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ORIGINAL PAPER

Low-level cognitive ability in young adulthood and other risk factors of depression in an observational cohort study among deployed Danish soldiers

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Abstract

Purpose Evidence exists of an association between pre-morbid lower cognitive ability and higher risk of hospitalization for depressive disorder in civilian cohorts. The purpose of this study was to examine the relationship of cognitive ability at conscription with post-deployment depression and the influence of (1) baseline factors: age, gender, and pre-deployment educational level, (2) deployment-related factors: e.g., war-zone stress and social support, and (3) co-morbid PTSD.

Methods An observational cohort study linking conscription board registry data with post-deployment self-report data. The study population consisted of Danish Army military personnel deployed to different war zones from 1997 to 2015. The association between cognitive ability at conscription and post-deployment depression was analyzed using repeated-measure logistic regression models.

Results Study population totaled 9716 with a total of 13,371 deployments. Low-level cognitive ability at conscription was found to be weakly associated with post-deployment probable depression after adjustment for more important risk factors like gender, education, and deployment-related factors [odds ratio (OR) 0.93, 95% confidence interval (CI) 0.88–0.99]. The co-occurrence rate with PTSD was nearly 60%. When adding co-morbid PTSD as an independent variable, the association between cognitive ability and probable depression became insignificant, OR 0.95, CI 0.89–1.02.

Conclusions Low cognitive ability at conscription is a risk factor for depression among returning military personnel, but unimportant compared to gender, education, and deployment-related factors. Part of this effect may be related to co-morbid PTSD. Use of cognitive ability score as an isolated selection tool cannot be recommended because of low predictive performance.

Keywords Depression · Cognitive ability · Military · PTSD · Epidemiology

Introduction

Armed conflicts are increasingly recognized as having long-term detrimental consequences for the mental health of combatants [1]. In particular, there is substantial evidence for a link between participation in combat and post-traumatic stress disorder (PTSD) [2, 3], while the influence of military deployment on depression is less well studied. There is evidence of a PTSD-depression co-morbidity both in general [4] and when PTSD is combat-related [5]. Whether there are risk factors specifically associated with depression in a military context has only been addressed in very few studies [6, 7]. Some studies indicate, however, that deployment with combat exposure is a risk factor for new-onset major depression [8–10]. In a study of 1560 marines deployed to Iraq or

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Afghanistan, five variables were found to be significantly associated with depression; combat exposure, deployment-related stressors, attitudes towards leadership, mild traumatic brain injury, and marital status [7]. As this study had a cross-sectional design, it was not possible to establish the direction of the associations.

To our knowledge, no longitudinal prospective studies have examined risk factors or vulnerability factors for depression after military deployment.

There is considerable interest in efforts to prevent post-deployment mental disorders [11]. A possible vulnerability factor is pre-deployment cognitive ability, which is tested as a part of the conscription procedures or recruit assessment programs in several countries, including Denmark [12, 13]. There is strong evidence of associations of young adult (premorbid) lower cognitive ability with higher risk of schizophrenia [14], and with hospitalization for other non-organic mental disorders, including major depression, which have been found in several studies [15–19]. In a questionnaire-based study, pre-deployment psychological screening has proven largely ineffective [20], while a more recent study involving pre-deployment mental health assessments by primary care providers showed that screening was associated with reduction in occupationally impairing mental health problems [11]. It is important to identify potential vulnerability factors such as cognitive ability possibly contributing to elevated risk of later psychological morbidity, as periodic mental health assessments are a part of the selection process before troops reach the battlefield [21]. We are not aware of studies that have examined the possible association between cognitive ability in young adulthood and risk of post-deployment depressive symptoms. Therefore, the overall aim of this study was to examine the influence of cognitive ability evaluated at time of conscription on the risk of post-deployment depression in a longitudinal timeframe while adjusting for other factors recorded at time of conscription and potential deployment-related risk factors such as rank, war-zone stress level, and social support.

Our primary aim was to examine the relationship between pre-deployment cognitive ability and post-deployment depression and the effect on this relationship of (1) age, gender, and educational level at the time of conscription, (2) deployment-related factors, and (3) co-morbid PTSD. The secondary aim was to examine the performance of cognitive ability as a predictor for post-deployment depression.

Methods

Study design and population

The study was an observational cohort study linking conscription board registry data with post-deployment self-reported data. The study population consisted of Danish Army military personnel deployed to different war zones including the former Yugoslavia, Iraq, and Afghanistan.

The data sources include conscription board examination data and data from the "Psychological Reactions following International Missions" (PRIM) questionnaire, which all deployed Danish Army military personnel have been invited to complete 6–8 months after deployment since 1998. The conscription board examination includes a test of cognitive ability, a physical examination, and self-reported data, e.g., on educational level. These data are from now on termed baseline variables. The PRIM database contains questionnaire data on personal characteristics, exposures during deployment, and psychological symptoms in the most recent 3 months before receiving the questionnaire, from which measures of depression and PTSD could be derived. These data are from now on termed deployment-related variables. The response rate for the PRIM questionnaire is on average 65% resulting in self-reported variables including psychological symptoms measured post-deployment from more than 21,000 deployments of about 14,600 Danish Army military personnel. Full details of the data sources and the collection of data are described in a study of the association between cognitive ability and PTSD [22]. The PRIM database has been updated, since the publication of the previous study and the present study includes deployments in the period 1997–2015.

The study population was created by merging data from the conscription board examinations and the PRIM database. A limiting prerequisite for establishing the study population was complete data on the variables (a) baseline: cognitive ability and educational level and (b) deployment-related: depression measure and PTSD measure. The study was approved by the Danish Data Protection Agency. As the study was based solely on registry and questionnaire data, no approval from the Committee on Health Research Ethics was needed.

Exposure variable

The baseline exposure variable was the total score on the Børge Prien's Prøve (BPP) test of cognitive ability [13]. A score of at least 28 correct answers is a prerequisite for being fit for military service. It has been shown that BPP has a satisfactory reliability and validity [23]. In our study population, the BPP test score was converted by linear transformation to a score with mean of 100 and a standard deviation (SD) of 15 to obtain a more familiar metric. This transformed score is referred to as the cognitive ability score. This score was applied in our previous study on the association between cognitive ability and PTSD [22].

Outcome variables

The PRIM-depression scale consists of ten items addressing different symptoms of depression. The measure has been validated using Rasch models (RM) [24], and an eight-item version of the PRIM-depression scale fitted a pure RM without any differential item functioning. Thus, the eight-item PRIM-depression total score provides a sufficient statistic, and the raw score can be applied as a measure of depression [24]. To establish cut-off scores for the eight-item PRIM-depression scale for categorizing individuals with high levels of depression symptomatology, we conducted a Receiver Operating Characteristics (ROC) Curve analysis (see Supplementary material). We found a PRIM-depression score of 6 was a relevant cutoff for depression screening, that is, for identifying those, that might need further assessment or clinical attention. This category was labelled possible depression. Furthermore, we found that a PRIM-depression score of 7 was a relevant cutoff for identifying those with a likely clinical depression in this sample. This category was labelled probable depression. Probable depression had a higher positive predictive value than possible depression, while the negative predictive value was similar in both measures. Therefore, we analyzed the adjusted associations of cognitive ability with the most severe outcome, probable depression. In a sensitivity analysis, the associations were also tested using possible depression as an outcome.

Covariates

Baseline variables included age, gender, and educational level at conscription time. Educational level was coded in two categories: (1) low or middle level of schooling (primary school only and secondary school unfinished) or vocational training and (2) high level (secondary school completed or higher education).

The deployment-related variables were age at deployment, cohabiting status at deployment, military rank during deployment, perceived social support during and after deployment, and perceived war-zone stress during deployment. The variables social support, during and after deployment, and perceived war-zone stress are described elsewhere [22]. PTSD and depression are known to co-occur [4]. To assess a potential effect of co-morbid PTSD on the relationship between cognitive ability and depression, we used a dichotomous measure of PTSD as a covariate. We applied the PRIM–PTSD scale with cut-off value 29.5 (probable PTSD) [22, 25].

Statistical analysis

For study participants with multiple deployments, outcome data were correlated, and consequently data were analyzed with multi-level logistic regression models allowing for repeated measures. The explained variance of all models was evaluated using McFadden's pseudo R-squared statistic [26]. Only variables with a Wald test p value lower than 0.25 were included in the final models. Cognitive ability score was expected to correlate moderately or even strongly with educational level, because educational attainment could represent essential aspects of cognitive ability leaving open the possibility of interaction between these variables [27]. This was tested using a likelihood-ratio test.

For both outcomes (possible and probable depression), models with cognitive ability score as the main exposure variable were created. First, models including only baseline variables were conducted. Second, models including baseline variables and deployment-related variables were conducted.

As noted above, depression is a common disorder co-morbid with PTSD, and the relationship between cognitive ability and depression could be influenced by PTSD [4, 5]. Figure 1 shows a diagram showing the underlying assumptions of associations and causality between the variables of interest governing the statistical analyses with focus on the role of PTSD. In the diagram, a possible confounding effect of education and a possible mediating effect of military rank is indicated as well. To test the potential influence of PTSD on the relationship between cognitive ability and probable depression, models including probable PTSD were examined. Two models were analyzed for comparison in this context, one without and one including perceived war-zone stress (model 1 and model 2), as this variable was expected to be correlated with probable PTSD, as indicated in Fig. 1. The nature of the effect of PTSD was examined by likelihood ratio testing of interaction between this factor and cognitive ability and subsequent analysis of mediation. The analysis of whether PTSD could be regarded as a mediating

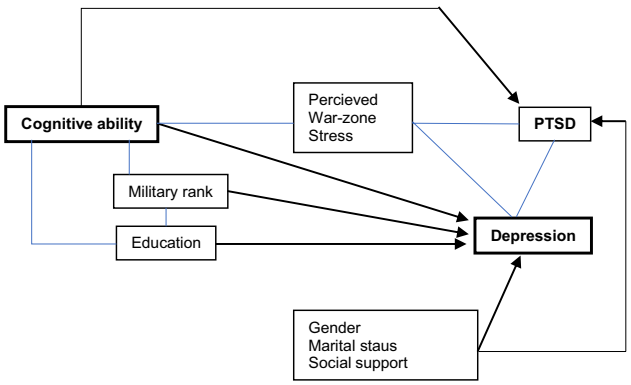

Fig. 1 Diagram showing the relations between the exposure variable cognitive ability and other independent variables and outcome Depression. Assumed causal relations are indicated by directed lines with arrows. Relations, where the causal direction is uncertain, are indicated by lines without arrows

variable was done using the principles of statistical mediation analysis in the four steps recommended by Baron and Kenny [28], that is, showing that cognitive ability is correlated with depression (step 1), showing that cognitive ability is correlated with PTSD (step 2), showing that PTSD affects depression (step 3), and finally in step 4 determining the size of the potential mediating effect by controlling the association between cognitive ability and probable depression for PTSD.

To evaluate if the cognitive ability score could be used as an indicator of potential mental vulnerability, we examined the performance of the score as a predictive test for post-deployment depression by conducting Receiver Operating Characteristics (ROC) curve analysis for both outcomes. As the test variable, we used the inverse of the cognitive ability score, because increase of the score decreases the risk of post-deployment depression.

The results are presented in the text and in tables as odds ratios (OR) with 95% confidence interval (CI). The nominal statistical significance level was 0.05. Analyses were performed in STATA 15 (Stata Corporation, College Station, Texas; http://www.stata.com).

Results

The study population totaled 9716 with a total of 13,371 deployments. The average age at the time of conscription was 19.6 years (sd 1.52 years).

Table 1 shows the distribution of the cognitive ability score by covariates and outcome variables and the corresponding percentage of post-deployment probable depression. The percentages of questionnaires indicating possible and probable depression were 7.9% and 4.6%, respectively.

When tested, no interaction between cognitive ability and education was found ($p=0.47$).

Table 2 shows the adjusted OR between cognitive ability score and probable depression in a model with only baseline variables (baseline model) and in a model with both baseline and deployment-related variables included (full model). Age at conscription and age at deployment were not included in any of the models due to non-significance ($p>0.25$). In the baseline model, a higher cognitive ability score reduced the risk of probable depression, and this was also the case in the full model after inclusion of deployment-related variables. In the latter case, the OR was 0.93, CI 0.88–0.99, $p=0.03$. Furthermore, Table 2 shows that gender, education, military rank, cohabiting status, social support, and perceived war-zone stress were more strongly associated with probable depression in the full model than cognitive ability. In a sensitivity analysis, similar models were run with the outcome possible depression with comparable results. In this case, though, the fully adjusted association between cognitive ability and possible depression did not reach significance: OR 0.95, CI 0.90–1.00, $p=0.057$.

Finally, a model with outcome probable depression and with inclusion of probable PTSD as an independent variable in addition to baseline and deployment-related variables was conducted. Among those reporting probable PTSD, there were 59.8% with concurrent probable depression, whereas in those not reporting probable PTSD, only 3.14% reported probable depression. A possible interaction between PTSD and cognitive ability was tested and found not to exist ($p=0.09$). Table 3 shows the OR of cognitive ability score in two versions of a model with inclusion of probable PTSD as an independent variable and a slightly different set of other covariates in the model versions. In addition to cognitive ability score and probable PTSD, model 1 included all other variables except for perceived war-zone stress score, and model 2 included all other variables. The inclusion of PTSD attenuated the association between cognitive ability score and probable depression considerably independent of whether perceived war-zone stress score was in the model (OR 0.94, 95% CI 0.88–1.01) or not (OR 0.95, 95% CI 0.89–1.02). A significant mediating effect of PTSD was found; approximately 42% of the effect of cognitive ability on probable depression could be attributed to probable PTSD.

ROC-curve analyses of the inverse of the cognitive ability score showed that the performance of this measure considered as an isolated test for risk of post-deployment depression was very poor for both outcomes. The results of these ROC-curve analyses are described in more detail in the online supplement.

Discussion

In this study, we found that young adult (baseline) cognitive ability score was significantly associated with probable depression measured post-deployment when controlled for other factors known at baseline such as age, educational level, and gender. When including deployment-related covariates in the model in addition to baseline variables, the findings were the following: the association between cognitive ability and probable depression was significant, but at a lower level than other significant factors. Female gender, lower education, lower military rank, being single, low level of perceived social support, and high level of perceived war-zone stress were found to be more important risk factors than lower cognitive ability for the occurrence of both possible and probable depression after returning from the military deployment.

When this model in addition to the factors mentioned above was adjusted for probable PTSD, the relation between cognitive ability and the probable depression was

Table 1 Distribution of cognitive ability and frequency of post-deployment probable depression by variables recorded at conscription time, deployment-related variables, and outcome variables among 9716 Danish Army military personnel

Variables recorded at conscription time (baseline)	Study population[a]			
	Pre-deployment Cognitive ability score[b]		Post-deployment probable depression[a]	
	n[a]	Mean (sd[c])	n[a]	%
Total population	9716	100.6 (14.9)	425	4.4
Year of birth				
1939–1950	172	100.3 (18.0)	1	0.6
1951–1960	436	98.9 (17.6)	12	2.8
1961–1970	32	96.4 (18.6)	4	12.5
1971–1980	4180	100.3 (14.8)	157	3.8
1981–1990	4756	101.1 (14.6)	243	5.1
1991–1994	140	98.7 (14.4)	8	5.7
Gender				
Men	9195	100.5 (14.9)	364	4.0
Women	521	102.6 (14.4)	61	11.7
Educational level at time of conscription				
Low or middle level, vocational training	5739	95.7 (14.1)	288	5.0
High level	3976	107.7 (13.0)	137	3.5
Variables recorded at deployment (deployment-related)	Study population[d]			
	Cognitive ability score[b]		Post-deployment probable depression	
	n[d]	Mean (sd[c])	n[d]	%
Age at deployment				
< 25 years	7102	100.3 (14.6)	331	4.7
25–29 years	3816	99.7 (14.8)	192	5.0
30–39 years	1550	101.8 (15.3)	70	4.5
40–49 years	336	99.0 (19.2)	11	3.3
≥ 50 years	567	97.2 (17.8)	12	2.1
Military rank during deployment				
Private	8668	97.3 (14.9)	466	5.4
Non-commissioned officer, commissioned officer or civilian	4703	105.4 (13.6)	150	3.2
Cohabiting status at deployment				
Married/cohabitant	7945	99.9 (15.1)	310	3.9
Single	5426	100.5 (14.7)	306	5.6
Social support during deployment and after homecoming				
Low–medium	4504	99.9 (15.3)	401	8.9
High	8867	100.2 (14.8)	215	2.4
Perceived war-zone stress score				
Low	4125	100.5 (15.3)	119	2.9
Medium	4407	100.2 (14.8)	156	3.5
High	4839	99.6 (14.8)	341	7.1

Table 1 (continued)

Variables recorded at deployment (deployment-related)	Study population[d]			
	Cognitive ability score[b]		Post-deployment probable depression	
	n[d]	Mean (sd[c])	n[d]	%
Probable PTSD				
No (< 29.5)	12,948	100.2 (15.0)	406	3.1
Yes (≥ 29.5)	341	96.7 (15.0)	204	59.8
Possible depression				
No (< 6)	12,318	100.3 (15.0)	0	0
Yes (≥ 6)	1053	98.3 (14.9)	616	58.5
Probable depression				
No (< 7)	12,755	100.2 (14.9)		
Yes (≥ 7)	616	97.5 (15.0)		

[a]Number of unique persons. In the case of post-deployment probable depression, the value is registered at the first deployment if the person returned post-deployment filled-in questionnaires from several deployments

[b]BPP linear transformed to a scale with mean 100 and standard deviation 15

[c]Standard deviation

[d]The numbers in the table are larger than the actual number of persons, because a person can have returned questionnaires from several deployments

no longer statistically significant, regardless of whether perceived war-zone stress was included in the model. In addition, we found that the relationship between cognitive ability and probable depression was partly mediated by PTSD.

Finally, when evaluating the isolated cognitive ability score by ROC-curve analysis as test for later occurrence post-deployment depression, the predictive performance was found to be very poor.

In Denmark, all conscripts or applicants to a military education are assessed with regard to their health, vision, hearing, and cognitive ability. In most cases, this assessment takes place in the early youth well before participation in deployments is relevant and offers the possibility of identifying vulnerability factors which could increase the risk of mental health consequences occurring as a result of the hardships during military missions. In recent years, it has become clear that pre-morbid cognitive ability is associated with the risk of later major depression [15, 17]. These findings have motivated the investigation of the relation between young adult cognitive ability and the occurrence of depression after deployment. A sufficiently predictive performance of the cognitive ability test could justify the use of this factor in a more rigorous selection strategy with the purpose to prevent the risk of post-deployment depression. However, our results indicate that even if there is a significant association between cognitive ability and the outcomes when baseline factors are adjusted for, it cannot be advised to use the cognitive ability test isolated as a decisive selection tool with regard to the risk of post-deployment depression.

In this study, the main focus was on the role of cognitive ability, but several other risk and protective factors for post-deployment depression such as education, gender, cohabiting status, social support, and perceived war-zone stress were also examined. The findings in our study population support the findings of other studies [6, 7], showing that combat exposure and deployment-related stressors were associated to post-deployment depression, and studies finding that other factors like gender, education, and rank [29] and social support [30] could be important.

The co-occurrence of PTSD and depression in the context of military deployment and combat exposure is well-established. In a meta-analysis including 57 studies of mostly civilian and some military populations, Rytwinski and co-workers found that among persons with PTSD 52% also met the criteria for depressive disorder [4]. In the present study, we found a higher, but comparable co-occurrence rate of 59.8%. On the basis of a thorough review of the literature [5], it was concluded that results of longitudinal studies indicated a causal role of PTSD in the development of co-morbid depression. It was considered less likely that pre-existing depression could be a predictor of combat-related PTSD [5]. These conclusions are supported by recent evidence, which suggests that disaster-related PTSD is a risk factor for subsequent development of postdisaster major depression [31].

Given these considerations, the inclusion of probable PTSD in the model in our study can be interpreted as introducing a major risk factor which is very predictive for probable depression. By comparing the full model for probable depression in Table 2 with model 2 in Table 3, it can be seen

Table 2 Association between probable depressions recorded 6 month post-deployment and cognitive ability score at time of conscription adjusted for other risk factors in Danish Army military personnel evaluated in a multi-level logistic regression model

Explanatory variables (covariates)	Outcome: probable depression	
	Baseline model[a]	Full model[b]
	OR (95% CI)[c]	OR (95% CI)
Cognitive ability score[d] at time of conscription	0.90 (0.85–0.96)	0.93 (0.88–0.99)
Educational level at time of conscription		
Low or middle level, vocational training	1	1
High level	0.62 (0.47–0.81)	0.60 (0.46–0.79)
Gender		
Men	1	1
Women	5.93 (3.93–9.00)	6.00 (3.93–9.19)
Cohabiting status at deployment		
Married/cohabitant		1
Single		1.76 (1.40–2.21)
Military rank at deployment		
Private		1
Non-commissioned officer, commissioned officer or civilian		0.65 (0.50–0.86)
Social support during deployment and after homecoming		
Low–medium		1
High		0.18 (0.14–0.23)
Perceived war-zone stress score		
Low		1
Medium		1.28 (0.94–1.75)
High		3.08 (2.24–4.26)

[a]Model with adjustment for baseline variables (gender, level of education at time of conscript board examination). Only significant covariates other than cognitive ability score are shown

[b]Model with adjustment for gender, level of education at time of conscript board examination, age at deployment, marital status, military rank, social support during and after deployment and danger/injury score (perceived war-zone stress during deployment). Only significant covariates other than cognitive ability score are shown

[c]*OR* Odds ratio, *CI* 95% Confidence Interval

[d]OR for cognitive ability score increased by ½ standard deviation (7.5) is shown

that the effect of adding concurrent PTSD as an independent variable in the model is attenuation of the associations of the other variables with the outcome. In model 2, not only cognitive ability, but also military rank becomes statistically insignificant. These findings reflect the fact that the main part of those reporting high levels of symptoms compatible with depression also reported high levels of PTSD symptoms, even though the questions forming the PRIM-depression scale were non-overlapping and different from those forming the PRIM–PTSD scale. The observations, together with the mediation analysis conducted, suggest that the association found between lower cognitive ability and probable depression was partly mediated by PTSD.

Strengths and limitations

One major study strength is that the present study sample was large, covered deployments to multiple locations and included a broad spectrum of well-known exposures. Furthermore, it did not merely rely on self-reported and cross-sectional data, but was based on a combination of cognitive ability score data (BPP) and self-reported educational level recorded at conscription and questionnaire data recorded post-deployment. However, there may be potential limitations. The risk of post-deployment depression could be influenced by other pre-deployment factors such as personality traits (e.g., neuroticism) [32], childhood adversity and social problems in childhood [33], and pre-existing depressive disorder [11]. Data on these factors were not available in this study, but they are considered to play a minor role in this setting, given the physical and mental health requirements for military personnel. However, we have not measured the mental status before deployment; hence, the results should not be interpreted as an effect of deployment per se. The simultaneous recording of outcome measures and risk information by questionnaires could increase the covariance between the variables, for instance between perceived war-zone stress

Table 3 Effect of co-morbid PTSD on the association between probable depression recorded 6 month post-deployment and cognitive ability score at conscription time in Danish Army military personnel evaluated in two multi-level logistic regression models

Explanatory variables (covariates)	Outcome: probable depression	
	Model 1[a]	Model 2[b]
	OR (95% CI)[c]	OR (95% CI)
Cognitive ability score[d] at time of conscription	0.94 (0.88–1.01)	0.95 (0.89–1.02)
Probable PTSD		
No (< 29.5)	1	1
Yes (≥ 29.5)	139.9 (77.3–253.2)	114.0 (63.0–206.4)
Educational level at time of conscription		
Low or middle level, vocational training	1	1
High level	0.69 (0.52–0.92)	0.66 (0.50–0.88)
Gender		
Men	1	1
Women	4.52 (2.94–6.90)	5.05 (3.26–7.81)
Cohabiting status at deployment		
Married/cohabitant	1	1
Single	1.84 (1.45–2.33)	1.90 (1.49–2.42)
Military rank at deployment		
Private	1	1
Non-commissioned officer, commissioned officer or civilian	0.75 (0.57–0.99)	0.76 (0.57–1.00)
Social support during deployment and after homecoming		
Low–medium	1	1
High	0.24 (0.19–0.31)	0.24 (0.18–0.31)
Perceived war-zone stress score		
Low		1
Medium		1.23 (0.90–1.69)
High		2.07 (1.52–2.81)

[a]Model with adjustment for baseline variables, probable PTSD and deployment-related variables except for perceived war-zone stress score

[b]Model 1, but with perceived war-zone stress score included

[c]*OR* Odds ratio, *CI* 95% confidence interval

[d]OR for cognitive ability score increased by ½ standard deviation (7.5) is shown

and depression. This challenge is present in other published large studies relating to mental health problems among military personnel after deployment [34], and correlation between self-reported exposures and effects has to be expected to some extent. In our study, we estimate the influence of this type of bias negligible. As an example, the addition of perceived war-zone stress to model 1 had little effect on the OR estimates (including PTSD) in model 2. The outcome measure in this study, the PRIM-depression scale in an eight-item version, has been shown to provide a valid tool for comparing levels of depression for deployments that differ in level of threat and combat exposure [24]. The approximately 65% response rate for the questionnaire data left open the possibility of response bias. However, we found the response rate satisfactory, since we analyzed only within-cohort associations. Finally, the study population was a post-deployment sample of military personnel and the results of the study cannot be generalised to the whole military population.

Conclusions

Not only PTSD, but also depressive disorder should be considered a consequence of traumatic exposure which is likely to occur during military deployments [6]. Lower cognitive ability is known to be a risk factor for severe depression in the general population [15, 17], but it has not been demonstrated before that lower cognitive ability is a risk factor for probable depression among returning soldiers. However, the predictive performance of the cognitive ability test was low, and compared with other risk factors, e.g., social support and perceived war-zone stress cognitive ability is a weak risk factor. In addition, the relationship between cognitive ability and post-deployment depression was found to be partly mediated by PTSD.

Implications

Cognitive ability score at time of conscription was found to be a vulnerability factor for post-deployment depression in the presence of other risk factors, but use of cognitive ability score as an isolated selection tool cannot be recommended because of low predictive performance.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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