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Validation of Scales From the Deployment Risk and Resilience Inventory in a Sample of Operation Iraqi Freedom Veterans

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The Deployment Risk and Resilience Inventory (DRRI) is a suite of scales that can be used to assess deployment-related factors implicated in the health and well-being of military veterans. Although initial evidence for the reliability and validity of DRRI scales based on Gulf War veteran samples is encouraging, evidence with respect to a more contemporary cohort of Operation Iraqi Freedom (OIF) veterans is not available. Therefore, the primary goal of the present study was to validate scales from the DRRI in a large sample of OIF army personnel diversified in occupational and demographic characteristics. In general, results supported the use of these DRRI scales in this population. Internal consistency reliability estimates were quite strong. Additionally, support was obtained for criterion-related validity, as demonstrated by associations with mental and physical health measures, and discriminative validity, as demonstrated by differences between key military subgroups.

Keywords: *war-zone exposure; military deployments; veterans; Operation Iraqi Freedom; psychometric evaluation*

The Deployment Risk and Resilience Inventory (DRRI) is the product of an extended psychometric endeavor to develop a comprehensive suite of scales to assess deployment-related factors that are implicated in the health and well-being of military veterans (L. King, King, Vogt, Knight, & Samper, 2006). The DRRI currently includes scales to assess 2 predeployment factors (prior stressors and childhood family environment), 10 features of the deployment (combat experiences; perceived threat; aftermath of battle; difficult living and working environment; sense of preparedness; nuclear, biological, and chemical exposures (NBCs); concerns about life and family disruptions; deployment social support; sexual harassment; and general harassment), and 2 postdeployment factors (postdeployment social support and postdeployment stressors). One or more of these measures of deployment risk and resilience factors

may be employed as stand-alone instruments or the full set of scales may be administered in concert.[1]

Scales from the DRRI offer a number of advantages relative to other measures of deployment risk and resilience factors available in the literature. A key strength of the DRRI is the multidimensional conceptualization of deployment experiences. Although many deployment measures focus on combat exposure, research findings point to other deployment factors that may render veterans more or less vulnerable to postwar distress and adjustment difficulties, including exposure to circumstances surrounding the aftermath of battle, subjective experiences of threat that may or may not accompany objective combat experiences, and potential exposure to environmental hazards in the war zone (Johnson, Cline, Marcum, & Intress, 1992; L. A. King, King, Fairbank, Keane, & Adams, 1998; D. W. King, King, Foy, Keane, & Fairbank, 1999; D. W. King, King, Gudanowski, & Vreven, 1995; Kolkow, Spira, Morse, & Grieger, 2007; Malone et al., 1996; McCarroll, Ursano, & Fullerton, 1995; Ryan-Wenger, 1992; Sutker, Uddo, Brailey, Vasterling, & Errera, 1994; Vogt, Pless, King, & King, 2005; Vogt & Tanner, 2007; Wolfe et al., 1998). Moreover, an increasing body of research emphasizes the importance of attending to predeployment and postdeployment risk and resilience factors (e.g., Brewin, Andrews, & Valentine, 2000; D. W. King, King, Foy, & Gudanowski, 1996; Norris, Maguen, Litz, Adler, & Britt, 2005; Rosenheck & Fontana, 1994), including, most importantly, predeployment and postdeployment life stressors and postdeployment social support (e.g., Bremner, Southwick, Johnson, Yehuda, & Charney, 1993; Egendorf, Kadushin, Laufer, Rothbart, & Sloan, 1981; Fontana & Rosenheck, 1994; Green, Grace, Lindy, Gleser, & Leonard, 1990; D. W. King et al., 1996; D. W. King et al., 1999; Solomon, Mikulincer, & Habershaim, 1990; Solomon, Mikulincer, & Hobfoll, 1987; Zaidi & Foy, 1994). The DRRI includes scales to address each of these factors.

Another advantage of the DRRI is its assessment of factors that are salient for the growing proportion of National Guard/Reservist personnel and women who have been activated in recent deployments. For example, the DRRI includes a scale to assess preparedness for deployment, a factor that may be of particular concern for women, given that women are increasingly exposed to combat-related circumstances despite the fact that they are officially prohibited from serving in direct ground combat, and therefore, may not receive the same level of combat training (La Bash, Vogt, D. W. King, & King, in press). The DRRI also includes a scale to assess concerns about life and family disruptions, an issue that may be especially relevant for National Guard/Reservist personnel who must leave civilian jobs behind and who may be less accustomed to family separations compared with active duty service members (Browne et al., 2007; Vogt, Samper, King, King, & Martin, 2008).

A final advantage of the DRRI is its systematic development and rigorous psychometric evaluation (L. King et al., 2006; Vogt, D. W. King, & King, 2004). The careful attention to the definition of key constructs and coverage of relevant content domains, as well as the application of a focus group methodology to enhance content validity, albeit in the context of the 1990-91 Gulf War (Gulf War I), are major strengths of the scales. Results based on the administration of these scales to Gulf War I veterans have revealed high internal consistency reliability, where appropriate, and sufficient levels of test–retest reliability. Moderate associations among the deployment risk and resilience factors provided support for convergent validity, whereas weaker associations between risk and resilience factors and a measure of social desirability provided evidence for discriminant validity. Modest to moderate associations between deployment risk and resilience factors and mental and physical health measures demonstrated evidence for criterion-related validity, whereas evidence for discriminative validity was provided in the form of

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demonstrated differences between key Gulf War I veteran subgroups. A detailed elaboration of the psychometric validation of the DRRI in a sample of Gulf War I veterans is available in L. King et al. (2006) and D. W. King, King, and Vogt (2003).

Although initial evidence for the reliability and validity of DRRI scales is encouraging, there is a need for further development and validation of the DRRI in a contemporary cohort of Iraq War veterans. This suite of scales was developed within the context of Gulf War I that occurred approximately 15 years ago. Yet it is well known that instruments that are valid for one assessment purpose may not be valid for other purposes, and psychometricians recommend ongoing evaluation and refinement of measurement systems (Anastasi & Urbina, 1996; Cook & Campbell, 1979; Cronbach & Meehl, 1955; Haynes, Richard, & Kubany, 1995; L. A. King & King, 1990; Nunnally & Bernstein, 1994; Suen, 1990). Evidence for the validity of the DRRI in other samples is available from research based on French–Canadian military personnel, the majority of which served in United Nations and North Atlantic Treaty Organization peacekeeping operations (Fikretoglu, Brunet, Poundja, Guay, & Pedlar, 2006). However, no in-depth exploration of the psychometric properties of the DRRI is yet available on the large and continually increasing cohort of veterans deployed in support of the more contemporary Iraq War. Given the range of deployment stressors experienced by this cohort (La Bash et al., in press), along with evidence of significant mental and physical health problems among returning Operation Iraqi Freedom (OIF) veterans (Hoge et al., 2004; Hoge, Terhakopian, Castro, Messer, & Engel, 2007; Kang & Hyams, 2005; Milliken, Auchterlonie, & Hoge, 2007; Seal, Bertenthal, Miner, Sen, & Marmar, 2007; Vasterling et al., 2006b), valid measurement of factors that have implications for their health and well-being is critical.

Therefore, the primary goal of the present study was to validate scales from the DRRI in a large occupationally and demographically diverse sample of OIF active duty army personnel. Evidence for internal consistency reliability, criterion-related validity, and discriminative validity was evaluated. Internal consistency reliability reflects the extent to which scores on scale items are intercorrelated, as would be expected for a unitary hypothetical construct (Cronbach, 1951; Cronbach & Meehl, 1955). Evidence for internal consistency reliability is provided in the form of Cronbach's alphas, and these values are compared with parallel information from Gulf War I veterans. Criterion-related validity reflects the extent to which scores on a scale are related to some criterion of practical value (Foster & Cone, 1995; Messick, 1994). In this study, evidence for this form of validity is provided vis-à-vis associations with a range of mental and physical health measures that have been linked to deployment stressors in prior research. Discriminative validity reflects the extent to which groups expected to differ on the construct of interest demonstrate expected differences (Foster & Cone, 1995). Evidence for discriminative validity was evaluated in terms of differences in deployment risk and resilience factors based on gender and deployment role (combat or combat-support vs. service-support).[2] Prior studies have identified several important differences in the deployment stressors experienced by men and women. Of relevance to the current study, findings based on the administration of DRRI scales to Gulf War I veterans indicate that men experience more combat-related events compared with women (Vogt et al., 2005). Although few studies have compared the deployment experiences of combat/combat-support and service-support personnel, combat/combat-support personnel would be expected to report combat-related exposures at a higher rate than service-support personnel.

Method

Participants and Procedure

Data were derived from the Neurocognition Deployment Health Study (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Vasterling et al., 2006a; Vasterling et al., 2006b), a longitudinal study focused on neuropsychological outcomes of Iraq War participation. Specifically, data were drawn from 640 Iraq-deployed active duty army soldiers who participated in the project both before deployment in 2003 to 2004 and shortly after their return from deployment in 2005 to 2006, depending on the deployment dates of each unit. At both time points, study measures were administered in groups through paper-and-pencil surveys. Participants completed 9 of the 14 DRRI scales. Specifically, they completed all DRRI scales except scales addressing childhood family environment, difficult living and working environment, deployment social support, sexual harassment, and general harassment. With the exception of the prior stressors scale, which was administered during the predeployment period, all DRRI scales in this study were administered following deployment. Only those soldiers who completed full tours (i.e., ≥ 320 days) were included in this study. Postdeployment assessments occurred on

Table 1
Sample Characteristics

	N	%
Gender		
Female	49	8
Male	591	92
Age group		
20 or younger	69	11
21 to 30	470	75
31 to 40	77	12
41 to 50	9	2
Hispanic ethnicity		
Hispanic	90	14
Non-Hispanic	549	86
Race		
Black/African American	104	19
Asian American	20	3
Caucasian	361	66
Other	64	12
Sample site		
Ft. Lewis	341	53
Ft. Hood	299	47
Deployment role		
Combat-arms/Combat-support	402	63
Service-support	238	37

average 73.33 days (*SD* = 19.52) after return from deployment.

Participants in this study included soldiers initially seen at two sites: Ft. Lewis, WA and Ft. Hood, TX. Soldiers were sampled at the military battalion unit level according to a modified categorization procedure designed to capture heterogeneous deployment experiences within the war zone. More detailed sampling information can be found in Vasterling et al. (2006a). Table 1 presents descriptive sample characteristics.

Measures

Nine DRRI scales were included in this study. These scales were derived from an earlier four-phase psychometric endeavor that included the following: (a) focus groups with veterans deployed to Gulf War I to establish content validity, (b) a telephone survey of a national sample of female and male Gulf War I veterans to select items and establish initial psychometric properties, (c) a national mail survey of Gulf War I veterans to confirm the psychometric properties and usefulness of the DRRI in paper-and-pencil format, and (d) a final validation telephone survey to another national sample of Gulf War I veterans to relate scores on the measures to physical and mental health and health-related quality of life (L. King et al., 2006).

Descriptions of these scales, sample items, and response formats are included in Table 2. With several exceptions, all scales were scored by summing items. It is important to note that combat experiences were measured using a modified version of the original DRRI combat experiences scale. The items in this version were identical to the original scale, except for the use of a 5-point Likert- type response format (1 = *never*; 2 = *a few times over entire deployment*; 3 = *a few times each month*; 4 = *a few times each week*; and 5 = *daily or almost daily*). Two scoring methods were applied to this scale, one that involved simply summing responses across all items in the scale and another that involved collapsing categories to reflect the dichotomous (*yes/no*) response format that was used in the initial development of this scale (L. King et al., 2006). In addition, please note that in scoring concerns about life and family disruptions, responses of *not applicable* were recoded to be equivalent to responses of *not at all* because these two response options were assumed to be conceptually equivalent for the purpose of establishing the amount of concern about life and family disruptions experienced by soldiers. A number of physical and mental health measures were administered in addition to the DRRI scales. These measures are described below.

Posttraumatic stress symptomatology (PTSS). The PTSD Checklist (Weathers, Litz, Herman, Huska, & Keane, 1993) contains 17 items adapted from the *Diagnostic and Statistical Manual of Mental Disorders IV* (American Psychiatric Association, 1994) to evaluate PTSD's Criteria B (reexperiencing and intrusive thoughts and memories), C (active avoidance and emotional numbing), and D (hyperarousal) symptom categories. Respondents rated how much "you have been bothered by that problem in the past month" on a 5-point scale, with anchors ranging from 1 (*Not at all*) to 5 (*Extremely*). This widely used instrument for assessing stress symptomatology has demonstrated coefficient alphas greater than .95 and is highly correlated with one of the most well-regarded measures of PTSD, the Clinician-Administered PTSD Scale (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). The coefficient alpha for this sample was .96.

Depression. Depression was assessed with the Center for Epidemiological Studies Depression Scale (CES-D). The CES-D is a 20-item self-report instrument that measures level of depressive symptomatology. Respondents rate items using a 4-point response format (0 to 3) to indicate the frequency with which they have been experiencing symptoms in the past

Table 2
Construct Definitions and Sample Items for the Deployment Risk and Resilience Inventory Scales Used in This Study

Construct	Construct Definition	Sample Items	Response Format
		Predeployment/Prewar factors	
Prior stressors	Exposure to traumatic events before deployment, such as community or domestic violence, physical assault, sexual abuse, or other highly stressful life events.	Before I was deployed, I experienced . . . . . . a natural disaster (for example, a flood or hurricane), a fire, or an accident in which I was hurt or my property was damaged. . . . the death of someone close to me.	Dichotomous items (0 = *No*; 1 = *Yes*).
		Deployment/War-zone factors	
Preparedness	Extent to which an individual perceives that he or she was prepared for deployment. This includes the extent to which military personnel believe they had the equipment and supplies they needed, were trained to perform necessary procedures and tasks, and were prepared for what to expect during the deployment.	I had all the supplies and equipment needed to get my job done. I was informed about the role my unit was expected to play in the deployment.	5-point Likert-type response format (1 = *Strongly disagree*; 5 = *Strongly agree*).
Concerns about life and family disruptions	Worries that deployment might negatively affect other important life domains, including both career-related concerns (perhaps especially important for members of the National Guard and Reserves) and family-related concerns.	While I was deployed, I was concerned about . . . . . . missing important events at home such as birthdays, weddings, funerals, graduations, etc. . . . harming my relationship with my spouse/significant other.	4-point Likert-type response format (1 = *Not at all*; 4 = *A great deal*) with an additional option of 0 = *Not applicable*.
Perceived threat	Fear for one's safety and well-being in the war zone, especially as a response to potential exposure to circumstances of combat, including fear of nuclear, biological, or chemical agents (NBCs), missiles, and friendly fire incidents.	I thought I would never survive. I felt that I was in great danger of being killed or wounded.	5-point Likert-type response format (1 = *Strongly disagree*; 5 = *Strongly agree*).
Combat experiences	Exposure to stereotypical warfare experiences, such as firing a weapon, being fired on, witnessing injury and death, and going on special missions and patrols that involve such experiences.	While deployed . . . . . . I went on combat patrols or missions. . . . my unit engaged in battle in which it suffered casualties.	Scoring method 1: Dichotomous items (0 = *No*; 1 = *Yes*). Scoring method 2: 5-point Likert-type response format (1 = *Never*; 5 = *Daily or almost daily*).
Aftermath of battle	Exposure to the consequences of combat, including observing or handling human remains, dealing with POWs, and observing other consequences, such as devastated communities and homeless refugees.	I saw refugees who had lost their homes and belongings as a result of battle. I was exposed to the sight, sound, or smell of dying men and women.	Dichotomous items (0 = *No*; 1 = *Yes*).

(continued)

Table 2 (continued)

Construct	Construct Definition	Sample Items	Response Format
NBC exposures	Endorsed exposures to an array of nuclear, biological, and chemical agents that the veteran believes he or she encountered while serving in the war zone.	While I was deployed, I was exposed to . . . . . . smoke or other air pollution . . . depleted uranium in munitions.	Polytomous items (0 = *No*; 1 = *Don't know*; 2 = *Yes*).
		Postdeployment/Postwar factors	
Postdeployment social support	The extent to which family, friends, coworkers, employers, and community provide emotional sustenance and instrumental assistance.	Among my friends or relatives, there is someone who makes me feel better when I am feeling down. There are people I can talk to about my deployment experiences.	5-point Likert-type response format (1 = *Strongly disagree*; 5 = *Strongly agree*).
Postdeployment stressors	Exposure to stressful life events after the deployment, including both generally stressful events that are unrelated to the deployment and events that may be related to efforts at reintegration (especially for National Guard and Reserves).	Since returning home, I have . . . . . . experienced a serious operation. . . . been robbed or had my home broken into.	Dichotomous items (0 = *No*; 1 = *Yes*).

month. Anchors range from *rarely or none of the time* to *most or all of the time*. This measure has demonstrated an acceptable level of internal consistency and convergent validity in community and patient samples (Radloff, 1977).

Health symptoms. Health symptoms were measured using a subset of items from the expanded Health Symptom Checklist (Proctor et al., 1998). This checklist includes 16 health symptoms assigned to one of 6 different body systems: cardiac, dermatological, neurological, pulmonary, gastrointestinal, and musculoskeletal. A final item was included to assess fatigue. Each item is rated using a response format ranging from 0 (*never, no symptoms*) to 4 (*symptoms experienced very often, almost every day*).

Physical and mental health functioning. Physical and mental health functioning was assessed using the Short Form-12 Health Survey (SF-12), adapted for use with veterans (Kazis et al., 1999). The SF-12 (now termed VR-12) has been found to reproduce at least 90% of the variance in the full SF-36, which has well-established reliability and validity (Kazis et al., 2006; McHorney & Ware, 1995; Ware & Sherbourne, 1992; Ware, Snow, Kosinski, & Gandek, 1993). The VR-12 includes items to assess social functioning, role limitations because of emotional problems, vitality, and general mental health perceptions. Although weighted differently depending on summary score (please see Kazis et al., 1999, for additional details on how weights were derived), each of the 12 questions contributes to the mental health functioning summary scores and physical health functioning summary scores.

Cognitive functioning. Subjectively perceived cognitive functioning was assessed with the 4-item version of the Medical Outcomes Study Cognitive Functioning Scale (MOS-CF4; Stewart, Ware, Sherbourne, & Wells, 1992). Ample psychometric support for this self-report instrument is available (Revicki, Chan, & Gevirtz, 1998). Specifically, evidence is available for internal consistency reliability, test–retest reliability, convergent validity (based on the association with the CES-D, a measure of psychological distress), discriminative validity (reflected in significant group differences for patients with symptomatic and asymptomatic HIV or AIDS), and criterion-related validity (based on the association with the Reitan Trail Making Task, a performance-based measure of cognitive functioning).

Table 3
Estimates of Internal Consistency Reliability and Comparison With Gulf War I Veterans

DRRI Scale	Study Sample of OIF Veterans Alpha	Comparison Sample of Gulf War I Veterans Alpha
Predeployment factors		
Prior stressors	.77	.75
Deployment factors		
Preparedness	.88	.87
Concerns about life and family disruptions	.84	.89
Perceived threat	.84	.89
Combat experiences—original	.85	.85
Combat experiences—frequency-based	.90	—
Aftermath of battle	.86	.89
NBC exposures	.77	.82
Postdeployment factors		
Postdeployment social support	.88	.87
Postdeployment stressors	.55	.72

Note: The frequency-based measure of combat exposure was not administered to the Gulf War I sample. NBC = nuclear, biological, or chemical agents. DRRI = Deployment Risk and Resilience Inventory; OIF = Operation Iraqi Freedom.

Analyses

Estimates of internal consistency reliability (i.e., Cronbach's alphas) were first computed for each DRRI scale. To assess criterion-related validity, we next examined relationships between the risk and resilience factors and physical and mental health measures.[3] Finally, we examined group differences based on gender and deployment role (combat-arms/combat-support vs. service-support) to evaluate support for discriminative validity.

Results

The first column of Table 3 presents estimates of internal consistency reliability for each DRRI scale. Seven of the 10 coefficients were .80 or higher, and 2 others (i.e., prior stressors and NBC exposures) fell just below .80. Only the postdeployment stressor scale demonstrated lower reliability, and as discussed in more detail below, lower Cronbach's alpha coefficients are generally expected for measures of discrete stressor events such as this one (Bollen & Lennox, 1991; D. W. King et al., 1996). In general, estimates of internal consistency reliability were quite similar to those based on prior research with Gulf War I veterans (see the second column of results in Table 3, from L. King et al., 2006), providing robust support for the internal consistency reliability of these scales across these different veteran cohorts. Importantly, findings revealed slightly higher internal consistency reliability for the frequency-based scoring of combat experiences compared with the original dichotomous response format.

Evidence for criterion-related validity, in the form of correlations between scores on the DRRI measures and scores on the health measures, is displayed in Table 4. The first three columns provide results for measures classified as mental and physical health symptomatology (i.e., PTSS, depression, and count of physical symptoms). The last three columns provide results for measures of functional health status (i.e., mental health functioning, physical health functioning, and cognitive functioning). The large majority of these correlations attained statistical significance ($p < .05$) and, with one exception (the close-to-zero association between aftermath of battle and physical health functioning), were in the expected direction (that is, risk factors demonstrated positive correlations with indicators of poorer health and resilience factors demonstrated negative correlations with indicators of poorer health). For ease of presentation and interpretation, correlations that equal or exceed what might be considered a moderate effect size of $r = .30$ (Cohen, 1988) are presented in bold.

Overall, associations between the risk and resilience factors and mental and physical health symptomatology were stronger than the corresponding associations with functional health status measures, suggesting that the impact of these factors on symptomatology may be stronger, or more immediate, than on functional outcomes. Within the health symptomatology category, correlations were generally highest for PTSS, closely followed by depression. In general, associations appeared to be greatest for concerns about life and family disruptions, perceived threat, and the two postdeployment factors: postdeployment social support and postdeployment stressors. Scores on both versions of the combat experiences measure generally demonstrated weaker associations with health measures compared with other risk and resilience factors. However, associations were slightly higher for the frequency-based scoring of combat experiences compared with scoring with the original dichotomous response format.

Evidence for discriminative validity is presented in the form of group comparisons for each of the risk and resilience factors. For each contrast, we report group

Table 4
Correlations Between Risk and Resilience Factors and Health Measures

	Mental and Physical Health Symptomatology			Functional Health Status		
Risk and Resilience Factors	PTSS	Depression	Count of Physical Symptoms	Mental Health Functioning	Physical Health Functioning	Cognitive Functioning
Prior stressors	.14*	.16*	.23*	−.13*	−.08*	−.12*
Preparedness	−.17*	−.26*	−.23*	.23*	.13*	.18*
Concerns about life and family disruptions	**.32***	.27*	.26*	−.21*	−.13*	−.20*
Perceived threat	**.46***	**.40***	**.35***	**−.35***	−.22*	**−.31***
Combat experiences—original	.23*	.09*	.05	−.09*	−.01	−.08*
Combat experiences—frequency-based	.29*	.11*	.07	−.12*	.00	−.10*
Aftermath of battle	.29*	.15*	.14*	−.15*	.02	−.08*
NBC exposures	.26*	.24*	**.37***	−.23*	−.11*	−.18*
Postdeployment social support	**−.32***	**−.40***	−.19*	**.30***	.16*	.25*
Postdeployment stressors	**.32***	.29*	.29*	−.23*	−.25*	−.23*

Note: PTSS = Posttraumatic stress symptomatology; NBC = nuclear, biological, or chemical agents. Correlations that equal or exceed what might be considered a moderate effect size of $r = .30$ are presented in bold.
*$p < .05$.

Table 5
Comparisons Between Men and Women

	Men		Women				
Risk and Resilience Factors	*M*	*SD*	*M*	*SD*	*t*	*df*	*Effect Size (Cohen's d)*
Prior stressors	4.56	3.26	5.12	3.91	−1.14	638	.09
Preparedness	49.14	10.03	45.02	11.19	−2.74*	635	**.22**
Concerns about life and family disruptions	24.47	7.55	26.20	6.78	−1.55	637	.12
Perceived threat	45.68	10.31	50.66	10.66	−3.24*	636	**.26**
Combat experiences—original	8.33	3.64	3.98	2.18	8.25*	635	**.65**
Combat experiences—frequency-based	31.98	10.27	22.45	4.68	6.43*	635	**.51**
Aftermath of battle	8.27	4.03	4.96	3.30	5.59*	635	**.44**
NBC exposures	20.01	5.80	18.74	5.12	1.48	636	.12
Postdeployment social support	56.87	9.91	56.35	7.17	0.36	637	.03
Postdeployment stressors	.93	1.31	1.31	1.60	−1.90	636	.15

Note: NBC = nuclear, biological, or chemical agents.
*$p < .05$.

means and standard deviations, values of the test statistic t, and an effect size estimate (Cohen's d; Cohen, 1992). Given the large sample size available for this study, we only interpret significant findings for which the corresponding effect size met the minimum criterion to be classified as a small effect (i.e., $d = .20$; Cohen, 1992). Results that met this criterion are bolded.

Table 5 itemizes gender-based contrasts for all measures. Significant differences emerged for 5 of the 10 variables, and each of these met our effect size criterion (again, 2 of which represented alternate scoring forms of the combat experiences measure). As expected, men reported greater exposure to combat and aftermath of battle than women. Men also reported being more well prepared for deployment. In contrast, women reported greater perceived threat compared with men. All other differences between men and women were quite small, consistent with prior results based on Gulf War I veterans (Vogt et al., 2005).

Table 6 presents findings for differences for combat-arms/combat-support versus service-support personnel. As indicated, significant differences were obtained for 6 of the 10 variables, all of which met our effect size criterion (again, 2 of which assessed combat exposure). As expected, combat/combat-support personnel reported significantly greater exposure to combat experiences and aftermath of battle compared with service-support personnel, and these effects were

Table 6
Comparisons Between Combat-Arms/Combat-Support Versus Service-Support

Risk and Resilience Factors	Combat/ Combat-Support *M*	Combat/ Combat-Support *SD*	Service-Support *M*	Service-Support *SD*	*t*	*df*	*Effect Size (Cohen's d)*
Prior stressors	4.86	3.29	4.17	3.33	2.54*	638	**.20**
Preparedness	49.84	10.04	47.11	10.20	3.30*	635	**.26**
Concerns about life and family disruptions	24.00	7.31	25.63	7.74	–2.66*	637	**.21**
Perceived threat	45.56	10.19	46.92	10.75	–1.59	636	.13
Combat experiences—original	9.33	3.45	5.75	3.05	13.23*	635	**1.05**
Combat experiences—frequency-based	34.66	10.39	25.52	7.01	12.04*	635	**.96**
Aftermath of battle	9.25	3.86	5.92	3.55	10.83*	635	**.86**
NBC exposures	20.22	5.79	19.39	5.67	1.76	636	.14
Postdeployment social support	56.87	9.58	56.76	9.98	0.15	637	.01
Postdeployment stressors	0.93	1.35	1.01	1.33	–0.80	636	.06

Note: NBC = nuclear, biological, or chemical agents.
*$p < .05$.

quite large (Cohen, 1992). Combat/combat-support personnel also reported slightly greater preparedness for deployment and exposure to more predeployment stressors compared with service-support personnel. In contrast, service-support personnel reported slightly more concerns about life and family disruptions compared with combat/combat-support personnel.

Discussion

This article reports on the validation of scales from the DRRI in an OIF veteran sample. Overall, results support the use of these scales in this population. Evidence for internal consistency reliability was quite strong and similar to that demonstrated in a sample of Gulf War I veterans on which these scales were originally developed and validated. In general, DRRI scales demonstrated reasonable to excellent values for coefficient alpha, suggesting that the item sets converged on a common construct, as expected. Given that the three scales with alphas less than .80 reflected variables based on discrete stressor events that are not necessarily expected to covary (e.g., being in an automobile accident and being assaulted), lower reliability for these scales was not surprising. In fact, many researchers have suggested that reliability coefficients for composite variables with causal indicators may not achieve high values (Bollen & Lennox, 1991; MacCallum & Browne, 1993). Internal consistency reliability for the postdeployment stressors scale may have been especially low because of the fact that many of the military personnel in this sample had only just recently returned from deployment, and therefore, may not yet have had the opportunity to experience many of the stressor events addressed in this scale. In fact, the average number of events endorsed out of a possible total of 17 was just under 1. Thus, in addition to the expectation of lower interevent covariation, restricted dispersion on this scale contributed to a lower coefficient alpha for this scale.

Evidence was obtained for the criterion-related validity of these scales in the form of demonstrated associations with mental and physical health measures. The finding that associations between the risk and resilience factors and mental and physical health symptomatology were stronger than the corresponding associations with functional health status measures replicate results based on other veteran cohorts (Fikretoglu et al., 2006; L. King et al., 2006). It may be that for these individuals, exposure to deployment stressors has translated into greater levels of symptomatology but has yet to impinge on functioning. The finding that within the health symptomatology category, correlations were generally higher for PTSS and depression compared with physical symptoms, is not surprising given that, as we have noted elsewhere, the risk and resilience factors are largely psychosocial in nature and might be expected to have more immediate and direct impacts on mental health, compared with physical symptoms (L. King et al., 2006).

As noted previously, associations were greatest for concerns about life and family disruptions, perceived threat, and the two postdeployment factors: postdeployment social support and postdeployment stressors.

Results for concerns about life and family disruptions mirror prior research with Gulf War I veterans (L. King et al., 2006), drawing additional attention to the importance of addressing factors associated with home and family in a military context characterized by more frequent deployments, longer deployments, and less time between deployments. Evidence for the key role of perceived threat is consistent with prior research (L. King et al., 2006; D. W. King et al., 1995; D. W. King et al., 1999; Kolkow et al., 2007; Vogt & Tanner, 2007), emphasizing the importance of moving beyond the assessment of objective combat exposures to evaluate the threat that may or may not accompany these experiences. To this end, it is important to note that scores on both versions of the combat experiences measure generally demonstrated weaker associations with health measures compared with a number of other risk and resilience factors. The finding that both postdeployment factors were strongly associated with current mental health status recapitulates the importance of attending to postdeployment circumstances and replicates findings based on other samples (L. King et al., 2006; Norris et al., 2005).

A number of group differences were obtained for comparisons between men and women, providing evidence relevant to discriminative validity. Consistent with findings based on Gulf War I veterans (Vogt et al., 2005), and as one might expect given that women are typically excluded from direct combat roles, men reported more combat experiences and greater exposure to the aftermath of battle compared with women. In contrast, women reported feeling less well-prepared and experiencing greater perceived threat compared with men. Although these results were not specifically hypothesized on the basis of prior research, it may be that women—who are excluded from direct ground combat roles and, therefore, likely do not receive the same degree of combat training as men—may feel less prepared for and more threatened by the pervasive nature of combat exposure in more contemporary conflicts. Future research is needed to further explore these interesting findings. As for comparisons based on a Gulf War I veteran sample, all other DRRI scales failed to discriminate between the sexes, and with the exception of results for combat exposure and aftermath of battle, the differences that did obtain were generally quite modest, suggesting that men's and women's deployment experiences may be generally more similar than dissimilar.

Several differences also emerged for combat/combat-support and service-support personnel. As expected, combat/combat-support personnel reported more exposure to combat and aftermath of battle and these differences were quite large. Although these results provide important support for the distinction between these roles, the finding that reports of combat-related exposures were not closer to zero for service-support personnel underscores the pervasive nature of combat exposure in this war. The finding that combat/combat-support personnel reported greater preparedness for deployment compared with service-support personnel is perhaps to be expected given that service-support personnel may have had greater exposure to combat-related circumstances than they anticipated based on their military training and deployment role. Both the finding that combat/combat-support personnel reported more predeployment stressors than service-support personnel and that service-support personnel reported more concerns about life and family disruptions are interesting and warrant additional investigation.

Overall, results provided compelling psychometric support for the use of these DRRI scales in studies of Iraq War veterans. These scales may be especially useful to researchers interested in studying how psychosocial risk and resilience factors from different deployment phases (e.g., predeployment, deployment, and postdeployment) contribute to postdeployment health and well-being among returning Iraq War veterans. The DRRI may also be useful for the assessment of risk and resilience factors among nontraditional military personnel (e.g., women, National Guard/Reservist personnel, and service-support personnel) who may have more varied deployment experiences and for whom measures that focus primarily on traditional deployment stressors (e.g., combat exposure) may be insufficient. Although the DRRI was developed as a research tool, it may also be used in the clinical setting to gather information that can assist the clinician in understanding the client's range of deployment experiences and inform decisions regarding the administration of appropriate diagnostic tools.

At the same time, there are a number of areas that require additional attention in further psychometric work with this suite of scales. First, psychometric support for the use of the five DRRI scales that were not included in this study is needed in a more contemporary cohort of Iraq War veterans. Also useful will be psychometric support for these scales in other branches of service and among National Guard/Reservist personnel. Second, future work could be directed toward examining evidence for convergent

validity vis-à-vis associations with other well-validated measures of deployment risk and resilience factors. Given the limited availability of psychometrically sound scales for assessing many of the deployment risk and resilience factors addressed within the DRRI, this work must await further developments in the field. In addition, although prior research has provided evidence for discriminant validity vis-à-vis modest associations between the DRRI scales and a measure of social desirability in a sample of Gulf War I veterans (L. King et al., 2006), future research might examine similar evidence in a sample of Iraq War veterans.

Also useful will be evidence for predictive validity based on longitudinal designs that involve multiple assessments during the postdeployment period. Strictly speaking, the evidence for criterion-related validity presented in the present study addressed concurrent validity, whereas evidence for predictive validity would require a design in which the outcome is assessed at some point in the future (Weathers, Keane, King, & King, 1997). In addition, although the extent to which background/demographic characteristics account for observed differences in deployment risk and resilience factors for subgroups was not the focus of the current study, future research could explore these differences in more depth, examining, for example, the extent to which age differences for combat-arms/combat-support and service-support personnel might account for observed differences in reports of deployment risk and resilience factors. Finally, scales from the DRRI were originally developed and validated within a sample of Gulf War I veterans, and items may be slightly more relevant for use in that cohort compared with more contemporary cohorts. Thus, future attention could also be directed toward exploring the need for the inclusion of additional items to address experiences that are salient for other cohorts.

In conclusion, it is important to ensure that measures of deployment stressors appropriately represent deployment-related experiences with implications for veterans' health and well-being. If researchers rely on measures that are not valid for their proposed purposes or do not capture important aspects of targeted constructs, conclusions based on these results will be flawed and incomplete. In this context, efforts aimed at the ongoing evaluation of the usefulness of the tools that are used to measure deployment experiences, such as the scales that comprise the DRRI, are of critical importance.

Notes

1. For the purposes of the Deployment Risk and Resilience Inventory, the term *risk factor* is used to label those factors that are positively related to postdeployment health problems, whereas the term *resilience factor* is used to label those factors that are negatively related to postdeployment health problems. This is simply a linguistic convenience because, in effect, the opposite pole of a risk factor (e.g., high combat exposure) could be judged a resilience factor (e.g., low combat exposure). Likewise, the opposite pole of a resilience factor (e.g., the presence of strong social support in the recovery environment) could be judged a risk factor (e.g., the absence of social support). We duly recognize, however, that there is an emerging literature on the terminology of resilience and recovery in stress and trauma research (e.g., Bonanno, 2004).

2. Please note that combat-arms (e.g., infantry, artillery, or armor) and combat-support (e.g., reconnaissance, security) groups were combined and compared with service-support personnel (e.g., mechanic or vehicle repair) based on initial analyses that suggested that their deployment experiences differed only minimally. This was not unexpected given the pervasive nature of combat exposure in this war.

3. Correlations among deployment risk and resilience factors and correlations among health measures are available from the first author. Please note that all but one of the 45 correlations among deployment risk and resilience factors were below .70 (with the exception of the correlation between the two different scoring forms for combat exposure), indicating that each set of variables shared less than approximately 50% of their variance, and leaving the other half of the variance in each unaccounted for by the other. Likewise, all but 2 of the 15 correlations among health measures were below .70, and none of the correlations in either set exceeded .75. Correlations of this magnitude fall below widely accepted thresholds for both multicollinearity and poor discriminant validity (Kline, 2005).

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