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Stressors Experienced During Deployment Among Canadian Armed Forces Personnel: Factor Structure of Two Combat Exposure Scales

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Combat exposure is linked to increased mental health problems among military personnel. Reliable, precise, and efficient measurement of combat experiences can facilitate understanding of the effects of combat on mental health. This study examined the psychometric properties of 2 scales used to assess deployment experiences in Canadian Armed Forces (CAF) personnel in 2 different settings: during a Third Location Decompression (TLD) program after deployment, and during routine post-deployment screening. Principal components analyses yielded similar results for the 2 measures. The components containing items relevant to Exposure to the Dead and Injured, Dangerous Environment, and Active Combat were common across both surveys. The TLD results revealed a fourth component, Personal Suffering, while the postdeployment screening data revealed a fourth component, Perceived Responsibility. This study found categories of deployment stressors that can be used for further analysis, and underscores the importance of assessing a broad range of exposures in the combat environment.

Keywords: combat, deployment, principal components analysis, mental health

An abundance of research has documented the effects of exposure to military combat on psychological health problems, such as posttraumatic stress disorder (PTSD) and depression (e.g., Booth-Kewley, Larson, Highfill-McRoy, Garland, & Gaskin, 2010; Smith et al., 2008; Wells et al., 2010). Indeed, among military factors, combat exposure is typically the strongest and most consistent predictor of psychopathology (see Watkins, 2014). Exposure to combat has also been found to be associated with behavioral outcomes such as aggression and problematic alcohol use (Bray, Brown, & Williams, 2013; Gallaway, Fink, Millikan, Mitchell, & Bell, 2013).

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Understanding the effects of combat on these psychosocial outcomes demands reliable, precise, and efficient measurement of combat experiences. Such measurement is also necessary to control for different levels of combat exposure in observational studies focusing on other variables of interest, such as social support and leadership. A broad range of approaches has been used to this effect: some studies have used deployment to a particular theater of operation or to particular locations as a proxy for combat exposure (Boulos & Zamorski, 2013). Others have used a single, dichotomous self-report item for lifetime combat exposure (Sareen et al., 2007), and others have defined combat as endorsement of one or more of a limited list of specific experiences (e.g., Smith et al., 2008; Wells et al., 2010). Most recent research has focused on scales with a larger number (30 or more) of potential combat-related experiences, usually analyzed as a count of the total number of events experienced (e.g., Hoge et al., 2004).

This last approach is appealing in its simplicity and power, and clear dose-response relationships between the count of experiences and mental health during (Garber, Zamorski, &

Jetly, 2012) and after deployment (Hoge et al., 2004) have been documented. Fewer studies have systematically examined the effects of individual categories of exposure. It might be expected that certain combat experiences, such as handling bodies or seeing someone killed or injured, are likely to occur together rather than independently, in which case scales might be shortened to minimize respondent burden. Depending on the mission and on the role of particular groups of personnel, experiences may co-occur in different patterns or occur at different frequencies, suggesting that scales developed for one mission or one group may not apply to others. Finally, different types of combat exposures may have different effects on mental health outcomes.

Using data reduction techniques, researchers have identified up to seven dimensions of combat exposure. Commonly found categories of deployment experiences include exposure to the combat environment (e.g., clearing homes or buildings), close physical engagement (e.g., engaging in hand-to-hand combat), and proximity to serious injury or death (e.g., handling or uncovering human remains; Guyker et al., 2013). Other studies have found additional factors, such as sexual trauma, interpersonal distress, and personal injury (Katz, Cojucar, Davenport, Clarke, & Williams, 2012); exposure evoking emotion (e.g., knowing someone who was seriously injured or killed; Gallaway et al., 2014); killing of the enemy (Killgore et al., 2008); and moral injury (violation of moral standards by self or others; Nash et al., 2013). As well, some investigators have captured dimensions reflecting stressful but typically nontraumatic deployment experiences such as home front separation, exposure to a different culture, physical workload, boredom, and work frustration (Boermans, Kamhuis, Delahaij, Korteling, & Euwema, 2013; Waller et al., 2012).

Despite the profusion of studies, it is not clear which aspects are driving the observed similarities and differences in factor structure. Variations in items used, response categories, and type of deployment may partly explain the differences in findings. This article uses data collected using two different combat exposure scales in two different populations of Canadian Armed Forces (CAF) personnel who deployed in support of the mission of Afghanistan. The objective is to explore similarities and differences in the factor structure of these two instruments. First, in Study 1, the factor structure of the most widely used combat exposure scale of dichotomous items (e.g., Guyker et al., 2013) was explored in a population of CAF personnel with diverse deployment experiences; this will provide insight into the extent to which factor structure depends on the diversity of deployment experiences in the deployed population, and whether the factor structure varies in the CAF compared with other militaries. Next, in Study 2, the factor structure of a frequency-based deployment experiences scale developed for peacekeeping operations is explored and compared with the structure identified in Study 1. Study 2 data were collected in an anonymous fashion during Third Location Decompression as opposed to in a confidential fashion during later postdeployment screening (Study 1), allowing for exploration into the extent to which these variables influence the factor structure. Ultimately, this work is expected to lead to more parsimonious and more complete measures of combat exposure and to exploration of the differential health effects of various dimensions of combat exposure.

Study 1: Combat Experiences Assessed During Enhanced Postdeployment Screening

Method

Procedure. The Enhanced Postdeployment Screening (EPDS) process is mandatory for all CAF members who have deployed overseas for 60 days or longer; it is administered between 90 and 180 days after returning to Canada. The EPDS involves a confidential, although not anonymous, paper-and-pencil health questionnaire followed by an interview with a mental health clinician. Components of the health questionnaire were analyzed in this study. The EPDS received ethics approval from Veritas IRB, Dorval, Quebec.

Participants. Participants were 14,616 CAF personnel who deployed in support of the later phases of the combat and peace-support mission in Afghanistan (Operation ATHENA) and completed the EPDS between 2009 and 2012. Personnel were largely deployed in Kandahar Province; however, the average threat level in this sample was relatively low because

it included some personnel deployed to safe air bases in the region and because the threat level in Kandahar declined significantly in 2010 and onward. Personnel in Kandahar fulfilled a broader range of roles than a US Army Brigade Combat Team, with similar proportions serving in remote locations (e.g., a checkpoint), semi-remote locations (e.g., a forward operating base), and "inside the wire" at Kandahar Airfield (Garber, Zamorski, & Jetly, 2012). After removing 1013 cases (7%) that were missing exposure data using listwise deletion, the dataset contained 13,603 individuals. Sociodemographic and military characteristics of the sample are presented in Table 1.

Measures. Combat exposure was assessed using a modified version of a widely used 34-item Combat Experiences Scale (CES) developed by the Walter Reed Army Institute for Research. This scale was developed and validated in US Army Brigade Combat Teams, and assesses events experienced during deployment (e.g., "being attacked or ambushed," "participating in improvised explosive device [IED]/ mine clearing"). For the EPDS, four items of the original scale were removed because of concerns that a positive response might require investigation into potential misconduct (e.g., "witnessing mistreatment of a noncombatant"). The response options for each item were "yes" and "no," for ever having been exposed during the most recent deployment.

Statistical analyses. The factor structure was explored using principal components analysis (PCA), using an oblique (Promax) rotation to account for the likely correlation of the underlying components, consistent with past research approaches (e.g., Guyker et al., 2013). Cross loading items were resolved using a combination of empirical (i.e., higher loading score) and subjective (i.e., thematic and theoretical relevance) criteria. Stata version 13.1 was used for analysis to calculate the tetrachoric correlations needed to perform the PCA for dichotomous items (Uebersax, 2006).

Table 1
Sociodemographic and Military Characteristics

Characteristic	Postdeployment screening	TLD
Sex		
Male	90.8%	91.7%
Female	9.2%	8.3%
Age		
<32	54.1%	54.1%
32 and above	45.9%	45.9%
Years of service		
10 or fewer	59.6%	56.9%
More than 10	40.4%	43.1%
Component		
Regular force	85.1%	84.9%
Reserve force	14.9%	15.1%
Rank		
Private or equivalent	8.4%	18.2%
Other junior NCM	58.8%	50.6%
Officer	32.8%	31.2%
Element		
Army	82.7%	—[a]
Air Force	14.5%	—[a]
Navy	2.8%	—[a]

Note. NCM = non-commissioned member.
[a] The Third Location Decompression (TLD) questionnaire did not include an item on element (Army, Navy, or Air Force), but administrative data indicates that at least 90% were Army personnel.

Results

As shown in Table 2, the most commonly reported combat exposure items were "Receiving incoming artillery, rocket or mortar fire" (64.3%), "Improvised explosive device (IED)/ booby trap exploded near you" (61.3%), and "Having hostile reactions from civilians" (58.9%). The least common items, including "Engaging in hand-to-hand combat," "Feeling responsible for the death a noncombatant," and "Feeling responsible for the death of Canadian or ally personnel," were endorsed by fewer than three percent of respondents.

PCA was run on all 30 items. Several aspects of principal components analysis, including the eigenvalues exceeding 1.00 (Kaiser's criterion) and visual interpretation of the scree plot and the pattern matrix, suggested that four components should be retained. In combination, these four components explained 81.9% of the variance in the rotated solution. The first component, labeled "Dangerous Environment," reflected items that were related to risks in the deployed environment, including exposure to small arms fire, IEDs, and hostile civilians, and accounted for 63.8% of the variance. The second component, labeled "Exposure to the Dead and Injured" reflected exposures to the aftermath of conflict involving death or serious injury of others; it accounted for 7.6% of the

Table 2
Factor Loadings Based on a Principal Components Analysis Using for Deployment Experiences Measured During Postdeployment Screening

Exposure category	Item	Proportion who experienced at least once	Factor loadings[a]			
			1	2	3	4
Dangerous environment (KR-20 = .88)	Having hostile reactions from civilians	58.9%	**1.02**			
	Clearing/searching homes or building	29.6%	**.91**			
	Participating in IED/mine clearing	29.2%	**.91**			
	Clearing/searching caves or bunkers	11.7%	**.80**			
	Working in areas that were mined or had IEDs	39.8%	**.80**			
	Witnessing an accident which resulted in serious injury or death	38.0%	**.77**			
	Being in threatening situation where you were unable to respond because of rules of engagement	20.1%	**.64**			
	Receiving small arms fire	42.7%	**.60**		.44	
	Having difficulty distinguishing between combatants and noncombatants	21.5%	**.60**			
	Being attacked or ambushed	43.0%	**.51**		.43	
	IED/booby trap exploded near you	61.3%	**.44**	.44		
	Seeing ill/injured women or children who you were unable to help	24.5%	**.42**			
Exposure to the dead and injured (KR-20 = .78)	Knowing someone seriously injured or killed	35.3%		**.85**		
	Handling or uncovering human remains	20.0%		**.80**		
	Seeing dead bodies or human remains	46.1%		**.69**		
	Seeing a unit member blown up or burned alive	12.0%	.34	**.63**		
	Having a member of your own unit become a casualty	39.8%	.36	**.45**		
	Had a buddy shot or hit who was near you	10.4%	.37	**.40**		
	Seeing dead or injured Canadians	34.7%	.37	**.37**		
Active combat (KR-20 = .70)	Feeling directly responsible for the death of an enemy combatant	10.4%			**.85**	
	Shooting or directing fire at the enemy	28.7%	.47		**.63**	
	Calling in fire on the enemy	13.8%			**.62**	
	Receiving incoming artillery, rocket or mortar fire	64.3%			**.58**	
	Sniper fire	6.9%	.39		**.47**	
Perceived responsibility (KR-20 = .29)	Engaging in hand-to-hand combat	.9%				**.78**
	Feeling directly responsible for the death of a noncombatant	1.9%			.30	**.73**
	Feeling directly responsible for the death of a Canadian or ally personnel	2.6%		.30		**.53**
	Percent of variance		63.8%	7.6%	5.7%	4.8%

[a] Factor loadings of less than .3 are suppressed in this table. IED = improvised explosive device.

variance. The third component, labeled "Active Combat," represented exposure to armed combat and included issues such as shooting or directing fire at the enemy. This component accounted for 5.7% of the variance. The final component, accounting for 4.8% of the variance, included three items: "Engaging in hand-to-hand combat," "Feeling directly responsible for the death of a noncombatant," and "Feeling directly responsible for the death of a Canadian or ally personnel." These items were grouped under the category titled "Perceived Responsibility" because of the potential moral implications of the events included in this component, as they likely reflected unintentional deaths.

Eleven items cross-loaded in the rotated solution; these items were assigned to components based on empirical and subjective criteria. For example, "Seeing a unit member blown up or burned alive" was assigned to the Exposure to

the Dead and Injured component because the item loaded much higher onto this component. Alternatively, "Improvised explosive device (IED)/booby trap exploded near you" was assigned to Dangerous Environment, which contained similar IED-related items. Three items with a loading score of less than .4 or that did not improve the reliability of the component did not load on any of the components: "Had a close call, was shot, hit but protective gear saved you" (reported by 10.3%); "Witnessing a friendly fire incident" (7.5%); and "Being wounded/injured" (7.6%). Table 2 shows the rotated pattern matrix for this analysis.

The four components exhibited intercorrelations between .29 and .62 (see Table 3). The highest correlation was between Dangerous Environment and Exposure to the Dead and Injured, while the lowest was between Dangerous Environment and Perceived Responsibility.

The first three components, Dangerous Environment, Exposure to the Dead and Injured, and Active Combat, exhibited good internal consistency (KR-20 coefficients of .88, .78, and .70, respectively). However, the fourth component, Perceived Responsibility, exhibited low reliability (.29).

Study 2: Combat Experiences Assessed During Third Location Decompression

Method

Procedure. The Third Location Decompression (TLD) program aims to assist military members in transitioning back to the civilian environment after a deployment through rest, recreation, and educational sessions in a neutral setting (Cyprus) before returning to Canada (Garber & Zamorski, 2012). Questions on combat exposure were included in an anonymous, voluntary, paper-and-pencil TLD evaluation questionnaire offered at the end of TLD.

Participants. Using listwise deletion of cases missing combat exposure data, the dataset contained 9,028 participants returning from a combat and peace support mission in Kandahar Province, Afghanistan. Sociodemographic and military characteristics of the sample are presented in Table 1.

Measures. Twenty items from the Stress in Military Service Questionnaire (SMSQ) from the CAF Human Dimensions of Operations study (Dobreva-Martinova, 1998) were used to assess deployment experiences. The SMSQ was developed to explore the stressors typical of the peacekeeping deployments in the 1990s, but includes combat-related experiences. Participants answered each item in terms of the frequency of encounters with various deployment experiences, such as "Being in armed combat," "Seeing a CAF member die," and "Being sexually assaulted." Response options were "Never," "Once," "A few times," and "Regularly," with higher scores indicating greater exposure to that experience.

Statistical analysis. SPSS version 22 was used to explore the factor structure of the items, again using PCA with an oblique (Promax) rotation. Cross loading items were again resolved using a combination of empirical (higher loading score) and subjective criteria (thematic and theoretical relevance). Given that the study data came from anonymous, voluntary evaluation of an educational intervention, no Research Ethics Board approval was sought.

Results

As shown in Table 4, the most commonly reported combat exposure items were "Being subject to shelling and/or artillery/mortar fire"

Table 3
Component Correlations: Postdeployment Screening Data

Factor	Dangerous environment	Exposure to the dead and injured	Active combat	Perceived responsibility
Dangerous environment	1			
Exposure to the dead and injured	.62	1		
Active combat	.55	.47	1	
Perceived responsibility	.29	.31	.36	1

Table 4
Factor Loadings Based on a Principal Components Analysis for Deployment Experiences Measured During Third Location Decompression

Exposure category	Item	Proportion who experienced at least once	Factor loadings[a]			
			1	2	3	4
Exposure to the dead and injured (α = .88)	Seeing multiple deaths	43.4%	**.90**			
	Handling bodies or body parts	38.1%	**.90**			
	Seeing a nonmilitary person die	46.5%	**.85**			
	Seeing serious injuries	64.8%	**.78**			
	Seeing a CAF member die	34.4%	**.77**			
	Seeing physical violence	56.1%	.37			.31
Personal suffering (α = .78)	Being sexually assaulted	2.6%		**.91**		
	Being held hostage/captive	3.0%		**.89**		
	Being physically assaulted	5.1%		**.84**		
	Being seriously injured	7.6%		**.74**		
	Being threatened with assault	15.3%		**.45**	.41	
Dangerous environment (α = .82)	Dangerous traffic conditions/incidents	63.6%			**.90**	
	Dangerous training conditions/incidents	44.0%			**.88**	
	Seeing widespread suffering	52.2%	.41		**.63**	
	Seeing widespread destruction	61.4%			**.58**	
	Being threatened with death	42.8%			**.49**	
Active combat (α = .78)	Being in armed combat	59.6%				**.85**
	Being fired at	64.8%				**.84**
	Being subject to shelling and/or artillery/mortar fire	82.1%				**.72**
	Harming a person	39.3%				**.67**
	Percent of variance		37.4%	13.2%	8.4%	5.2%

[a] Factor loadings of less than .3 are suppressed in this table. CAF = Canadian Armed Forces.

(82.1%), "Seeing serious injuries" (64.8%), and "Being fired at" (64.8%). Other items, including "Being held hostage" (3.0%) and "Being sexually assaulted" (2.6%), were endorsed by a much smaller percentage of participants.

The PCA, run using the general approach used in Study 1 except that the responses were treated as continuous, supported retaining four components. Items with a loading score of less than .4 and those that did not improve the reliability of the component were excluded from the factor structure, which resulted in the removal of one item ("Seeing physical violence," reported by 56.9% of respondents).

The four components exhibited intercorrelations between .30 and .60 (see Table 5), justifying the use of an oblique rotation. The highest correlation was between Dangerous Environment and Active Combat; the lowest was between Personal Suffering and Active Combat.

The first component, labeled "Exposure to the Dead and Injured," reflected exposures to the consequences of combat events involving the death or serious injury of others, including seeing multiple

Table 5
Component Correlations: Third Location Decompression Data

Factor	Exposure to the dead and injured	Personal suffering	Dangerous environment	Active combat
Exposure to the dead and injured	1			
Personal suffering	.33	1		
Dangerous environment	.52	.35	1	
Active combat	.51	.30	.60	1

Note. All correlations are significant at the $p < .01$ level.

deaths and handling bodies or body parts. This component explained 37.4% of the variance. The second component, labeled "Personal Suffering," contained items reflecting personal harassment and threats such as physical assault or being threatened with assault. This component explained 13.2% of the variance. The experiences that loaded onto this component were much less commonly reported (3 to 15% of participants) than the items in the other components (34 to 65% of participants). The third component, labeled "Dangerous Environment," contained items reflecting dangers in the combat environment that do not necessarily involve personal injury, such as dangerous training conditions. This component explained 8.4% of the variance. Finally, the fourth component, labeled "Active Combat," reflected exposure to traditional combat events such as being fired at or harming another person. This component explained 5.2% of the variance, for a total explained variance of all four components of 64.1%. Interitem reliabilities for each component were in the acceptable range, with Cronbach's αs of .88, .78, .82, and .78, for Exposure to the Dead and Injured, Personal Suffering, Dangerous Environment, and Active Combat, respectively. The rotated pattern matrix for the items is shown in Table 4.

Discussion

Summary of key findings. Principal components analysis of two different combat exposure scales each yielded four components, three of which appeared very similar in the two studies ("Dangerous Environment," "Exposure to the Dead and Injured," and "Active Combat"). The commonality of the factor structure was seen despite important differences between (a) the context for which the scale was developed (combat vs. peacekeeping operations); (b) somewhat different items; (c) the response categories (use of dichotomous vs. frequency); (d) the context and timing of the assessment (during postdeployment screening 3 to 6 months after return vs. during TLD on the way home from deployment; (e) the anonymity of the assessment; (f) the diversity of the study population (a more diverse group, including personnel deployed to a safe air base vs. personnel deployed to a high-threat area); and (g) the average threat level of the population (a lower threat period late in the conflict vs. a higher threat period early in the conflict).

One unique component emerged in each of the studies: In Study 1, a fourth component, labeled "Perceived Responsibility" came out, while in Study 2, a different fourth component, labeled "Personal Suffering" was identified. These differences reflect variations between the two scales in some of the items used. The internal consistency values of all of the components were acceptable, with the exception of Perceived Responsibility (Study 1), which contained only three items. The analyses revealed several items (three in Study 1 and one in Study 2) that did not load on any of the components.

Comparison with previous research. These results show both commonalities and discrepancies with three U.S. factor analytic studies that used different versions of the same measure used in Study 1. Gallaway et al. (2014), Guyker et al. (2013), and Killgore et al. (2008) identified seven, four, and three factors, respectively. For example, Killgore et al.'s first factor, labeled "violent combat exposure," included items that in Study 1 loaded on "dangerous environment" and others that loaded on "exposure to the dead and injured." Gallaway et al.'s (2014) "active exposure" factor had strongly loading items on all four of Study 1's factors. Similar discrepancies are seen between the factor structure of Study 1 and those of Guyker et al. (2013).

Some of these differences are likely because of technical differences in the studies, notably the use of dichotomous versus frequency-based response categories, the extraction method (principal axis factoring vs. PCA), the particular items included in the studies, and the use or nonuse of tetrachoric correlations in the extraction process for dichotomous items. Other differences may relate to decisions as to which factor to assign weakly loading or cross-loading items. The principal differences in the observed factor structure seem readily attributable to differences in the items. For items common to both Study 1 and Study 2, the factor structures appear to be conceptually coherent.

A possible explanation for the coherent factor structure in Study 1 and Study 2 and the divergent factor structure between Study 1 and that seen in U.S. studies with the same items (or subsets thereof) is that the underlying experiences occur together in ways that are idiosyn-

cratic to the study population, its role on deployment, and the circumstances on the ground at the time. Consistent with this hypothesis, as opposed to technical issues or limitations associated with factor analysis, Gallaway et al. (2014) found convergent findings in both exploratory factor analysis and confirmatory factor analysis in their study population.

Limitations

Principal components analysis has intrinsic limitations, related in part to the broad range of choices investigators have with respect to the extraction method, use of correlation versus covariance matrices, rotation options, and the many subjective choices surrounding issues such as cross-loading items and cut-offs for eigenvalues. Confirmatory factor analysis is a potential solution, but it is limited in applications without a well thought-out conceptual framework or well-validated factor structure to draw upon. We chose to use an exploratory approach in both studies precisely because of the differences in factor structure observed in other studies.

The data collected in both studies are based on self-reported, retrospective recall of events during deployment. Self-reported combat exposure has the potential for biased or inaccurate recall, particularly in the case of postdeployment screening, which occurs several months after returning from a deployment (Richardson, Frueh, & Acierno, 2010). In addition, although confidentiality is assured, some respondents may be reluctant to admit involvement in certain events, particularly those involving perceived responsibility for the death of others, because of fear of personal or career repercussions.

The items falling into the Perceived Responsibility component in Study 1 yielded a subscale containing only three items, which exhibited low reliability. Having few items on a subscale is commonly associated with low reliability (Cortina, 1993). Although one of these items, involvement in hand-to-hand combat, may seem conceptually unrelated to the other items on perceived responsibility for unintended death, this item loaded with others in at least one other study (Killgore et al., 2008), suggesting that this may not be a spurious or purely technical finding. As well, qualitative research on killing in hand-to-hand combat among military personnel shows that this experience may have particularly strong psychological repercussions (Jensen & Simpson, 2014), suggesting that it may be associated with perceived responsibility for unintended death in at least some who have had this experience. Future research is needed to further develop this subscale to more accurately assess the experiences of military personnel. Qualitative research to determine the events involving personal responsibility may yield further insight into this category of stressors, and allow for the development of a scale to fully capture such experiences during deployment. Although such scales have been developed for other militaries (e.g., Nash et al., 2013), it is important that scales capture the experiences of CAF members as well as the current types of conflict, and continue to be updated as involvement in missions changes.

Combat exposure events were assessed in dichotomous response format during postdeployment screening. The creation of exposure categories does not account for the relative degree of stress associated with each experience. Certain types of exposures may be more likely to lead to the development of psychological health problems. As well, there may be subjectivity in reporting of certain events. This is especially important for some items, such as feeling responsible for the death of another individual, in which there is particular room for subjectivity or errors in recall. In contrast, items such as being under mortar attack or IED blast are more objective, and the dichotomous response categories are more likely to accurately reflect participants' experiences.

Implications

In the context of the present article, the factor structure of deployment experiences provides insight into which experiences tend to occur together in a given individual in the study populations. Study 1 and Study 2 showed convergent results, suggesting that, in the same region over different time periods, the experiences of military personnel clustered together in reproducible ways. Where differences were seen, they could be traced to the disparities in items on the two surveys.

A parsimonious explanation for the divergent results between the factor structure identified in

the current study and the structures found in other populations at other times is that the pattern of shared experiences happened to be different for that group at that time. The larger size and greater diversity of personnel in both of our studies relative to similar work may have facilitated convergence in the factor structure, in that the role of particular shared experiences in, for example, a single Brigade Combat Team, may have been lessened.

That certain experiences happened to occur together should not be interpreted as evidence of homogeneous impacts on mental health. The motivation for this study was largely technical in nature: to inform the development of a more compact exposure scale for the purpose of controlling for combat exposure in epidemiological studies and for exploring the effects of different types of combat exposure. Before item reduction, the association of each of those experiences with mental health problems will need to be explored. Other recent work on the psychosocial consequences of different types of combat exposure (Gallaway et al., 2014; Killgore et al., 2008) has not explicitly done so.

The presence of unique components (Perceived Responsibility in Study 1 and Personal Suffering in Study 2) points to the need for greater conceptual and empirical clarity. Developing more items (or better items) in these two areas will help to understand if they contribute to the burden of postdeployment mental disorders. Qualitative research in these domains will be helpful. In addition, qualitative research on cross-loading items may provide a deeper understanding of the nature of each of the identified components and why certain experiences tended to occur together.

Four items of the original CES in Study 1 were removed because of concerns that they may require investigation into potential misconduct. Inclusion of these items (e.g., witnessing mistreatment of noncombatants) may have yielded a more statistically reliable perceived responsibility scale, or a separate component pertaining to violations of ethical norms. As well, ethical violations have conceptual and empirical links to mental health, underlining the importance of work in this area.

Two other types of deployment experiences should also be explored in conjunction with combat experiences in future work to provide the fullest possible picture of how those experiences affect deployed personnel. Noncombat stressors (such as exposure to a harsh environment, separation from family, and lack of physical intimacy) may exert independent negative effects or may moderate the effects of traumatic experiences; these effects may differ in-theater compared with postdeployment. Positive deployment experiences (e.g., gratitude from civilians, camaraderie) raise similar questions. Positive mental health may both serve as a stress buffer and contribute independently to well-being; it has been targeted in resilience training programs, particularly in the U.S. Army. Understanding how all of these factors (traumatic stressors, nontraumatic stressors, and positive experiences) influence health may identify targets for intervention. Noncombat stressors and positive experiences are appealing targets in that the military may have greater control over them than traumatic combat stressors. Finally, exploration of all of these experiences in future noncombat operations is essential.

Conclusion

It is important to systematically assess combat exposure to develop valid and reliable measures that accurately reflect the experiences of military personnel. Accurate information about traumatic experiences, both traditional combat events, such as being involved in a firefight, as well as events involving perceived responsibility for harm of others, can provide information to clinicians to help focus assessment and treatment strategies for mental health issues. The current study found categories of deployment stressors that can be used for further analysis. Further research is underway linking the components found in this study to mental health outcomes, to determine those combat experiences that are most strongly associated with well-being after deployment. In particular, we will examine the association of the subscales with mental health problems, as well as the association of individual combat experiences with mental health. This further research will help to inform strategies for treatment of postdeployment mental health issues.

The similarities and differences in the factor structure of similar combat exposure scales in different groups raises the possibility that combat exposures cluster somewhat idiosyncrati-

cally, particularly in smaller groups that work together in a particular place at a particular time. Additional exposure items are needed to capture dimensions of negative deployment experiences (e.g., moral injury; Nash et al., 2013) that are not well-covered by the most widely used scales. Furthermore, investigators should consider the possibility that experiences that happen to occur together could have very different impacts on mental health. Finally, exploration of the health effects of traumatic deployment experiences needs to occur in conjunction with exploration of the effects of noncombat stressors and positive deployment experiences.

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