RESEARCH

Are military personnel with a past history of mental health care more vulnerable to the negative psychological effects of combat?

Mark A. Zamorski,[a] Kimberley Watkins,[b] and Corneliu Rusu[a]

ABSTRACT

Introduction: Military clinicians often need to assess fitness for duty after a mental disorder diagnosis. The ability to respond to the psychological demands of deployment is a primary consideration. This analysis explores whether personnel with past mental health problems are more vulnerable to the effects of combat. **Methods:** Data came from 16,944 Canadian Armed Forces personnel undergoing post-deployment screening in 2009–2012 after deployment in support of the mission in Afghanistan. Those who had previous deployments ($n = 9,852$) and those who were currently in mental health care ($n = 588$) were excluded, leaving 6,504 in the analysis sample. The primary outcomes were the presence of one or more of six common mental health problems assessed by the screening questionnaire and the SF-36 Health Survey Mental Component Summary (MCS), a dimensional measure of general mental health. Logistic and linear regression were used to assess the interaction between past mental health care (a proxy for past mental health) and a 30-item combat exposure scale. **Results:** Past mental health care and combat were strongly and independently associated with both primary outcomes, but no statistically significant interaction was seen for either. **Discussion:** The effects of past mental health and combat on post-deployment mental health are simply additive. Those with past mental health problems are not, on average, more vulnerable to the effects of combat. The variability in outcome at the individual level and the treatability of common mental disorders argue for an individualized approach to fitness-for-duty decisions.

Key Words: combat, mental disorders/statistics and numerical data, military personnel, stress disorders, post-traumatic, use of health services

RÉSUMÉ

Introduction : Les médecins militaires doivent souvent juger de l'aptitude au service suite à un diagnostic de problème de santé mentale. L'habileté à répondre aux demandes psychologiques du déploiement est une considération primaire. Cette analyse vise à mesurer l'impact des problèmes de santé mentale antérieurs sur la vulnérabilité aux effets du combat. **Méthodologie :** Les données proviennent de 16944 membres des Forces armées canadiennes (FAC) qui ont subi le dépistage post-déploiement pendant la période allant de 2009 à 2012 suite à un déploiement dans le contexte de la mission en Afghanistan. Ceux qui avaient déjà été en déploiement (n=9852) et ceux qui étaient déjà suivi des soins de santé mentale (n=588) ont été exclus, laissant 6504 pour l'échantillon d'analyse. Les résultats primaires étaient la présence d'un ou plus des six problèmes de santé mentale mesurés par le questionnaire de dépistage et le score sommaire de la composante mentale SF-36, qui est une mesure dimensionnelle de la santé mentale générale. Une régression logistique et linéaire a été utilisée afin d'évaluer l'interaction entre les soins de santé mentale passés (un proxy de la santé mentale passée) et une échelle d'exposition au combat de 30 items. **Résultats :** Les soins de santé mentale passés et le combat furent fortement et indépendamment associés avec les deux résultats primaires, mais aucune interaction statistiquement significative ne fut observée pour chacun. **Discussion :** Les effets de la santé mentale passée et du combat sur la santé mentale post-déploiement sont simplement additifs. Les participants présentant des problèmes de santé mentale passée ne sont pas, en moyenne, plus vulnérables aux effets du combat. La variabilité des résultats sur le plan individuel et la capacité de traiter les problèmes de santé mentale communs requièrent une approche individualisée lors du processus de décision relatif à l'aptitude au service.

Mots clés : problèmes de santé mentaux/données statistiques et numériques, utilisation des services de santé, combat, personnel militaire, troubles de stress post-traumatique

a   Directorate of Mental Health, Canadian Forces Health Services Group, Ottawa
b   Defence Research and Development Canada, Ottawa

Correspondence should be sent to Mark A. Zamorski at mark.zamorski@forces.gc.ca.

INTRODUCTION

The past decade has seen growing awareness of the prevalence and impact of post-deployment mental health problems in military personnel and Veterans. Although prevalence estimates vary,[1] a recent meta-analysis identified a post-traumatic stress disorder (PTSD) point prevalence estimate of 13% in Iraq-deployed personnel and 7% in Afghanistan-deployed personnel.[2] Mental disorders (whether service related or not) obviously have significant impacts on the well-being of afflicted personnel and those close to them.[3]

Employers feel the impact of mental disorders in the form of absenteeism, impaired productivity, medical care costs, long-term disability, and attrition.[3] In military organizations, these employer effects are magnified: Large numbers of personnel deploy to trauma-prone areas, which results in service-related mental disorders.[4] Medical personnel then need to determine whether the disorders and their consequences interfere with stringent military fitness standards. They often do, resulting in medical attrition.[5] In military organizations, such attrition is presumably particularly costly, given their specialized training requirements.

Understanding risk and protective factors for post-deployment mental health problems may inform these fitness-for-duty decisions. The historical literature focused on post-deployment risk factors, including the presence of post-deployment life stressors and social support.[6] Research over the past decade has focused on the roles of combat exposure[7] and cohesion (vertical and horizontal).[8] More recently, attention has focused on pre-deployment and pre-military factors, including adverse childhood experiences[9] and past mental health.[10,11] These pre-deployment risk factors are most salient for fitness-for-duty decisions because they are often known before exposure to deployment-related adversity.

Pre-deployment mental health is associated with a broad range of post-deployment mental health outcomes. Personnel with a history of suicide attempts are more likely to report post-deployment suicidal ideation,[12] and personnel with poor pre-deployment mental health status are also more likely to report post-deployment PTSD symptoms.[11] This association has been amply demonstrated in civilian studies as well, with poorer pre-trauma mental health predicting PTSD symptoms after exposure to events such as a severe bush fire[13] and to occupational trauma.[14]

Several mechanisms may explain the linkage between past mental health status and post-deployment mental health. Personnel with past mental health problems may have inherent maladaptive cognitive processes that apply to all types of stressful events, including combat experiences, such as anxiety sensitivity, a tendency to ruminate, and negative appraisals of stressors.[15] In support of this, King and colleagues[16] found that personnel who reported early familial problems also perceived more combat exposure and, in turn, were more likely to suffer from post-combat PTSD. Others have shown that the linkage between pre-deployment PTSD and pre-deployment risk factors is indeed partially mediated by war zone threat appraisals.[17] A limited number of international research studies have confirmed greater vulnerability to deployment stressors in those with past mental health problems.[18–20] However, the moderating effect of past mental health status may differ from nation to nation as a function of differences in those selected for military service, in systems of mental care, and other factors.

In this article, we explore this issue using questionnaire data collected at the time of post-deployment mental health screening in Canadian Armed Forces (CAF) personnel who had deployed in support of the mission in Afghanistan. We hypothesized that both past mental health care (a proxy for past mental health problems) and combat exposure would be independently associated with post-deployment mental health. As well, we hypothesized that past mental health care would interact with combat exposure, such that those with a past history of mental health care would be more vulnerable to the adverse psychological consequences of combat.

METHODS

Study population

The study population consisted of all CAF personnel ($N = 16,944$) who deployed in support of the mission in Afghanistan who completed an Enhanced Post-deployment Screening (EPDS) questionnaire from January 2009 to July 2012.

Enhanced Post-deployment Screening process

CAF policy requires that all personnel deployed overseas for more than 59 days undergo the EPDS process between 90 and 180 days after their return.[21] The process consists of completion of a detailed mental health screening questionnaire and a 40-minute semi-structured interview with a mental health professional. Compliance with the EPDS process is at least 76%.[21]

Questionnaire content

The EPDS questionnaire contains questions on sociodemographic and military characteristics that were developed specifically for the EPDS process.

Current and past mental health care were assessed using two questions adapted from the Canadian Community Health Survey Cycle 1.2 – Mental Health and Well-being:[22] "Have you *ever* seen, or talked to on the telephone, a health professional about your emotional or mental health? [Do NOT include routine pre- or post-deployment screening]" and "Are you *currently* seeing a health professional about your emotional or mental health?" Current use of psychiatric medications was assessed using a single item from the Patient Health Questionnaire (PHQ):[23] "Are you taking any medication for anxiety, depression, or stress?" Respondents were categorized into three groups: current care, past care only, and never care.

Combat exposure was assessed using 30 items developed by the US Army determining whether respondents had ever experienced, during their most recent deployment, a range of potentially traumatic events such as "receiving small arms fire," "being wounded/injured," and "seeing ill/injured women or children who you were unable to help." A score reflecting the simple sum of affirmative responses (potential range = 0–30) was calculated.

Two complementary approaches were used to measure post-deployment mental health: First, common mental health problems were assessed using the PHQ[23] and the Patient Checklist for PTSD, Civilian Version (PCL-C).[24] Standard algorithms[23] were used for PHQ major depressive syndrome (major depression), PHQ other depressive syndrome (minor depression), and PHQ other anxiety syndrome (generalized anxiety). For PHQ panic syndrome (panic disorder symptoms), the EPDS questionnaire omitted the symptom checklist for panic attacks;[21] the original algorithm requires four or more symptoms during the last panic attack in addition to endorsing a panic attack in the previous 4 weeks, having had other attacks previously, having had at least one attack "out of the blue," and having been bothered by the attacks or worried about future attacks. Suicidality was assessed using one of the PHQ depression items, "Thoughts that you would be better off dead, or of hurting yourself in some way" during the previous 2 weeks. For PTSD, a cut-off of 50 or higher on the PCL-C was used.[25]

General mental health was assessed using the SF-36 Health Survey[26] Mental Component Summary (MCS).[27] The SF-36 assesses mental and physical health status across eight domains loading on two higher order factors, one of which is captured as the MCS.[27] Domains that contribute strongly to the MCS include current symptoms of anxiety and depression, perceived impact of emotional problems on functioning, and perceived impact of health problems on social functioning.[27] The MCS is norm based,[27] using in the case of this study a large reference population of CAF personnel undergoing post-deployment screening. MCS scores have a mean of 50 and a standard deviation of 10, with higher scores reflecting better mental health.[27]

Primary outcomes

The primary outcomes for this analysis were (1) the presence of one or more of six mental health problems (major depressive syndrome, other depressive syndrome, suicidality, panic syndrome, other anxiety syndrome, or PTSD), hereinafter termed *any mental health problem,* and (2) the SF-36 MCS.

Statistical analysis

To simplify interpretation of results, for individuals who completed more than one EPDS questionnaire (*n* = 972), only the first questionnaire was used for the analysis. In addition, those who had completed other deployments were excluded (*n* = 9,852), so as to lessen possible selection effects. Finally, to keep the focus on the role of past mental health care as a marker for post-deployment mental health, those who were receiving mental health care at the time of their screening were excluded (*n* = 588), resulting in a final analysis data set with 6,504 participants.

Analyses were performed with SAS software, version 9.3 (SAS Institute, Cary, NC). For the outcome of any mental health problem, logistic regression was used to characterize univariate and multivariate associations among past mental health care, combat exposure score, and potential confounders. A similar linear regression approach was used with MCS as the outcome. Variables with an unadjusted association with the outcome were included in multivariate models. Results are reported as odds ratios (ORs) for logistic regression and standardized regression coefficients for linear regression, with their 95% confidence intervals (CIs). After filling in missing values using administrative data, missing data accounted for at most 8.4% of each individual covari-

ate. Listwise deletion was used for regression modeling, resulting in the elimination of 1,284 cases (19.7%).

Ethical aspects

This analysis is part of the CAF's Mild Traumatic Brain Injury Outcome Study, which was approved by an independent Research Ethics Board (Veritas Institutional Review Board, Dorval, QC).

RESULTS

Characteristics of participants

As shown in Table 1, respondents were largely noncommissioned men younger than age 35 years in the Regular Force of the Canadian Army.

Outcomes and key covariates of interest

As shown in Table 2, 7.47% of participants had one or more of the six common mental health problems assessed by the questionnaire, with the most common conditions being other depressive syndrome, major depressive syndrome, and suicidal ideation, which affected 2.95%, 1.70%, and 1.64% of respondents, respectively. The mean MCS score was 51.38 (SD = 8.7). Overall, 11.96% had had past mental health care at the time of their screening. The median number of combat exposures (of a maximum of 30) was 6, with an interquartile range of 2–12. Both Figure 1 and Figure 2 show clear evidence of main effects for past mental health care and combat exposure for both outcomes; no clear evidence of an interaction is apparent for either outcome. The difference in mean MCS scores in those with and without past mental health care (Table 2) was 4.75 (95% CI = 4.46–5.02).

Multiple regression models

Table 3 shows the results of the logistic regression model using any mental health problem as the outcome. As expected, both a past history of mental health care and combat exposure had a strong unadjusted relationship with the outcome. Language, marital status, rank, element, and lag time (from return from deployment to screening) also had an unadjusted relationship and were included along with past history of mental health care and combat exposure in the final adjusted model. The interaction term (past mental health care × combat exposure) was non-significant ($p > 0.05$) and was hence excluded in the final model.

Table 4 shows the analogous results of the linear regression model using general mental health (MCS) as
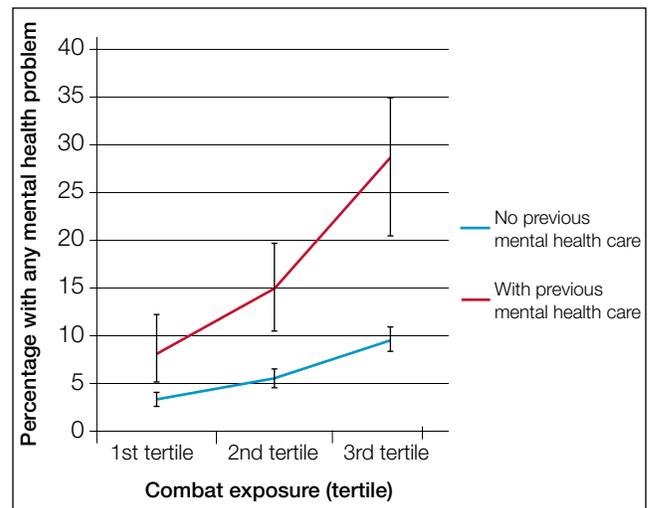

Figure 1. Prevalence of any mental health problem as a function of combat exposure in those with and without a history of mental health care.
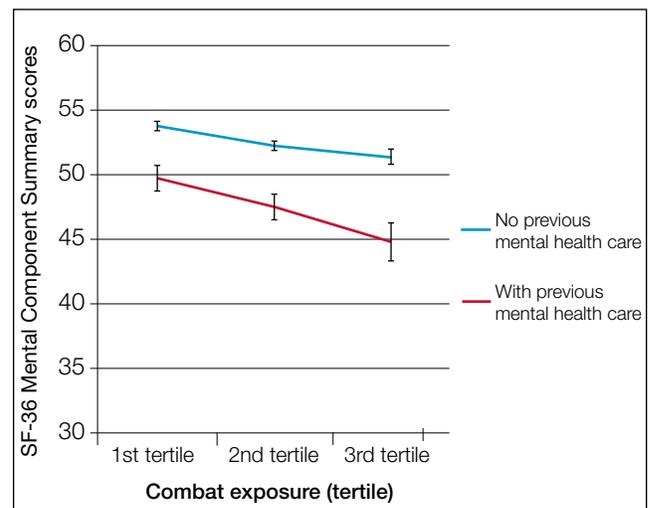

Figure 2. SF-36 Mental Component Summary scores as a function of combat exposure in those with and without a history of mental health care.

the outcome; this confirmed the two main effects seen in Figure 2. All variables except component were included in this adjusted model. Both past mental health care and combat exposure had a significant, independent relationship with the MCS. The interaction term (past mental health care × combat) was again non-significant ($p > 0.05$) and was hence excluded in the final model.

DISCUSSION

Summary of key findings

Respondents with a past history of mental health care had a significantly elevated independent risk (OR = 3.55) of having any of six mental health prob-

Table 1. Sociodemographic and military characteristics of respondents

	n	% (95% CI)
Sex		
Male	5,844	89.88 (89.15–90.61)
Female	658	10.12 (9.39–10.85)
Total	6,502	
Age at time of questionnaire, y		
≤24	2,135	32.86 (31.72–34.00)
25–34	3,202	49.28 (48.06–50.50)
35–44	802	12.34 (11.54–13.14)
≥45	359	5.52 (4.96–6.08)
Total	6,498	
Language		
English	4,855	74.98 (73.93–76.04)
French	1,584	24.46 (23.41–25.51)
Other	36	0.56 (0.38–0.74)
Total	6,475	
Marital status		
Married or living with partner	2,838	43.65 (42.44–44.86)
Single (never married)	3,334	51.28 (50.01–52.56)
Widowed, divorced, or separated	329	5.06 (4.53–5.59)
Total	6,501	
Rank		
Officer	967	14.89 (14.02–15.76)
Senior noncommissioned member*	304	4.68 (4.17–5.19)
Junior noncommissioned member†	5,224	80.43 (79.47–81.39)
Total	6,495	
Component		
Regular Force	5,269	81.01 (80.06–81.96)
Reserve Force	1,235	18.99 (18.04–19.94)
Total	6,504	
Element		
Land	5,266	81.20 (80.25–82.15)
Sea	289	4.46 (3.96–4.96)
Air	930	14.34 (13.49–15.19)
Total	6,485	
Military service, y		
≤5	3,672	56.46 (55.26–57.67)
6–15	2,170	33.36 (32.21–34.51)
≥16	662	10.18 (9.45–10.91)
Total	6,504	
Past mental health care		
No	5,726	88.04 (87.25–88.83)
Yes	778	11.96 (11.17–12.75)
Total	6,504	
Deployment length, mo		
<2	119	1.83 (1.50–2.16)
2–5	842	12.97 (12.15–13.79)
6–8	5,144	79.24 (78.25–80.23)
≥9	387	5.96 (5.38–6.54)
Total	6,492	
Lag time between return from deployment and questionnaire completion, d		
<90	757	12.70 (11.85–13.55)
90–180	3,525	59.15 (57.90–60.90)
181–365	1,375	23.07 (22.00–24.14)
≥366	302	5.07 (4.51–5.63)
Total	5,959	

* Sergeant or equivalent and above.
† Master Corporal and equivalent or below
CI = confidence interval.

Table 2. Prevalence of mental health problems and SF-36 Mental component summary scores in those with and without a history of mental health care

Problem*	Overall		Without history of mental health care		With a history of mental health care	
	n/N	% (95% CI)	*n/N*	% (95% CI)	*n/N*	% (95% CI)
Post-traumatic stress disorder	77/6,496	1.19 (0.93–1.45)	47/5,718	0.82 (0.59–1.05)	30/778	3.86 (2.51–5.21)
Major depressive syndrome	110/6,475	1.70 (1.39–2.01)	76/5,706	1.33 (1.03–1.63)	34/769	4.42 (2.97–5.87)
Other depressive syndrome	191/6,477	2.95 (2.54–3.36)	153/5,706	2.68 (2.26–3.10)	38/771	4.93 (3.40–6.46)
Suicidal ideation	106/6,472	1.64 (1.33–1.95)	72/5,701	1.26 (0.97–1.55)	34/771	4.41 (2.96–5.86)
Panic syndrome	59/6,168	0.96 (0.72–1.20)	36/5,475	0.66 (0.45–0.87)	23/693	3.32 (1.99–4.65)
Other anxiety syndrome	79/6,406	1.23 (0.96–1.50)	57/5,644	1.01 (0.75–1.27)	22/762	2.89 (1.70–4.08)
Any of six mental health problems	459/6,144	7.47 (6.81–8.13)	343/5,439	6.31 (5.66–6.96)	116/705	16.45 (13.71–19.19)
	Mean	95% CI	Mean	95% CI	Mean	95% CI
SF-36 Mental Component summary score	51.38	51.17–51.60	51.95	51.74–52.16	47.21	46.42–48.00

*See Methods section for case definitions.
CI = confidence interval.

lems, and they also had significantly lower MCS scores (Mean 4.74 [SD 0.5] points). As expected, combat exposure was a strong, independent predictor of both outcomes. However, we could not detect any statistically significant interactions between past mental health care and combat exposure for either outcome.

Comparison with other findings

Many other studies have documented the association of past mental health (captured in several ways, including past use of mental health care) with post-deployment mental health problems.[11,12] Similar results have, of course, been seen in many civilian studies on predictors of mental health.[13,14] Similarly, the effect of combat on mental health has been amply demonstrated.[7,28]

Few past studies have explicitly looked for an interaction between past mental health and combat or other forms of adversity. Larsson et al.[18] found that trait anxiety, measured before deployment, significantly interacted with peacekeeping deployment stressors, with members reporting high trait anxiety incurring a slightly stronger negative psychological impact when faced with heavier deployment stressor exposure. Others have shown analogous interaction of pre-deployment negative affectivity with combat exposure.[20] Finally, military personnel with pre-deployment PTSD and high combat exposure showed a slight increase in pre- to post-deployment PTSD symptoms, whereas those with pre-deploy-

ment PTSD and low combat exposure actually showed a decrease in PTSD symptomatology.[19] The divergence of our findings (no significant interactions) from these earlier findings (small interactions) may be traceable to differences in methods, the study populations, and indeed the entire organizational context.

Strengths and limitations

The primary strength of this analysis is the large sample size, which should have facilitated the detection of even small interactions, particularly for a continuous outcome such as the MCS score. The use of two complementary mental health measures, including a continuous general mental health measure, is another strength, as is the use of a precise measure of largely objective combat experiences as opposed to more subjective stressor measures.

The primary limitation is the cross-sectional nature of the data and, in particular, the use of self-reported past mental health care as a proxy for past mental health status. We cannot be certain whether the past care occurred before or after the mental health problems identified during post-deployment screening. We excluded those who were currently in mental health care to partially address this limitation. Some of those who reported past care only may, however, have had their first episode of a mental health problem and their first care for it only after deployment-related trauma exposure but were no longer in care at the time of the screening. For

Table 3. Unadjusted and adjusted association of past mental health and combat exposure with any mental health problem

	OR (95% CI)	p	Adjusted OR (95% CI)	p*
Sex				
Male (Ref.)	1.00			
Female	1.27 (0.95–1.71)	0.11		
Age at time of questionnaire, y				
≤24				
25–35	1.15 (0.84–1.57)	0.38		
35–44 (Ref.)	1.00			
≥45	1.03 (0.63–1.71)	0.89		
Language				
English	2.15 (1.64–2.82)	<0.001	1.96 (1.44–2.65)	<0.001
Non-English (Ref.)	1.00		1.00	
Marital status				
Married or living with partner (Ref.)	1.00		1.00	
Single (never married)	1.00 (0.82–1.23)	0.96	0.82 (0.65–1.03)	0.09
Widowed, divorced, or separated	1.86 (1.29–2.68)	<0.001	1.70 (1.11–2.59)	0.014
Rank				
Officer (Ref.)	1.00		1.00	
Senior noncommissioned member†	2.33 (1.33–4.06)	0.003	2.11 (1.15–3.88)	0.016
Junior noncommissioned member‡	2.43 (1.69–3.49)	<0.001	2.12 (1.42–3.17)	<0.001
Component				
Regular Force	1.05 (0.82–1.35)	0.68		
Reserve Force (Ref.)	1.00			
Element				
Land	1.74 (1.26–2.41)	<0.001	1.36 (0.92–2.02)	0.13
Sea	1.41 (0.80–2.50)	0.24	1.66 (0.84–3.29)	0.15
Air (Ref.)	1.00		1.00	
Military service, y				
≤5	1.21 (0.86–1.70)	0.28		
6–15	1.14 (0.79–1.63)	0.48		
≥16 (Ref.)	1.00			
Past mental health care				
No (Ref.)	1.00		1.00	<0.001
Yes	2.93 (2.33–3.67)	<0.001	3.55 (2.74–4.62)	
Deployment length, mo				
<2 (Ref.)	1.00			
2–5	1.08 (0.45–2.58)	0.87		
6–8	1.52 (0.67–3.49)	0.32		
≥9	1.37 (0.55–3.41)	0.50		
Combat exposure score	1.07 (1.06–1.09)	<0.001	1.08 (1.06–1.10)	<0.001
Lag time between return from deployment and questionnaire completion, d				
<90	1.27 (0.67–2.42)	0.46	1.34 (0.69–2.58)	0.38
90–180	1.98 (1.12–3.50)	0.018	1.61 (0.89–2.91)	0.11
181–365	1.43 (0.78–2.60)	0.24	1.31 (0.71–2.44)	0.39
≥366 (Ref.)	1.00			

*Variables included in adjusted model include language, marital status, rank, element, past mental health care, combat exposure, and lag time between return from deployment and questionnaire completion.
†Sergeant or equivalent and above.
‡Master Corporal and equivalent or below.
OR = odds ratio; CI = confidence interval; Ref. = reference category.

Table 4. Unadjusted and adjusted association of past mental health and combat exposure with general mental health

	Unadjusted β coefficient (95% CI)	p-value for unadjusted β	β coefficient for adjusted model (95% CI)	p-value for β in adjusted model*
Sex				
Male (Ref.)				
Female	−1.04 (−1.74 to −0.34)	0.003	−1.42 (−2.19 to −0.66)	<0.001
Age at time of questionnaire, y				
≤24	−0.02 (−0.72 to 0.69)	0.96	0.54 (−0.38 to 1.46)	0.25
25–35	−0.63 (−1.30 to 0.04)	0.07	−0.28 (−1.08 to 0.52)	0.49
35–44 (Ref.)				
≥45	1.46 (0.38–2.54)	0.008	0.79 (−0.39 to 1.96)	0.19
Language				
English	−0.81 (−1.30 to −0.32)	0.001	−0.32 (−0.84 to 0.20)	0.23
Non-English (Ref.)				
Marital status				
Married or living with partner (Ref.)				
Single (never married)	−0.08 (−0.51 to 0.36)	0.73	0.15 (−0.36 to 0.66)	0.56
Widowed, divorced, or separated	−2.04 (−3.03 to −1.05)	<0.001	−1.48 (−2.55 to −0.42)	0.006
Rank				
Officer (Ref.)				
Senior noncommissioned member†	−1.45 (−2.57 to −0.33)	0.011	−1.24 (−2.51 to 0.02)	0.054
Junior noncommissioned member‡	−1.456 (−2.06 to −0.87)	<0.001	−1.15 (−1.83 to −0.48)	<0.001
Component				
Regular Force	0.03 (−0.51 to 0.56)	0.93		
Reserve Force (Ref.)				
Total				
Element				
Land	−1.53 (−2.14 to −0.93)	<0.001	−0.68 (−1.38 to 0.02)	0.06
Sea	−1.44 (−2.59 to −0.29)	0.014	−1.64 (−2.98 to −0.29)	0.017
Air (Ref.)				
Military service, y				
≤5	−1.05 (−1.77 to −0.33)	0.004	−0.37 (−1.40 to 0.65)	0.48
6–15	−1.42 (−2.18 to −0.66)	<0.001	−0.86 (−1.85 to 0.13)	0.09
≥16 (Ref.)				
Past mental health care				
No (Ref.)				
Yes	−4.74 (−5.38 to −4.10)	<0.001	−4.65 (−5.35 to −3.95)	<0.001
Deployment length, mo				
<2 (Ref.)				
2–5	−1.18 (−2.85 to 0.49)	0.17	−1.14 (−2.93 to 0.65)	0.21
6–8	−2.68 (−4.26 to −1.09)	<0.001	−1.94 (−3.65 to −0.23)	0.026
≥9	−3.72 (−5.50 to −1.93)	<0.001	−3.62 (−5.53 to −1.72)	<0.001
Combat exposure score	−0.19 (−0.22 to −0.16)	<0.001	−0.21 (−0.25 to −0.17)	<0.001
Lag time between return from deployment and questionnaire completion, d				
<90	−1.20 (−2.35 to −0.05)	0.041	−1.49 (−2.64 to −0.34)	0.011
90–180	−1.48 (−2.49 to −0.47)	0.004	−1.62 (−2.65 to −0.59)	0.002
181–365	−0.73 (−1.80 to 0.35)	0.18	−1.06 (−2.14 to 0.02)	0.06
≥366 (Ref.)				

*Variables included in adjusted model include language, marital status, rank, element, past mental health care, combat exposure, and lag time between return from deployment and questionnaire completion.
†Sergeant or equivalent and above.
‡Master Corporal and equivalent or below.
OR = odds ratio; CI = confidence interval; Ref. = reference category.

such individuals, past mental health care is an unsatisfying measure of pre-trauma mental health, and this could have interfered with our ability to detect an interaction with combat exposure. However, we believe that this would be a small group on the basis of survey data collected showing that only 5% had sought care while deployed.[29]

In addition, the population with past mental health care was presumably a heterogeneous mixture of those who had very minor problems, those who had more serious problems but who become more resilient during care, and those who had more serious problems but for whatever reason had failed to benefit from mental health care fully, leaving them with ongoing vulnerability to stressors. The group that had not sought care was also a presumably heterogeneous group of those who had good mental health and had not sought care for that reason and those who had impaired mental health but happened not to have sought care. As such, our findings of the relationship between combat and post-deployment health represents a blended dose–response relationship that may be different in each of these subgroups.

The non-anonymous nature of the data collection is also an important limitation; data collected in screening settings significantly underestimate the true prevalence of mental health problems.[30] This was part of our rationale for the use of the MCS, an instrument that may be more sensitive and less transparent, as a second primary outcome. Nevertheless, our failure to confirm earlier findings demonstrating significant interactions between pre-deployment mental health and deployment stressors may relate to the context of data collection in our study (a clinical screening process, more reflective of real-life circumstances) and in the other studies (research projects with stronger confidentiality protections).

The exclusion of the substantial number of personnel who had deployed previously is another limitation. We did this because the development of mental health problems after one deployment can influence the likelihood of being deemed fit for a subsequent one. Our results might have been different (and harder to interpret) among multiple deployers.

Finally, we did not have a non-deployed comparison group of those with and without a history of mental health care. However, we had substantial numbers with low levels of combat exposure. It is conceivable that this group was either exquisitely sensitive to even low levels of combat or that deployment stressors other than com-

bat contributed heavily to their mental health. However, other work has shown that those with low levels of combat have a similar (or even lower) risk of mental disorders than those who never deployed at all.[28,31] We thus believe that this low-combat group serves as a reasonable proxy for mental health in the absence of deployment.

Implications

Health professionals in military organizations increasingly face decisions about fitness for duty among those who have a history of mental health problems. Our findings and those of others suggest that although personnel with a past history of mental health care are at increased risk for post-deployment mental health problems, they would be at increased risk for mental health problems even if they never deployed at all. Combat exposure, on average, adds to this risk (as it does for personnel who do not have a history of past mental health care), but not disproportionately, at least within the CAF. These considerations apply to the average dose–response relationship between combat and post-deployment mental health problems. However, the variation in post-deployment mental health outcomes from person to person (again, among both those with and without pre-existing mental health problems) suggests that the slope of this dose–response relationship (Figures 1 and 2) differs accordingly.

Using any mental health problem as an outcome, many of those with a past history of mental health problems did well post-deployment, with or without combat. For example, two-thirds of those with a past history of mental health care in the highest tertile of combat exposure were free of the six mental health problems assessed (Figure 1). Finally, even if mental health problems develop, they are treatable, with a good clinical outcome for most.

Our findings thus argue for an individualized approach to fitness-for-duty decisions among those with a history of mental health problems. Factors to consider might include the nature of ongoing treatment (and its availability while on deployment), current symptom burden and functional impairment, past level of impairment while ill, performance on exercises or in garrison, past response to treatment, the predicted extent of trauma exposure on a given operation, and the values and preferences of personnel.

Future research may clarify which personnel with a history of mental health problems will do well and which will not. In particular, exploration of the inter-

action between combat and mental health in different subgroups with mental disorders (e.g., those who completed therapy successfully and those who did not) will be helpful. Finally, research on interventions to prevent relapse of mental disorders is clearly needed. Such interventions will pay dividends for those who deploy and those who do not.

CONCLUSIONS

Our findings demonstrate that the increased risk of post-deployment mental health problems seen in personnel with a past history of mental health care represents simply the sum of their incremental risk related to their past history of mental health problems (which they would have independent of deployment) and the incremental risk related to exposure to combat (which is similar to that seen in those without a history of mental health problem). The variability in resilience to trauma at the individual level and the largely favourable outcomes after treatment of deployment-related conditions argue for individualization of decisions surrounding fitness for deployment in those with a history of mental health care.

REFERENCES

1. Sundin J, Fear NT, Iversen A, et al. PTSD after deployment to Iraq: conflicting rates, conflicting claims. Psychol Med. 2010;40(3):367–82. http://dx.doi.org/10.1017/S0033291709990791. Medline:19671210

2. Hines LA, Sundin J, Rona RJ, et al. Posttraumatic stress disorder post Iraq and Afghanistan: prevalence among military subgroups. Can J Psychiatry. 2014;59(9):468–79.

3. Karney BR, Ramchand R, Chan-Orsilla K, et al. Predicting the immediate and long-term consequences of post-traumatic stress disorder, depression, and traumatic brain injury in veterans of Operation Enduring Freedom and Operation Iraqi Freedom. In: Tanielian T, Jaycox LH, editors. Invisible wounds of war: psychological and cognitive injuries, their consequences, and services to assist recovery. Santa Monica (CA): RAND Corporation; 2008.

4. Boulos D, Zamorski MA. Deployment-related mental disorders among Canadian Forces personnel deployed in support of the mission in Afghanistan, 2001-2008. CMAJ. 2013;185(11):E545–52. http://dx.doi.org/10.1503/cmaj.122120. Medline:23820441

5. 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 or Afghanistan. JAMA. 2006;295(9):1023–32. http://dx.doi.org/10.1001/jama.295.9.1023. Medline:16507803

6. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J Consult Clin Psychol. 2000;68(5):748–66. http://dx.doi.org/10.1037/0022-006X.68.5.748. Medline:11068961

7. Hoge CW, Castro CA, Messer SC, et al. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. N Engl J Med. 2004;351(1):13–22. http://dx.doi.org/10.1056/NEJMoa040603. Medline:15229303

8. Jones N, Seddon R, Fear NT, et al. Leadership, cohesion, morale, and the mental health of UK Armed Forces in Afghanistan. Psychiatry. 2012;75(1):49–59. Medline:22397541

9. Perales R, Gallaway MS, Forys-Donahue KL, et al. Prevalence of childhood trauma among US Army soldiers with suicidal behavior. Mil Med. 2012;177(9):1034–40. http://dx.doi.org/10.7205/MILMED-D-12-00054. Medline:23025132

10. Sandweiss DA, Slymen DJ, Leardmann CA, et al.; Millennium Cohort Study Team. Preinjury psychiatric status, injury severity, and postdeployment posttraumatic stress disorder. Arch Gen Psychiatry. 2011;68(5):496–504. http://dx.doi.org/10.1001/archgenpsychiatry.2011.44. Medline:21536979

11. LeardMann CA, Smith TC, Smith B, et al.; Millennium Cohort Study Team. Baseline self reported functional health and vulnerability to post-traumatic stress disorder after combat deployment: prospective US military cohort study. BMJ. 2009;338:b1273. http://dx.doi.org/10.1136/bmj.b1273. Medline:19372117

12. Lemaire CM, Graham DP. Factors associated with suicidal ideation in OEF/OIF veterans. J Affect Disord. 2011;130(1-2):231–8. http://dx.doi.org/10.1016/j.jad.2010.10.021. Medline:21055828

13. Parslow RA, Jorm AF, Christensen H. Associations of pre-trauma attributes and trauma exposure with screening positive for PTSD: analysis of a community-based study of 2,085 young adults. Psychol Med. 2006;36(3):387–95. http://dx.doi.org/10.1017/S0033291705006306. Medline:16255836

14. Orr SP, Lasko NB, Macklin ML, et al. Predicting post-trauma stress symptoms from pre-trauma psychophysiologic reactivity, personality traits and measures of psychopathology. Biol Mood Anxiety Disord. 2012;2(1):8. http://dx.doi.org/10.1186/2045-5380-2-8. Medline:22738068

15. Bomyea J, Risbrough V, Lang AJ. A consideration of select pre-trauma factors as key vulnerabilities in PTSD.

Clin Psychol Rev. 2012;32(7):630–41. http://dx.doi.org/10.1016/j.cpr.2012.06.008. Medline:22917742

16. King DW, King LA, Foy DW, et al. Prewar factors in combat-related posttraumatic stress disorder: structural equation modeling with a national sample of female and male Vietnam veterans. J Consult Clin Psychol. 1996;64(3):520–31. http://dx.doi.org/10.1037/0022-006X.64.3.520. Medline:8698946

17. Franz MR, Wolf EJ, MacDonald HZ, et al. Relationships among predeployment risk factors, warzone-threat appraisal, and postdeployment PTSD symptoms. J Trauma Stress. 2013;26(4):498–506. http://dx.doi.org/10.1002/jts.21827. Medline:23893499

18. Larsson MR, Bäckström M, Johanson A. The interaction between baseline trait anxiety and trauma exposure as predictor of post-trauma symptoms of anxiety and insomnia. Scand J Psychol. 2008;49(5):447–50. http://dx.doi.org/10.1111/j.1467-9450.2008.00649.x. Medline:18452503

19. Vasterling JJ, Proctor SP, Friedman MJ, et al. PTSD symptom increases in Iraq-deployed soldiers: comparison with nondeployed soldiers and associations with baseline symptoms, deployment experiences, and postdeployment stress. J Trauma Stress. 2010;23(1):41–51. Medline:20135698

20. Souza WF, Figueira I, Mendlowicz MV, et al. Negative affect predicts posttraumatic stress symptoms in Brazilian volunteer United Nations peacekeepers in Haiti. J Nerv Ment Dis. 2008;196(11):852–5. http://dx.doi.org/10.1097/NMD.0b013e31818b4682. Medline:19008738

21. Zamorski MA, Rusu C, Garber BG. Prevalence and correlates of mental health problems in Canadian Forces personnel who deployed in support of the mission in Afghanistan: findings from postdeployment screenings, 2009-2012. Can J Psychiatry. 2014;59(6):319–26. Medline:25007406

22. Statistics Canada [homepage on the Internet]. Ottawa: Statistics Canada; 2002 [cited 2012 Jul 5]. Canadian Community Health Survey Mental Health and Wellbeing Cycle 1.2: Master file documentation. Available from: http://www.statcan.ca/english/sdds/document/5015_D4_T1_V1_E.pdf

23. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. JAMA. 1999;282(18):1737–44. http://dx.doi.org/10.1001/jama.282.18.1737. Medline:10568646

24. Blanchard EB, Jones-Alexander J, Buckley TC, et al. Psychometric properties of the PTSD Checklist (PCL). Behav Res Ther. 1996;34(8):669–73. http://dx.doi.org/10.1016/0005-7967(96)00033-2. Medline:8870294

25. Weathers FW, Litz BT, Herman DS, et al. The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. San Antonio (TX): International Society for Traumatic Stress Studies.

26. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30(6):473–83. http://dx.doi.org/10.1097/00005650-199206000-00002. Medline:1593914

27. Ware JE, Kosinski M. SF-36 Physical & Mental Component summary scales: a manual for users of version 1. 2nd ed. Lincoln (RI): QualityMetric Incorporated; 2001.

28. Smith TC, Ryan MA, Wingard DL, et al.; Millennium Cohort Study Team. New onset and persistent symptoms of post-traumatic stress disorder self reported after deployment and combat exposures: prospective population based US military cohort study. BMJ. 2008;336(7640):366–71. http://dx.doi.org/10.1136/bmj.39430.638241.AE. Medline:18198395

29. Garber BG, Zamorski MA, Jetly R. Mental health of Canadian Forces members while on deployment to Afghanistan. Can J Psychiatry. 2012;57(12):736–44. Medline:23228232

30. Warner CH, Appenzeller GN, Grieger T, et al. Importance of anonymity to encourage honest reporting in mental health screening after combat deployment. Arch Gen Psychiatry. 2011;68(10):1065–71. http://dx.doi.org/10.1001/archgenpsychiatry.2011.112. Medline:21969463

31. Wells TS, LeardMann CA, Fortuna SO, et al.; Millennium Cohort Study Team. A prospective study of depression following combat deployment in support of the wars in Iraq and Afghanistan. Am J Public Health. 2010;100(1):90–9. http://dx.doi.org/10.2105/AJPH.2008.155432. Medline:19910353

AUTHOR INFORMATION

Mark A. Zamorski is a Senior Medical Epidemiologist for the Directorate of Mental Health of the Canadian Armed Forces and an Adjunct Professor in the Department of Family Medicine, University of Ottawa. Prior to joining the Department of National Defence in 2002, he was a Clinical Assistant Professor of Family Medicine at the University of Michigan Medical School.

Kimberley Watkins received her MA in Psychology from Carleton University in 2009. Since 2009, she has been a Defence Scientist with the Psychosocial Health Dynamics Team within Director General Military Personnel Research and Analysis, Department of National Defence.

Corneliu Rusu is a biostatistician with the Deployment Health Section in the Directorate of Mental Health, Canadian Forces Health Services Group Headquarters, Ottawa. Prior to his current position, he was with the Public Health Agency of Canada's Centre for Chronic Disease Prevention and Control.

COMPETING INTERESTS

None declared.

DISCLAIMER

The thoughts and opinions expressed herein are those of the individual contributors and do not necessarily reflect the views or policies of the Department of National Defence, the Canadian Armed Forces, or the Government of Canada.

This article has been peer reviewed.

CONTRIBUTORS

Mark A. Zamorski and Corneliu Rusu conceived and designed the study and acquired and analyzed data. All authors revised the article for important intellectual content and approved the final version submitted for publication.

FUNDING