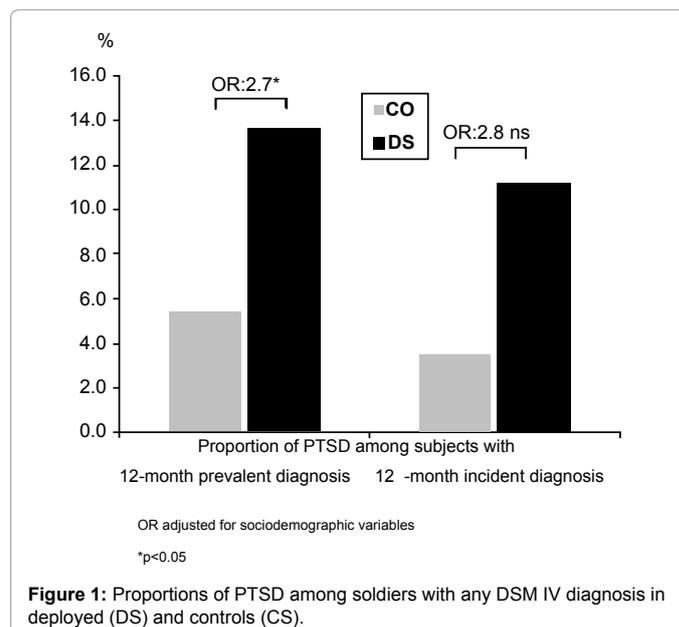
Results

Combat experiences and traumatic events in deployed and non-deployed soldiers

In the MHAT scale 85.5% (95% CI: 83.3–87.5) of the DS subjects reported at least one combat/mission related event. Most soldiers experienced several different events (mean: 5.3, SD=5.3, range: 0-30) during their deployment (see [17] for a breakdown by type of events). Using the DSM-IV-TR definition for “traumatic” (A1/A2) events, 24.2% of all deployed soldiers versus only 11.1% in the control group reported at least one mission-related traumatic event ($p<0.001$). The DS and CO soldiers did not differ though with regard to their lifetime probability of experiencing any traumatic event (DS: 49.2% vs. CO 49.9%), DS soldiers however had a higher rate of multiple traumatic events ($p=0.032$). DS subjects deployed to Kunduz (OR: 2.8, 95% CI 1.9–4.2%) as well as combat units (OR: 1.8, 95% CI 1.2–2.7%) had a significantly higher probability as compared to CO soldiers to report recent traumatic events [17].

Prevalence and incidence of mental disorders

The 12-month prevalence rates include both cases that had lifetime, respectively prior-deployment, mental disorders as well as incident mental disorders. Although both groups did not differ in their rates of having any mental disorders (12-month prevalence: CO: 22.5% vs. DS: 21.4%, $p=0.782$), the DS group had higher 12 month rates for PTSD (2.9% vs. CO: 1.2%, ORadj: 2.4, $p=0.043$), and alcohol use disorders (AUD: 3.6% vs. 2.2%, ORadj: 1.9, $p=0.047$). The higher prevalence for anxiety (10.8% vs. 8.0%) and somatoform disorders (2.5% vs. 1.1%) in the DS group, and the lower DS rates of mood and other mental disorders (i.e. psychotic, obsessive-compulsive and organic mental disorders) were non-significantly different. (Figures 1 and 2)



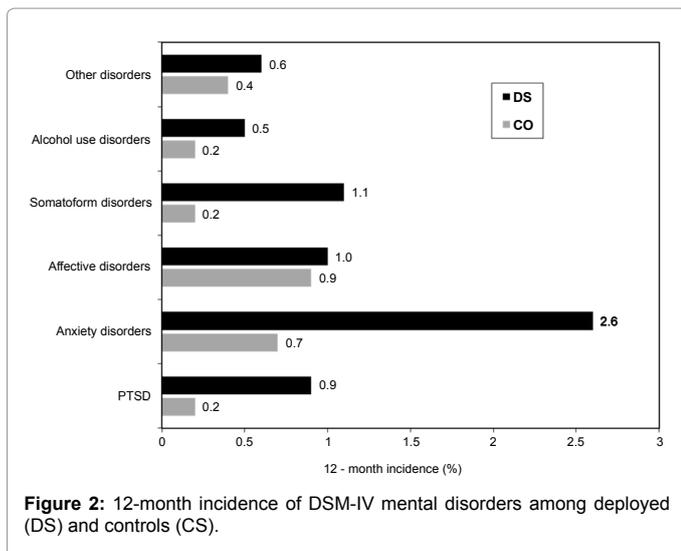


Figure 2: 12-month incidence of DSM-IV mental disorders among deployed (DS) and controls (CS).

DS soldiers revealed higher incidence rates (first ever onset during or 12 month after mission) as compared to controls for PTSD (0.9% vs. 0.2%, OR: 4.2, $p=0.110$), anxiety (2.6% vs. 0.7%, OR: 3.6, $p=0.045$), and somatoform (1.1% vs. 0.2%, OR=6.5, $p=0.001$) disorders. The difference for PTSD was not statistically significant, presumably because of low case numbers. It is noteworthy (Figure 1) that incident PTSD in the DS group accounts for only a fraction of the total 12-month PTSD prevalence and that PTSD itself accounts only for a small proportion of the total incidence of mental disorders (Figure 2) (overall incidence DS: 8%).

Comorbidity and current distress

Deployed soldiers had a higher number of diagnoses than controls (MR=2.29, $p=0.001$) (Figure 3). Patterns of comorbidity were complex, most frequent combinations of 12-month diagnoses involved anxiety disorders, depression, alcohol disorders and PTSD. For incident diagnoses this pattern was more pronounced (MR=7.55, $p=0.042$).

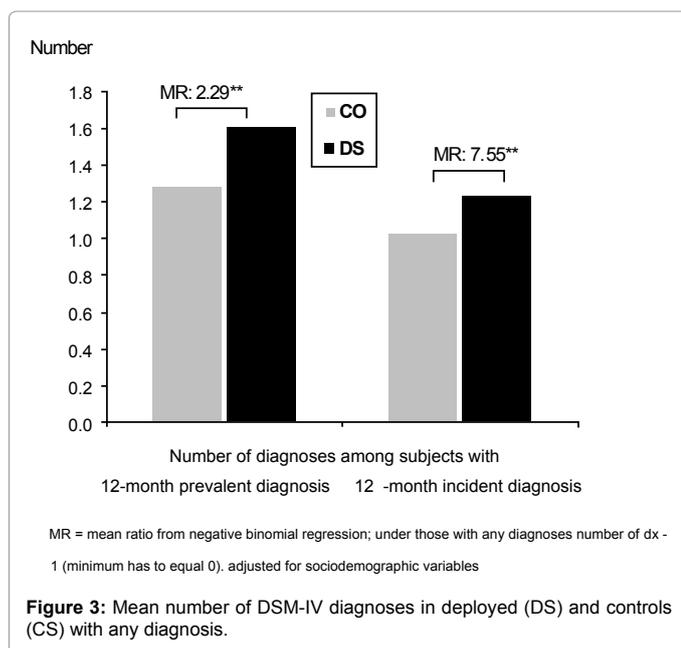


Figure 3: Mean number of DSM-IV diagnoses in deployed (DS) and controls (CS) with any diagnosis.

Additional analyses of the current anxiety and depression distress among those with incident disorders further revealed, that increased (but nonsignificant) total scores of the HADS among deployed (11.5 vs. 9.3) were mainly due to anxiety (interaction incident anxiety disorder* deployment on HDAS anxiety: crude $p=0.015$, adjusted: $p=0.057$) and not depression.(Figure 3)

Factors associated with 12-month PTSD and other mental disorder prevalence

Associations of selected variables with the main diagnostic outcome groups (Table 2) reveal, across diagnostic groups, almost all prior psychopathology variables as the most consistent predictor for all mental disorders. Higher age was only moderately associated with elevated risk for PTSD. Military variables revealed variable diagnostic specific associations. A shorter length of military service and number of previous deployments was associated with elevated rates of alcohol and affective disorders. Medical personnel were at increased risk for PTSD and anxiety disorders, whereas combat personnel had increased rates of affective disorders. Alcohol disorders were associated with longer duration of deployment.

Discussion

This cross-sectional study in a representative random sample of German ISAF soldiers deployed to Afghanistan in 2009/10 is based on standardised clinical-diagnostic interviews for mental disorders according to the criteria of DSM-IV-TR. This procedure allowed a stringent application of differential diagnostic considerations, a broader coverage of various clinical syndromes and a more detailed evaluation of deployment related mental disorders and PTSD by separating current, past and prior deployment disorders. An additional strength is the use of a matched control group of never deployed to examine excess morbidity. Noteworthy study limitations are the cross-sectional design, in that recall bias effects cannot be excluded particularly in the separation of prevalence and incidence as well as restricting prohibiting causal inferences, and the relative infrequency of some outcomes, that did not allow further investigations of effects, due to insufficient statistical power.

Our main findings are that we record modest, diagnosis-specific effects of deployment on the 12-month prevalence and the incidence of some mental disorders. The vast majority of deployed soldiers, though, return evidently from mission without any clinically relevant diagnostic complications. Instead they reveal an overall prevalence of disorders that is similar to never deployed controls and estimates reported for community samples [4,24]. These findings are consistent with previous conclusions from the UK [6] that find no indications for a “tidal wave” of deployment-related mental health problems among military.

Our finding of only small increases of incident disorders was unexpected, given that 85.5% of our deployed soldiers have reported a considerable number and range of stressful mission and combat events and 49.2% of deployed even meeting strict DSM-IV criteria for having had at least one “traumatic” event [17]. Strictly defined, only 8% of the deployed developed a mental disorder, that occurred during or after the mission for the first time ever, thus the majority of deployed soldiers with 12-month prevalent disorders had the disorder already years before the mission. Given the relatively high number of traumatic events it is also remarkable that PTSD was neither the most prevalent nor the most frequent incident disorder among deployed, other disorders in particular anxiety disorders (such as panic and agoraphobia) were much more frequent.

Factor	PTSD		Alcohol use disorder		Anxiety disorder		Affective disorder		Somatoform disorder	
	OR(95%CI)	p-value	OR(95% CI)	p-value	OR(95% CI)	p-value	OR(95% CI)	p-value	OR(95% CI)	p-value
Age										
Per year increase	1.1 (1.0-1.1)	0.022	1.0 (0.9-1.0)	0.062	1.0 (1.0-1.0)	0.234	1.0 (0.97-1.047)	0.789	1.0 (1.0-1.0)	0.963
Education										
Middle Vs low	1.1 (0.4-2.8)	0.911	1.1 (0.5-2.5)	0.877	1.4 (0.8-2.3)	0.257	1.4 (0.6-3.1)	0.453	0.6 (0.3-1.5)	0.308
High Vs low	1.6 (0.5-5.0)	0.403	1.3 (0.5-3.6)	0.581	1.6 (0.8-2.9)	0.161	1.1 (0.4-3.1)	0.888	0.7 (0.2-2.2)	0.591
Marital status										
Divorced/separated/widowed Vs married	2.6 (0.9-7.8)	0.091	0.4 (0.1-1.5)	0.167	1.1 (0.5-2.8)	0.779	2.2 (0.7-7.1)	0.190	0.6 (0.1-4.5)	0.595
Unmarried Vs married	0.6 (0.3-1.2)	0.115	2.1 (1.0-4.3)	0.058	1.2 (0.8-1.9)	0.313	1.7 (0.9-3.4)	0.124	0.9 (0.4-1.9)	0.749
Rank										
Middle Vs low	0.9 (0.4-1.9)	0.760	1.1 (0.6-2)	0.833	0.8 (0.6-1.3)	0.424	1.1 (0.6-2.0)	0.743	1.2 (0.5-3.0)	0.664
High Vs low	1.2 (0.4-3.5)	0.782	0.3 (0.1-1.4)	0.137	0.6 (0.3-1.2)	0.154	0.8 (0.3-2.3)	0.636	0.5 (0.1-2.3)	0.347
Length of services										
<2 vs. 6-10	0.6 (0.1-3.1)	0.530	1.9 (0.3-11.7)	0.486	0.3 (0.1-1.3)	0.116	***		2.4 (0.6-10.3)	0.240
3-5 vs. 6-10	0.5 (0.2-1.1)	0.079	2.0 (0.9-4.4)	0.105	1.5 (0.9-2.4)	0.086	0.8 (0.4-1.7)	0.558	0.8 (0.3-2.1)	0.591
>10 vs. 6-10	0.5 (0.2-1.1)	0.077	2.3 (1.1-5.2)	0.036	1.2 (0.8-2.0)	0.372	1.4 (0.7-2.7)	0.324	1.0 (0.4-2.4)	0.952
Branch										
Combat vs. logistics	1.1 (0.5-2.1)	0.879	1.4 (0.8-2.4)	0.292	1.2 (0.8-1.8)	0.264	1.8 (1.0-3.1)	0.042	0.8 (0.4-1.7)	0.525
Medical vs. logistics	3.4 (1.3-9.3)	0.013	0.9 (0.2-3.7)	0.842	2.7 (1.4-5.0)	0.002	0.7 (0.2-2.9)	0.598	1.3 (0.4-4.6)	0.696
Location at Kunduz	0.8 (0.4-1.8)	0.624	1.5 (0.8-2.8)	0.182	1.8(1.2-2.6)	0.004	1.5 (0.8-2.7)	0.174	1.9 (0.9-4.3)	0.107
Number of previous deployments										
1-2 versus none	1.6 (0.7-3.5)	0.259	0.9 (0.4-1.7)	0.717	0.9 (0.6-1.3)	0.552	1.9 (0.98-3.6)	0.058	1.5 (0.73-6)	0.316
3+ versus none	1.6 (0.7-3.7)	0.285	0.4 (0.2-1.0)	0.048	0.7 (0.5-1.2)	0.230	2.0 (0.96-4.0)	0.064	0.8 (0.3-2.3)	0.737
Length of deployment*										
3-5 versus 1-2 months	0.7 (0.3-1.6)	0.439	2.5 (1.1-5.8)	0.032	1.1 (0.7-1.7)	0.758	0.7 (0.4-1.4)	0.370	1.0 (0.4-2.6)	0.926
6+ versus 1-2 months	1.1 (0.4-3.1)	0.935	4.8 (1.8-12.8)	0.002	1.3 (0.7-2.5)	0.360	1.2 (0.5-2.9)	0.635	1.1 (0.3-4.0)	0.872
Prior PTSD*	126.7 (55.2-290.8)	<0.001	2.8 (0.9-9.0)	0.085	4.4 (2.2-8.6)	<0.001	5.6 (2.5-12.7)	<0.001	5.7 (2.0-16.0)	0.001
Prior alcohol use disorders	3.0 (1.5-6.2)	0.002	38.3 (17.2-85.4)	<0.001	1.6 (1.0-2.4)	0.043	1.6 (0.9-3.1)	0.143	1.8 (0.8-4.4)	0.173
Prior anxiety disorders	6.0 (3.0-12.1)	<0.001	2.6 (1.3-5.3)	0.007	88.3 (52.4-148.9)	<0.001	6.0 (3.4-10.7)	<0.001	3.5 (1.5-7.8)	0.003
Prior affective disorders	8.9 (4.3-18.7)	<0.001	1.4 (0.5-3.7)	0.514	4.9 (3.0-8.0)	<0.001	314.0 (139.0-709.4)	<0.001	7.6 (3.4-17.0)	<0.001
Prior somatoform disorders	3.4 (1.0-11.4)	0.045	2.4 (0.7-8.6)	0.183	3.6 (1.7-7.4)	0.001	6.8 (2.9-15.9)	<0.001	71.0 (29.5-170.7)	<0.001

*Missing values imputed using sociodemographical and soldier characteristics; **Defined as onset before 12 months; ***no OR because of empty cell

Table 2: Factors associated with increased risk for 12-month PTSD and other 12-month disorders.

Nevertheless, the 12 month prevalence of PTSD (2.9% vs. 1.2%, OR: 2.4) and the mission-related incidence (0.9% vs. 0.2%, OR: 4.3) was elevated over and above the rates of soldiers in the control group. However, unlike to the majority of studies focussing on PTSD, we find first, that other mental disorders, in particular anxiety disorders, somatoform and alcohol use disorders are much more frequently associated with deployment. Secondly, findings suggest that deployment was associated with increased rates of comorbidity possibly indicating a more malignant disease pattern, particularly in deployed soldiers with pre-existing disorders; this was confirmed indirectly by elevated cross-sectional anxiety-depression distress scores in deployed subjects with a diagnosis. The increased risk for adverse mental health outcome among those with pre-existing vulnerability is also supported by our risk factor

analyses. Prior psychopathology across the diagnostic spectrum was the most powerful and consistent predictor for all 12-month mental disorders. In contrast socio-demographic as well as military and mission characteristics appear to be associated with less consistent and weak effects. If this finding is confirmed in prospective studies, pre-mission comprehensive psychopathological screening might be a powerful measure to reduce the deployment mission risk for PTSD and other mental disorders [17].

There are several limitations in our study that should be taken into account. (i) This is a cross-sectional study; associations should not be interpreted as evidence for causal relations. (ii) Traumatic event assessment was solely based on respondent's report and thus

might be subject to recall failure. Similarly, retrospective reports of psychopathology might be subject to recall failure as well. (iii) Prevalence and incidence estimates are based on age of onset and recency information provided by the respondent. Although such reports have been shown to be reliable [25,26], the validity of such consistent reports is unknown. (iv) Direct comparisons of our findings with previous studies are restricted for various reasons: This is the first German epidemiological study [27], the study assessment standards are different, German ISAF soldiers have a comparatively short deployment period (average: 4 months, range 1–8 months), probably lower combat involvement as compared to US and UK troops, deployment requires a minimum of one year service prior to deployment and is largely restricted to regulars and involves extensive preparation periods.

Nevertheless, our findings of only slightly elevated mission-related rates of mental disorders and PTSD in particular are clearly at the lower end of previous estimates. Regarding PTSD, our 12-month prevalence findings of 2.9% seem to be in the range of previous UK armed forces studies (4.8%, range by service type: 1.2–6.2%) [2] as well as Dutch, Canadian and Australian surveys [7]. It is noteworthy that unlike Hotopf M et al. [28] for Iraq missions and Fear et al. [6] for Iraq and Afghan samples, our study finds a significant deployment effect for PTSD. This difference might be due to the fact that our control group consisted of soldiers that were never deployed, whereas the comparison studies included soldiers with previous deployment. Consistent with our findings, all these non US-studies revealed substantially lower rates of mission related PTSD than studies in US samples (4–17%) see [7,8].

The reasons for the striking and fairly consistent difference between US and non-US studies remain unclear. Salient explanations at least for our relatively low PTSD rates might be the current mission characteristics of German ISAF soldiers (i.e. short deployment duration, lower rates of combat) [17,29,30], the selection process of German soldiers for deployment and preparation procedures for the mission [31] and methodological factors. We speculate that our PTSD findings might be mainly due to the joint effects of strictly applying DSM-IV criteria, by simultaneously not considering sub-threshold expressions of PTSD, and being very conservative by separating prior and more recent 12-month PTSD.

Our rates for anxiety disorders (10.8%) are remarkably elevated in comparison to the control group as well as over the relatively few findings in previous military and community studies that have cited rates of 3–5% [2,25]. We suspect that the difference is due to covering a broader spectrum of anxiety disorders and particularly panic and agoraphobia as the most frequent incident disorders in our study [32]. Our prevalence rates for alcohol use disorders in deployed are than in controls as well as higher than in the community, but lower to the estimates of 10–18% cited by Iversen et al. [2] for deployed soldiers. We assume that might be due to the application of strict DSM-IV criteria for abuse and dependence, whereas previous papers used variable definitions of alcohol problems.

To conclude, ISAF deployment of German military in its current form is associated with a significant, though overall smaller risk for developing mission related PTSD than previously assumed and found for US soldiers. Assuming validity of our findings, this indirectly suggests the possibility that high estimates of PTSD in particularly US-samples might partly be explained by less restrictive diagnostic criteria and possible symptom confounds with mental disorders associated with stressors or trauma other than PTSD [8]. Our findings also suggest that other mental disorders (such as anxiety, alcohol use disorders, somatoform disorders), and not just PTSD, as well as the development

of complex comorbid patterns are crucial topics that have so far been underappreciated and understudied in previous research on mental health problems associated with deployment. Our findings impressively underline the importance to examine a more comprehensive spectrum of mental disorders beyond PTSD in order to avoid an overestimation of rates and ultimately get a fuller understanding of adverse mental health effects of deployment. The indication that the risk of mission-related mental disorders is strongly associated with pre-existing psychopathology calls for prospective-longitudinal studies to identify the complex pathways to mental disorders and comorbid patterns associated with stressful and traumatic events during deployment, ultimately leading to diagnostically sensitive screening and preventive measures. Future research needed in this context might also address several weaknesses by providing better answers to questions like how data from different countries can be integrated and how effects of deployment-related experiences can be differentiated within and across populations.

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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.

Declaration of Interests

HUW is member of advisory boards and received grant support and travel compensation by the following pharmaceutical companies: Servier, Lundbeck, Novartis, Pfizer, and Sanofi. RH is an officer in the German Armed Forces Medical Service and assigned to the German Armed Forces Station Hospital Berlin as postdoctoral research fellow. His employment had no influence on the study design. PZ is employed by the German Armed Forces. His employment had no influence on the study design. All other authors declare that they have no conflict of interests.

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Stress

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