

Mental health screening in armed forces before the Iraq war and prevention of subsequent psychological morbidity: follow-up study

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Abstract

Objective To assess whether screening for mental disorder before the start of the 2003 Iraq war would have predicted subsequent mental disorders.

Design Longitudinal cohort study of the United Kingdom armed forces.

Participants 2820 of 2873 personnel of the three services who completed an initial questionnaire in 2002 were asked to complete a second questionnaire between June 2004 and 2 March 2006.

Setting Regiments, air stations, bases, ships, and homes for those who had left the services.

Main outcome measures Positive and negative likelihood ratios, and positive and negative predictive value of first assessment compared with assessment two to three years later of post-traumatic stress disorder, general health questionnaire, physical symptoms, self perception of health, and alcohol misuse for the entire group and for those deployed to the Iraq war.

Results The response rate to the follow-up questionnaire was 69%, adjusted for return to senders. The positive likelihood ratio of post-traumatic stress disorder was high (13.1, 95% confidence interval 7.2 to 23.8), but the negative likelihood ratio was close to 1 (0.78, 0.67 to 0.91). The positive predictive values were low because of the low prevalence of post-traumatic stress disorder in the period before the Iraq war. The positive likelihood ratios for the other psychological assessments varied between 2.7 and 5.6, and the negative likelihood ratios were slightly lower than for post-traumatic stress disorder, indicating that these were not good candidates for screening. Results were the same for the analyses restricted to those who were deployed.

Conclusions Screening for common mental disorders before deployment in this cohort would not have reduced subsequent morbidity or predicted post-traumatic stress disorder, but this may change if there is a considerable increase in the prevalence of the disorder.

Introduction

Psychological syndromes after combat have been a feature of many wars.^{1,2} As these syndromes are

common and associated with morbidity and considerable costs, there have been calls for the implementation of screening programmes to detect and exclude those who are psychologically vulnerable before they are deployed.^{3,4} At the start of the second world war there was a strong belief that excluding those who were psychologically vulnerable would greatly decrease the proportion of psychiatric casualties after deployment.⁵⁻⁷ The programme was a costly failure, and, despite high rates of rejection on the basis of presumed psychological vulnerability, the rates of psychiatric breakdown in the field were comparable with or even greater than those observed in the first world war.^{8,9}

Few recent reports have been published on the association between assessments of mental disorders in the armed forces before and after deployment. In 2002 we assessed the acceptability of screening questionnaires for psychological illness and the validity of these questionnaires, using as the "gold standard" the opinion of medical officers (equivalent to general practitioners) in a random sample of the British armed forces in the period immediately before preparations for the Iraq war began.^{10,11} A proportion of participants in our study were subsequently deployed to Iraq. We contacted the participants in our initial study, including those who were deployed, to assess the value of such screening before deployment in predicting mental disorders after deployment using the same measurements for post-traumatic stress disorder, general psychological health, physical symptoms, self perception of health, and excessive alcohol use. We also analysed those who were not deployed to Iraq, most of whom have been on other recent deployments,¹⁰ to assess the general predictability of psychological tests in the armed forces.

Methods

Sampling

In 2002, two groups were randomly selected to receive a full or an abridged screening questionnaire to assess

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Table 1 Criteria for referral to medical centres according to length of the questionnaire

Dimension	Full questionnaire	Abridged questionnaire
Symptoms	≥5 mild or combinations of mild and moderate; ≥3 moderate; at least 1 severe symptom	At least 3 mild or moderate symptoms or at least 1 severe symptom
GHQ	GHQ-12 with score of ≥4	GHQ-4 with score of ≥2
PTSD	17 items with score of ≥50	14 items with score of ≥40
Health status	Poor or fair	Poor or fair
Alcohol intake	≥40 units/week in men and ≥30 in women, or if somebody expressed concern with individual's drinking in past year	Not applicable

GHQ=general health questionnaire; PTSD=post-traumatic stress disorder.

psychological health. Units were randomly selected, and 45 individuals were randomly selected from each unit. The study had a response rate of 67% (n = 2873) among those with a valid address (n = 4304).¹⁰ From June 2004 to 2 March 2006 we asked 2820 of the 2873 who completed the initial questionnaire to complete a second questionnaire. This follow-up study was carried out simultaneously with a larger cross sectional study aimed at comparing the health outcomes of those deployed to Iraq and those not deployed.¹² The methods of tracing and recruiting the two samples were identical and were done simultaneously. Full details are given elsewhere.¹² The United Kingdom deployment to Iraq is code named Operation Telic and is divided into several phases. If personnel were deployed between 18 January and 28 April 2003 they belonged to operation Telic 1; if they were deployed from the 29 April or later they belonged to Operations Telic 2 to 6; if they were not deployed to the Iraq war they were included in the Era

group. The cohort includes only regular personnel, some of whom left the forces during the study.

Information

The full 2002 questionnaire (baseline) included the civilian version of the post-traumatic stress disorder checklist (PCL-C),¹³ the general health questionnaire 12 (GHQ-12) as a measure of psychological distress,¹⁴ 15 physical symptoms selected from a previously used questionnaire,¹⁵ a self assessment of health status from the SF-36,¹⁶ and three questions from the World Health Organization's alcohol use disorders identification test questionnaire (WHO Audit) to assess alcohol use.¹⁷ The abridged 2002 questionnaire included a post-traumatic stress disorder checklist, reduced from 17 to 14 items, a selection of four items from the GHQ-12 following published criteria,¹⁸ five of the 15 symptoms of the full questionnaire, and a question on self perception of health. We excluded questions on alcohol use.

The questionnaire administered after deployment included the full version of the same psychological scales used in the previous study but included 53 physical symptoms. Information was also obtained on sex, age, rank, the number of previous deployments, and, in the initial survey, medical downgrading. Medical downgrading refers to the system of assessment of fitness and employability of service personnel based on a medical examination. Table 1 shows the criteria for caseness for the psychological scales.

Analysis

We assessed the validity of the baseline questionnaire in predicting mental disorders in the follow-up

Table 2 Characteristics of respondents according to deployment on Telic operations. Figures show numbers (percentages) unless stated otherwise

	Era (n=1216)	Telic 1 (n=383)	Telic 2-6 (n=286)
Baseline			
Service:			
Navy	353 (29.0)	60 (15.7)	31 (10.8)
Army	557 (45.8)	192 (50.1)	160 (55.9)
RAF	306 (25.2)	131 (34.2)	95 (33.2)
Ranked below officers	946 (77.8)	286 (74.7)	228 (79.7)
Mean (SD) age (years)	33.8 (7.7)	32.2 (7.0)	30.8 (7.2)
Men	1115 (91.7)	359 (93.7)	266 (93.0)
Medically downgraded	160 (13.2)	40 (10.4)	28 (9.8)
Cases (from both questionnaires*) according to:			
GHQ	270 (22.2)	64 (16.7)	47 (16.4)
PTSD	32 (2.6)	6 (1.6)	7 (2.4)
Symptoms	212 (17.4)	55 (14.4)	41 (14.3)
Self perception of health	153 (12.6)	37 (9.7)	33 (11.5)
Cases† (from full questionnaire) according to:			
GHQ	138 (22.5)	27 (15.9)	20 (12.7)
PTSD	13 (2.1)	3 (1.8)	5 (3.2)
Symptoms	196 (31.9)	49 (28.8)	43 (27.4)
Alcohol misuse	59 (9.6)	20 (11.8)	23 (14.6)
Cases at follow-up according to measure			
GHQ	240 (19.7)	64 (16.7)	54 (18.9)
PTSD	37 (3.0)	5 (1.3)	9 (3.1)
Symptoms	387 (31.8)	104 (27.2)	82 (28.7)
Self perception of health	162 (13.3)	44 (11.5)	37 (12.9)
Alcohol misuse	154 (12.7)	76 (19.8)	47 (16.4)

Era=personnel not deployed to Iraq; Telic 1= personnel deployed to Iraq 18 January to 28 April 2003; Telic 2-6=personnel deployed to Iraq 29 April 2003 or later.

GHQ=general health questionnaire; PTSD=post-traumatic stress disorder.

*From full and abridged questionnaires, using questions common to both.

†In 614 in Era, and 170 in Telic 1 and 157 in Telic 2-6.

Table 3 Caseness at baseline as a predictor of caseness at follow-up in total cohort (n=1885): likelihood ratios, sensitivity, specificity, and positive and negative predictive values (with 95% confidence intervals)

	Positive likelihood ratio	Negative likelihood ratio	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Full and abridged questionnaires (using questions common to both):						
GHQ	2.7 (2.3 to 3.2)	0.69 (0.63 to 0.75)	0.42 (0.36 to 0.47)	0.85 (0.83 to 0.87)	0.39 (0.34 to 0.44)	0.86 (0.84 to 0.88)
PTSD	13.1 (7.2 to 23.8)	0.78 (0.67 to 0.91)	0.24 (0.13 to 0.37)	0.98 (0.97 to 0.99)	0.27 (0.15 to 0.42)	0.98 (0.97 to 0.98)
Symptoms	4.8 (3.8 to 5.9)	0.69 (0.65 to 0.73)	0.36 (0.32 to 0.40)	0.92 (0.91 to 0.94)	0.68 (0.62 to 0.73)	0.77 (0.75 to 0.79)
Self perception of health	5.6 (4.5 to 7.0)	0.63 (0.57 to 0.70)	0.42 (0.35 to 0.48)	0.93 (0.91 to 0.94)	0.45 (0.39 to 0.52)	0.91 (0.90 to 0.93)
Full questionnaire:						
GHQ	3.2 (2.6 to 4.1)	0.64 (0.56 to 0.73)	0.45 (0.37 to 0.52)	0.86 (0.84 to 0.89)	0.44 (0.37 to 0.51)	0.87 (0.84 to 0.89)
PTSD	16.3 (7.1 to 37.2)	0.76 (0.61 to 0.94)	0.25 (0.11 to 0.45)	0.98 (0.97 to 0.99)	0.33 (0.15 to 0.57)	0.98 (0.97 to 0.99)
Symptoms	2.9 (2.4 to 3.5)	0.55 (0.48 to 0.63)	0.56 (0.50 to 0.62)	0.81 (0.78 to 0.84)	0.57 (0.51 to 0.63)	0.80 (0.77 to 0.83)
Alcohol misuse	4.4 (3.1 to 6.3)	0.74 (0.66 to 0.82)	0.32 (0.24 to 0.40)	0.93 (0.91 to 0.95)	0.44 (0.34 to 0.54)	0.88 (0.86 to 0.91)

GHQ=general health questionnaire; PTSD=post-traumatic stress disorder.

questionnaire (end point assessment) in terms of sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios. The analysis was carried out for the subgroup with complete psychological scales and for the total sample by using the items common to the full and abridged questionnaires.

Results

The response rate was 1885 (67%), being higher in officers and older personnel. Psychological health variables in the initial assessment did not predict non-response in the second survey. Caseness according to GHQ, symptoms, and health perception was more common before deployment in the Era than in the Telic groups, but alcohol misuse was higher in the Telic groups (table 2).

We assessed whether caseness before the Iraq war predicted caseness later using items common to the full and abridged questionnaires and for those who completed only the full questionnaire (table 3). With a few exceptions, both analyses gave similar results. The positive likelihood ratio was higher for post-traumatic stress disorder than for the other psychological assessments, though the 95% confidence intervals were wide. The negative likelihood ratio for post-traumatic stress disorder was only 0.78. For the other psychological assessments, the positive likelihood ratio was between 2.7 and 5.6, and the negative likelihood ratio was between 0.55 and 0.69. The negative likelihood ratio for alcohol misuse was only slightly below 1, indicating a low predictability in those who did not drink to excess before. The sensitivity values were low, especially for post-traumatic stress disorder, and specificity values were high, especially for post-traumatic stress disorder and alcohol misuse. The positive predictive value for post-traumatic stress disorder was low because it was uncommon. The negative predictive value for post-traumatic stress disorder was high, indicating that an initial score below the threshold for post-traumatic stress disorder would tend to remain below. For the other psychological assessments the positive predictive value was higher than for post-traumatic stress disorder, but the negative predictive value was much lower. Results

were the same for the analysis restricted to those who were deployed

Discussion

Main findings

This study provides little support for the use of mental health screening before deployment for preventing mental disorders after deployment. For every psychological assessment either the positive predictive value or the negative predictive value was low. The positive likelihood ratio for post-traumatic stress disorder was much higher than for any other psychological assessment, but as the disorder was uncommon (< 3.2%) even with a relatively high positive likelihood ratio the positive predictive value was low. The negative likelihood ratio showed low predictability of a negative case at baseline. Our findings indicate that although there is a meaningful relation between the results of each test before and after the war, the levels of predictability were too low to infer a persistent mental health state.

Our study is unique in that we had data on mental health status in a randomly selected sample of the British armed forces just before planning started for the Iraq war. Thus the assessment before deployment was not coloured by anticipatory anxiety or exhilaration, both commonly seen before deployment.¹⁹ Screening before and after deployment has been implemented by the US Department of Defense, but longitudinal assessments are unavailable.^{19 20} A limitation of our study is the response rate of about 70%, although this compares favourably with other studies in the military²¹ and is as expected considering the high mobility of young military personnel and a high rate of turnover.¹² Possible bias associated with non-completion of the questionnaire cannot be eliminated but those with a possible mental disorder at baseline had a similar response rate in the follow-up to the rest.

Our results should be interpreted in the light of an ongoing discussion of the merits of screening before deployment.^{1 4 22-24} Such screening for assessing mental health before a major conflict has been an issue since the first world war.^{1 2} In the US a recent attempt has been made to develop a battery of psychological tests to be used for screening.^{20 23} This may have been influenced by the high rates of post-traumatic stress disorder in the US armed forces deployed in

What is already known on this topic

Since the aftermath of the first world war there has been an ongoing discussion on the benefits of screening military personnel for mental health vulnerability before deployment

What this study adds

Screening before deployment has a low predictability for most common mental health conditions

The predictability of screening for post-traumatic stress disorder is higher than for any other mental health problem

As the prevalence of post-traumatic stress disorder is low before deployment, screening for the condition would be inappropriate despite a moderately high predictability

Iraq—18% in the army and nearly 20% in the marines, in contrast with 4% of the UK armed forces.^{12 19}

The findings in context

Our results suggest that psychological symptoms tend to persist for all our measures regardless of deployment. With the exception of post-traumatic stress disorder, however, the likelihood ratios, positive and negative, suggest implementation of a screening programme would be an imperfect way of identifying individuals with mental health symptoms. Our results are equivalent to those published over 50 years ago that showed that although there was an association between those originally identified as unsuitable to serve in the armed forces, over time most had only sporadic problems.^{22 25} Caseness related to the general health questionnaire, physical symptoms, and alcohol misuse is common in the civilian population and in the military. The application of these tests for screening would create great difficulties given the stigma associated with mental health problems,^{10 19} have serious resource implications, develop an unsustainable staffing shortage, and might have an adverse effect on morale.

We have focused only on the assessment of the instrument. This must be considered with the question of acceptability, effectiveness, and side effects of screening and treatment. Issues related to efficient organisation of the scheme should also be thoroughly assessed. For example, only 22% of those above the threshold for post-traumatic stress disorder in the US military were referred for further mental health evaluation.²⁶ In both the US and UK militaries there remains considerable reluctance to admit to mental health problems because of stigma and the perception of negative effects on career. Until these are addressed, screening would continue to be ineffective.

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- Jones E, Hyams KC, Wessely S. Screening for vulnerability to psychological disorders in the military: an historical survey. *J Med Screen* 2003;10:40-6.
- Shepherd B. *A war of nerves: soldiers and psychiatry 1914-1994*. London: Jonathan Cape, 2000.
- Implementation and application of joint medical surveillance for deployment. DoD Instruction No 6490.3, 1997. http://amsa.army.mil/documents/DoD_PDFs/dodinstrct_implmnt64903.pdf (accessed 25 Jan 2005).
- Wright KM, Huffman AH, Adler AB, Castro CA. Psychological screening program overview. *Mil Med* 2002;167:853-61.
- Orr DW. Objectives of the selective service psychiatric classification. *Bull Menninger Clin* 1941;5:131-3.
- Salmon T. The care and treatment of mental diseases and war neuroses ("shell shock") in the British Army. *Mental Hygiene* 1917;1:529-30.
- Sutton D. The utilisation of psychiatry in the armed forces. *Psychiatry* 1939;2:133.
- Appel JW, Beebe GW, Hilger DW. Comparative incidence of neuropsychiatric casualties in world war I and world war II. *Am J Psychiatry* 1946;103:196-9.
- Brill NQ, Beebe GW. Some applications of a follow-up study to psychiatric standards for mobilization. *Am J Psychiatry* 1952;109:401-10.
- Rona RJ, Jones M, French C, Hooper R, Wessely S. Screening for physical and psychological illness in the British armed forces. I: The acceptability of the programme. *J Med Screen* 2004;11:148-53.
- Rona RJ, Hooper R, Jones M, French C, Wessely S. Screening for physical and psychological illness in the British Armed Forces. III. The value of a questionnaire to assist a medical officer to decide who needs help. *J Med Screen* 2004;11:158-61.
- Hotopf M, Hull L, Fear N, Browne T, Horn O, Iversen A, et al. The health of UK military personnel who deployed to the 2003 Iraq war: a cohort study. *Lancet* 2006;367:1731-41.
- Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD checklist (PCL). *Behav Res Ther* 1996;34:669-73.
- Goldberg D, Williams P. *A user's guide to the general health questionnaire*. NFER-Nelson: Windsor, 1988.
- Unwin C, Blatchley N, Coker W, Ferry S, Hotopf M, Hull L, et al. Health of UK servicemen who served in Persian Gulf War. *Lancet* 1999;353:169-78.
- Ware J, Snow K, Kosinski M, Gandek B. *SF-36 health survey manual and interpretation guide*. Boston, MA: Health Institute, New England Medical Center, 1993.
- Barbor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. *The alcohol use disorders test: guidelines for use in primary care*. 2nd ed. Geneva: World Health Organization, 2001.
- Jacobsen B, Hasvold T, Høyer G, Hansen V. The general health questionnaire: how many items are really necessary in population surveys? *Psychol Med* 1995;25:957-61.
- Hoge C, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *N Engl J Med* 2004;351:13-22.
- Hoge CW, Auchterlonie JL, Milliken CS. Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq and Afghanistan. *JAMA* 2006;295:1023-32.
- Barrett D, Gray G, Doebbeling BN, Clauw DJ, Reeves WC. Prevalence of symptoms and symptom based conditions among Gulf War veterans: current status of research findings. *Epidemiol Rev* 2003;24:218-27.
- Aita J. Efficacy of brief interview method in predicting adjustment: 5 year follow-up study of 304 Army inductees. *Arch Neurol Psychiatry* 1949;61:170-8.
- Bliese PD, Wright KM, Adler AB, Thomas JL. Psychological screening validation with soldiers returning from combat. In: Roy MJ, ed. *Novel approaches to the diagnosis and treatment of posttraumatic stress disorder*. Amsterdam: IOP Press, 2006:78-86.
- Rona RJ, Hyams KC, Wessely S. Screening for psychological illness in military personnel. *JAMA* 2005;293:1257-60.
- Egan J, Jackson L, Eanes R. A study of neuropsychiatric rejectees. *JAMA* 1951;145:466-9.
- GAO Report to Congressional Committees. Post-traumatic stress disorder. DOD needs to identify the factors its providers use to make mental health evaluation referrals for servicemembers. GAO-06-397. www.gao.gov/cgi-bin/getrpt?GAO-06-397 (accessed May 2006).

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