Prevalence of Environmental and Other Military Exposure Concerns in Operation Enduring Freedom and Operation Iraqi Freedom Veterans

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Objective: This study examined the prevalence of self-reported exposures in returning Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF) veterans and the relationship of exposure reports to current physical symptoms. **Methods:** Using self-reports obtained immediately after return from deployment in a cohort of 760 enlisted Army reserve component military personnel, we assessed prevalence rates of environmental and other exposures and the association of these exposures to severity of physical symptoms. **Results:** Reporting of environmental exposures was relatively low in veterans of OEF/OIF, but reporting more environmental and other exposures, in particular screening positive for a traumatic brain injury, was related to greater physical symptom severity immediately after deployment. **Conclusions:** Non–treatment-seeking, enlisted Army reserve component personnel reported relatively few exposures immediately after return from deployment; however, more exposures was modestly associated with greater severity of physical symptoms when controlling for predeployment symptoms, gender, and other deployment-related exposures.

Environmental exposures are an important occupational concern for current and former military personnel because they can have health consequences. The Vietnam War highlighted the detrimental health effects that can occur from some environmental exposures, such as Agent Orange, encountered during military combat operations.[1] During recent wars, there have been concerns about health effects following reported exposures to potential environmental hazards,[2,3] although the cause of these health effects remains difficult to discern given the paucity of objective exposure data. Environmental exposures during Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF) have also occurred, potentially affecting relatively small groups over a limited time period, such as the sodium dichromate exposure at Qarmat Ali,[4] and in other cases, potentially affecting many individuals over long periods of time such as exposure to burn pit emissions at Balad Air Force base.[5]

Historically, environmental exposures have been strongly associated with increases in physical symptoms (eg, during the 1991 Persian Gulf War.[3,6–9] Here we use the term *physical symptoms* to refer to those physical symptoms that are not specifically associated with dysfunction in a particular organ system and that can co-occur with many different medical conditions or with no diagnosable condition (eg, stomach pain, headaches, trouble sleeping). These physical symptoms are commonly experienced by most individuals at one time or another.[10,11] They lead to health care seeking when the cause of the symptom is unknown, when the symptom is concerning or unusual or the symptom is experienced over a prolonged period.[12–14] Having many physical symptoms is also frequently associated with poorer functional status, higher psychological distress, and greater disability.[7,15]

A major difficulty in determining the relationship between environmental exposures and physical symptoms is how exposures are measured. Objective evidence of an exposure is typically minimal in the theater of war where immediate sampling from air, water, or soil can be difficult. More commonly, clinicians and scientists obtain retrospective self-reports of exposure to environmental hazards. This is problematic for several reasons. First, these reports are typically made months to years after the individual's combat deployment. Memory biases often become more pronounced over time. More critical than the passage of time, however, is the possibility that reports could be affected by the extent of health problems in the person reporting the exposures.[16–18]

In this study, we report the prevalence of self-reported lifetime environmental exposures and the association of these exposures to physical symptoms in a cohort of Army National Guard and Reserve personnel who deployed to either Iraq or Afghanistan. We are not aware of any studies that report the prevalence of self-reported environmental exposures among non–treatment-seeking OEF/OIF military personnel. To minimize retrospective reporting biases, we obtained reports in individuals immediately before and immediately after deployment. This study is also unique in that it provides a broader view of exposures across the range of Army Reserve component personnel because we sampled over a number of different units from multiple Army brigades, with participants from 48 different states who had widely varying military occupational specialties and who were deployed across widely disparate geographic regions. We report here the prevalence of exposures to a limited set of environmental agents, as well as blast exposure, rates of screening-based traumatic brain injury (TBI), and deployment experiences. We also examined the relationship between these self-reported military exposures and postdeployment physical symptoms after controlling for gender and predeployment physical symptoms. Consistent with findings from veterans of the first Persian Gulf War obtained long

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after the war[6,19–21] (for review see Barrett et al[7]) we hypothesized that lifetime environmental exposure reports obtained immediately after deployment would be positively correlated with postdeployment physical symptoms in this enlisted Army Reserve component sample.

METHODS

Participants

We recruited 805 enlisted Army National Guard and Reserve soldiers as they were preparing for their combat deployment in Iraq or Afghanistan (phase 1). Individuals were recruited from units preparing to deploy either from Fort Dix, New Jersey, or Camp Shelby, Mississippi. Individuals were approached and asked to volunteer (typically while waiting for, or after completing, their predeployment medical processing). Individuals who declined to participate usually did so either because they were unwilling or uninterested or because they had insufficient free time. Exclusion criteria included being an officer; having currently diagnosed depression, schizophrenia, or bipolar disorder (self-reported); being pregnant; having a chronic disease such as cancer or high blood pressure (self-reported); or taking medications that could affect our cardiovascular measures (not reported here). Medication exclusions included those for high blood pressure or cardiac arrhythmias, steroids for asthma, tricyclic antidepressants, benzodiazepines, or selective serotonin reuptake inhibitors at antidepressant doses (we did not exclude those using lower doses such as those prescribed to aid sleep), stimulants such as Ritalin, narcotic analgesics, and anticonvulsants. The informed consent process began with a verbal descriptive briefing about the study either to individuals or larger groups. Then, individuals were given another verbal briefing about the study in the testing space, asked to read both informed consent documents (one for the Department of Defense and one for the Department of Veterans Affairs), asked to answer questions indicating that they understood the study, and asked to sign both consent documents. The informed consent process typically took 15 to 20 minutes per soldier.

From the larger sample, 37 soldiers did not ultimately deploy or were officers and were not included in our final sample. In addition, eight individuals were either killed in action ($n = 2$) or seriously injured ($n = 5$) and could not be followed or their phase 1 survey data were missing ($n = 1$), and these were also removed from the analyses. We followed the remaining 760 participants from predeployment (phase 1) to immediately after deployment (phase 2), 3 months after deployment (phase 3), and 1 year after deployment (phase 4). Data from phases 3 and 4 are not reported here. Soldiers were asked about their environmental exposures before deployment (phase 1) and immediately after deployment (phase 2). Of the original 760 who were eligible to be followed, 508 soldiers (66.8%) were successfully contacted and completed some of the measures reported here for phase 2. Generally, soldiers completing phase 2 were those whose units had returned to their deploying base rather than to another base where we were unable to contact the participant. We did attempt to have individuals whose units returned to a different base complete phase 2 by contacting them at home, but these efforts were only partly successful. Because of an administrative error, 80 participants did not complete the TBI measure, blast exposure measure, or deployment experiences measure. Approval for all procedures was given by institutional review boards from both the Department of Veterans Affairs and the Department of Defense.

Measures

Environmental Exposures

We developed an exposure checklist that primarily reflected exposures that could affect acetylcholinergic receptor activity. This was done on the basis of concerns raised after the first Persian Gulf War that cholinergically active exposures may have been harmful in certain vulnerable individuals.[22] We also queried for depleted uranium exposure given its importance as a potential exposure of concern for the current cohorts. The environmental exposure questions asked were preceded by the instructions, "These questions ask about whether you have ever been exposed to any environmental agents or drugs for prolonged periods (several hours or more)" and then each question asked, "Were you exposed for several hours or more to: (a) Biological warfare agents, (b) Nerve agents/gas, (c) Contact with herbicide or defoliants (eg, Agent Orange), (d) Pesticides, (e) Did you consume Pyridostigmine (NAPP) used to protect against nerve gas (small white pills in a foil package), (f) insect repellent sprays, (g) insect repellent flea collars (skin contact), or (h) depleted uranium? Response choices were: (a) No, (b) Yes, once or twice, (c) Yes, many times, or (d) I don't know. We examined the prevalence of each item and the relationship of the item to physical symptoms. In regression analyses we used a count of any positive response (ie, either yes, once or twice, or yes, many times) to the environmental exposure questions to examine the relationship of reported environmental agents to physical symptoms. Cronbach α for the exposure checklist measure was 0.56 at phase 1 and 0.54 at phase 2.

Traumatic Brain Injury and Blast Exposure

Our measure of the report of screening-based TBI was similar to items on the Brief Traumatic Brain Injury Screen (BTBIS[23]). The BTBIS asks whether the participant had an injury during deployment and whether the injury resulted in a symptom. Our version first asked, "Did you have any injuries (including minor injuries or injuries for which you did not seek treatment) during your deployment from any of the following (please check all that apply)." Participants indicated if they had had a vehicular accident (including in an airplane), a fall or fight involving a blow to the head, or an injury from a fragment, bullet, blast, or other injury. If participants indicated that they had had any injury, they were asked, "Did any of these injuries result in any of the following (please check all that apply): feeling dazed, inability to remember the accident or event that caused the injury, loss of consciousness, concussion, headache, dizziness, irritability, or head injury." The authors of the BTBIS suggested that if a participant reports a symptom it be confirmed through clinical interview. However, because this study had to rely on self-reports obtained outside a clinical setting, participants' answers to the screening questions here could not be confirmed by clinical interview.

Blast exposure was determined from the following question: "How many times have you been in the presence of an explosion (eg, from an improvised explosive device, rocket-propelled grenade, land mine, grenade, etc.) during a deployment?" with response options of: (a) Never, (b) Once, (c) Twice, (d) Three times, (e) Four times, or (f) Five or more times.

Deployment Experiences

Deployment experiences were measured using the Aftermath of Battle Experiences Scale of the Deployment Risk and Resilience Inventory.[24,25] This measure reflects experiences that occur in the deployment theater, but not during direct combat, and they include seeing dead and dying people, seeing refugees, and working with or handling prisoners. Cronbach α for this sample was 0.88.

Physical Symptoms

Nonspecific physical symptom severity was measured using the 15-item Patient Health Questionnaire (PHQ-15[26], a somatic symptom checklist developed as part of the PRIME-MD study.[27]) The measure was developed to assess physical symptoms in primary care and nonspecific physical symptoms more generally.[26] For simplicity, in the rest of the article we will refer to these nonspecific physical symptoms as physical symptoms. For each of the 15 symptoms, individuals indicate whether they are not bothered at all, bothered a little, or bothered a lot. The symptom severity scale range is 0 to 30. Cronbach α in our sample was 0.79 and in prior samples was 0.79 to 0.80.[26,28]

Analyses

All analyses were completed with PASW version 18 (IBM, Chicago, IL). We examined the distributions of all variables for normality and several were skewed (PHQ-15, count of environmental exposures, deployment experiences). A square root transformation was used to correct the following variables for skew: PHQ-15 (both phases), exposure counts (both phases), and deployment experiences. Transformed variables were used in the regression analyses. In the remaining analyses, we report the nontransformed means, for example, in Table 2, to preserve the interpretability of the data and because the use of transformed variables did not significantly alter the results.

Descriptive analyses were conducted to examine the prevalence of self-reported exposure to environmental hazards, blasts, deployment experiences, and screening-based reports of TBI. For dichotomous independent variables (exposure to each environmental agent and TBI), independent *t* tests were conducted to examine differences in self-reported physical symptoms. We examined the relationship between these dichotomous variables and physical symptom severity cross-sectionally. We also calculated Spearman correlation coefficients between exposures (count of blast exposures, count of environmental exposures, and deployment exposures) and physical symptom severity. Finally, we examined whether the total exposure count was related to physical symptom severity immediately after deployment after controlling for gender (which is related to the report of physical symptoms) and predeployment physical symptoms. To do this, we conducted a hierarchical regression analysis (with backward elimination) using gender, physical symptom severity before deployment, and the exposure variables (count of environmental exposures, TBI, blast exposures, and deployment experiences) measured immediately after deployment to predict physical symptom severity immediately after deployment. Following this first model, we then sequentially removed the variable with the highest *P* value in the model (ie, backward elimination) and conducted a subsequent model with the remaining variables. This resulted in a second (and final) model with the informative demographic and exposure-related predictors of postdeployment physical symptom severity.

RESULTS

Soldiers were predominantly male (89.6%) and aged 28.0 years on average before deployment. The sample was predominantly white (72.9%), with 25.5% reporting minority status (African American, Hispanic, or Asian) and 1.6% who did not provide this information. More than half of soldiers (55.9%) reported no prior deployments; however, 26.6% had one prior deployment, 10.5% had two, 4.1% had three, and 2.9% had four or more prior deployments.

In general, soldiers reported low levels of exposure to most of the environmental agents both before and after deployment (Table 1). Notable exceptions were to insect repellent sprays for several hours (before deployment, 55.5%; after deployment, 46.7%), to pesticides (before deployment, 15.0%; after deployment, 26.4%), and to blasts (after deployment, 63.0%). The mean number of environmental exposures reported before deployment was 0.94 and the mean number of environmental exposures after deployment was 0.92. Physical symptom severity both before and after deployment was consistently (and in most cases, statistically significantly) higher across all exposures for those who reported an environmental exposure compared with those who did not report an exposure (Table 2). Greater total counts of exposure to environmental agents were significantly but modestly correlated with reporting greater physical symptom severity both before and after deployment, and, as expected, the highest correlations were for exposures and symptoms measured at the same time point (Table 3).

TABLE 1. Prevalence of Self-Reported Lifetime Exposures to Environmental Hazards Before and Immediately After Deployment

Exposure	Before Deployment	After Deployment
Biological warfare agents	21/693 (3.0)	4/407 (1.0)
Nerve agents/gas	27/718 (3.8)	6/438 (1.4)
Contact with herbicides or defoliants (eg, Agent Orange)	33/703 (4.7)	20/422 (4.7)
Pesticides	101/675 (15.0)	102/387 (26.4)
Pyridostigmine	22/733 (3.0)	9/482 (1.9)
Insect repellent sprays for several hours	405/730 (55.5)	221/473 (46.7)
Insect repellent flea collars for several hours	64/749 (8.5)	52/490 (10.6)
Depleted uranium	39/691 (5.6)	42/411 (10.2)
Blast	–	320/508 (63.0)
Positive screen for TBI	–	103/478 (21.5)

Values are given as count/total no. (percent of individuals endorsing "Yes" exposed). Total no. excludes those endorsing "I don't know" or declining to answer. TBI, traumatic brain injury.

Soldiers reported higher rates of exposure to blasts than to any other single exposure. In this sample, 15.2% reported exposure to one blast, 9.4% to two blasts, 7.7% to three blasts, 2.2% to four blasts, and 28.5% to five or more blasts. Having experienced a greater number of blasts was significantly, but only modestly, correlated with report of greater physical symptom severity ($r = 0.12$; see Table 3). In this sample, nearly 22% screened positive for TBI (see Table 1). Individuals who screened positive for TBI reported greater symptom severity than those screening negative for TBI (see Table 2). Finally, having had more stressful deployment experiences was related to reporting greater physical symptom severity after deployment ($r = .21$, $P < 0.05$; see Table 3).

In the initial regression model used to predict postdeployment physical symptom severity, we included gender, predeployment physical symptom severity, deployment experiences, positive TBI screen, count of blast exposures, and count of environmental exposures as predictors of immediate postdeployment physical symptom severity. In the context of this model, blast exposures were nonsignificantly related to physical symptoms, so a subsequent model was conducted removing blast exposures from the model. The final model is shown in Table 4. The β coefficients here are interpreted as the standardized effect of each predictor (ie, independent) variable on the outcome (ie, dependent) variable, and thus permit comparison of the relative effects of each predictor on the outcome when all of the other predictors are included. The final regression analysis revealed an expected significant relationship between both gender and predeployment physical symptom severity and greater physical symptom severity immediately after deployment. Also, having a greater number of stressful deployment experiences and screening positive for a TBI were both related to greater physical symptom severity immediately after deployment, although the β coefficient for deployment experiences was small. Finally, a higher total count of environmental exposures was related to greater physical symptom severity immediately after deployment, although the β coefficient was small ($\beta = 0.10$; see Table 4).

TABLE 2. Pre- and Postdeployment Physical Symptom Severity Scores for Those Who Did and Did Not Report Any Lifetime Exposure to Each Environmental Hazard

	Physical Symptom Severity Before Deployment		Physical Symptom Severity After Deployment	
Exposure	Exposed	Not Exposed	Exposed	Not Exposed
Biological warfare agents	6.2	5.0	14.0	7.5**
Nerve agents/gas	6.5	5.1	11.8	7.6*
Contact with herbicides or defoliants (eg, Agent Orange)	6.8	5.0**	10.4	7.4**
Pesticides	6.3	4.9**	9.8	6.7**
Pyridostigmine bromide	7.4	5.2*	10.9	7.7
Insect repellent sprays for several hours	5.8	4.6**	9.0	7.0**
Insect repellent flea collars for several hours	6.8	5.1**	11.2	7.4**
Depleted uranium	8.5	5.0**	10.8	7.3**
Positive screen for TBI			10.6	7.0**

Not exposed does not include those who responded "I don't know." TBI, traumatic brain injury.
$^{*}P \leq 0.10$; $^{**}P \leq 0.05$.

TABLE 3. Correlation Between Lifetime Exposures Reported Before and After Deployment With Physical Symptom Severity

	Physical Symptom Severity Before Deployment	Physical Symptom Severity After Deployment
Count of environmental exposures before deployment	0.17*	0.10*
Count of environmental exposures after deployment	0.12*	0.23*
Blast exposure	-0.01	0.12*
Deployment experiences	0.09	0.21*

$^{*}P < 0.05$

TABLE 4. Regression Analysis Predicting Physical Symptom Severity Immediately After Deployment

	B	SE	β	t	P
Gender	0.57	0.13	0.20	4.36	<0.001
PHQ-15 before deployment	0.48	0.05	0.46	10.20	<0.001
Deployment experiences	0.12	0.05	0.12	2.40	<0.05
Positive screen for TBI	0.42	0.10	0.20	4.23	<0.001
Count of environmental exposures after deployment	0.23	0.11	0.10	2.10	<0.05

B indicates the nonstandardized relationship of each predictor to the outcome whereas β is the standardized relationship of each predictor. PHQ-15, Patient Health Questionnaire-15 (physical symptom scale); SE, standard error; TBI, traumatic brain injury

DISCUSSION

Environmental exposures are a growing concern among veterans and their health care providers, as evidenced by the Department of Veterans Affairs' commissioning of an 18-month National Academy of Science Institute of Medicine study of burn pit exposures,[29] a report by the Government Accountability Office about adherence to guidelines on open pit burning and waste management practices by the Department of Defense[5] and Senate hearings about the Qarmat Ali incident.[30] The findings here reveal that although enlisted Army Reserve component OEF/OIF veterans report few specific environmental exposures immediately after return from deployment, greater total exposure counts are related to greater physical symptom severity immediately after OEF/OIF deployment. Another deployment-related exposure—having a positive TBI screen—was even more strongly related to greater physical symptom severity than total exposure counts when all variables were included simultaneously in the model. The prevalence data and our finding of at least a modest relationship between environmental and other military exposure reports (ie, TBI and deployment experiences) and physical symptom severity provide important baseline, immediate postdeployment results for at least a limited set of environmental and other military exposures that should prove useful for future comparisons.

Although there are no available reports of environmental exposures per se with which to compare our findings, there is a report that provides prevalence estimates of overall exposure concerns in non–treatment-seeking OEF/OIF personnel.[31] These findings from the Post-Deployment Health Assessments and Post-Deployment Health Re-Assessments revealed that 26% of Army Reserve component individuals had exposure concerns, which was higher than that reported by active-duty personnel and in service branches other than the Army. This level of exposure concern is considerably higher than our reports of exposures. The differences in these findings are likely because of reporting concerns versus exposures, temporal differences in when the assessments are made (ie, immediately versus several months later), and , in part, to random sample variation. In addition, it has been pointed out that the Post-Deployment Health Assessments and Post-Deployment Health Re-Assessments measures were not designed for, nor are they optimal for, epidemiologic research,[32] but until environmental monitoring at the level of the individual becomes the norm[33] we will have to rely on self-report, with its potential for reporting biases. For optimal use of self-reports, we suggest that exposure reports be obtained as early after deployment as possible to minimize retrospective reporting bias.

Our finding of a modest relationship between exposures and physical symptoms is consistent with our other report in this Special Issue.[34] In that report we document that greater concern about exposures mediated (ie, accounted for) the relationship between exposure reports and physical symptoms in a clinical sample. These two samples differ in that the current sample is not seeking treatment and reported environmental exposures rather than concerns. In comparison, the clinical sample discussed in the other report is seeking treatment and is more likely to be concerned about exposures because such concerns are one reason why they would seek a tertiary care assessment. Despite the differences across these two cohorts, there are notable similarities. In both, there was relatively high consistency (ie, high Cronbach α) across reports of exposure to individual environmental agents despite these being checklist measures that would not be expected to have even modest internal consistency across items. This suggests the possibility that there is a factor in common across these exposures. This is most likely a general concern about exposures or a tendency to report more exposures or concerns when experiencing physical symptoms[35] or other health concerns. The second similarity was the positive relationship between exposure reports (or exposure concerns) and physical symptoms, which suggests a more generalizable tendency for these to co-occur. The corollary implication is that health care providers should be attentive to veterans' reports of environmental exposures or exposure concerns because such reports can co-occur with health outcomes. Physical symptoms are commonly associated with poorer functional status[11] and greater health care utilization. Our study suggests that health care providers need to ask about environmental exposures and address with the patient what is known about the risks of such exposures and any related exposure concerns.

Interestingly, in the final regression model examining possible predictors of immediate postdeployment physical symptom severity, blast exposures were not uniquely related to more severe physical symptoms (over and above other exposures). In part this might be because of how we queried individuals about their blast exposure or the way exposure was quantified (ie, counts). Our finding is similar to data from a study by Wilk et al,[36] showing that blasts were not generally related to postconcussion symptoms (except for headache and ringing in the ears, and even then, only when the blast was accompanied by loss of consciousness). Postconcussion symptoms overlap with physical symptoms as they were measured here; indeed, Wilk et al[35] measured postconcussion symptoms using the PHQ-15 (in addition to other head injury–specific symptoms, namely, memory problems, irritability, concentration problems, balance problems, and ringing in the ears). Taken together, these findings suggest that self-reported exposure to blasts without accompanying information about alterations in function (eg, loss of consciousness) may not be particularly informative about future health outcomes.

There are several limitations to the study. First, although we asked soldiers to report lifetime environmental exposures, it is possible that soldiers reported exposures that occurred recently or only during the deployment. That we did not see an increase in self-reported environmental exposures on average across the sample from before deployment to after deployment suggests that either of these may have occurred. Indeed, a considerable number of individuals reported fewer exposures after deployment than before. This suggests that soldiers may have assumed that we were asking only about deployment-related exposures at the postdeployment assessment or that some other factor influenced their current report of symptoms (such as their current health state). Similar findings of changes in the self-reported exposure history solely due to the passage of time have been previously reported,[18] suggesting that numerous factors can intervene between two different exposure reports that can change the meaning or significance of any given exposure (see also Brewer et al[34]). However, as noted earlier, until individual-level objective exposure measures are available, we will only be able to utilize self-reports, which should be obtained soon after, if not during, deployment. Another limitation is our TBI screening measure, which was based on self-report, and although similar to an existing screen[23] it did not fully meet that definition (ie, no clinician verification). Moreover, there are several definitions of mild TBI, and recent modifications to the diagnostic criteria for mild TBI have been suggested (see Ruff et al,[37] for a discussion). Accurately determining whether mild head injury occurred in theater would require documenting loss of consciousness, posttraumatic amnesia, and altered consciousness close to the time of the head injury and, even if this assessment occurred in theater, this information was not available to us. In addition, the use of "I don't know" as a response option for exposures may have impacted our outcomes. Finally, there was considerable loss to follow-up in this sample mostly due to our inability to track some units when they came back to the United States after their deployment. This should have resulted in a relatively random pattern of dropout with minimal effects on our outcomes, as was evidenced by the fact that the group that did not complete phase 2 did not differ from those who did on either physical symptoms or total exposure counts before deployment.

In conclusion, this study provides preliminary data for the prevalence of self-reported environmental hazards and other military exposures (TBI, stressful deployment experiences, and blasts) in a non-treatment-seeking sample of enlisted Army National Guard and Reserve personnel who served in support of OEF/OIF. These exposures were modestly related to greater severity of physical symptoms after deployment when controlling for predeployment symptoms, gender, and other deployment exposures. Our other article in this issue[34] suggests that concerns about the environmental exposure may be one mechanism that leads to increased physical symptoms. Whether more severe or numerous physical symptoms occur as a result of an environmental exposure, concern about exposures, or to some combination of these factors, these individuals need appropriate supportive treatment to help reduce their symptoms.[38] When it is not possible to mitigate the symptoms, the next best line of defense is to minimize the detrimental functional effects that can co-occur with such symptoms.[39,40] We emphasize the need for objective and accessible measures of potential environmental hazards in future combat deployments because environmental exposures are a recurring concern in the modern war zone. Practical limitations to measuring objective environmental exposures in the theater of war likely mean that it will be some time before such measures are possible, particularly at the level of individual military personnel. In the meantime, it is important that health care providers ask about environmental exposures and address the known risks of such exposures and any exposure concerns with their veteran patients. Veteran health care providers who provide risk information about environmental exposures[41] and supportive education to their patients will best be able to help veterans manage physical symptoms and functional issues regardless of their origin.

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