Hardiness Protects Against War-Related Stress in Army Reserve Forces

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As active-duty forces continue to shrink in the post–Cold War military, reserve and National Guard units play an increasingly important role in deployments of all types. When mobilized for deployment, reservists may experience a range of major life stressors in addition to the stressors encountered in the area of military operations. Although previous studies show ill effects of stress on some of these personnel, few studies have sought to explain the continued good health and stress resiliency displayed by the majority of veterans. This study examined personality hardiness as a potential protective variable among Army reserve personnel mobilized for the Persian Gulf War. Regression results showed hardiness interacted with both combat-related stress and stressful life events to predict psychiatric symptoms on several measures. The pattern of results suggested hardiness protects against the ill effects of stress, particularly under high- and multiple-stress conditions. These results have implications for preventing the ill effects of stress across a variety of occupations that can expose workers to multiple stressors, including job disruption and family separation.

American military forces have undergone a major organizational downsizing in the post–Cold War era. From 1989 to 1997, total active duty forces were reduced by 33% and active Army forces by 36% (Department of Defense, Washington Headquarters Services, 1998). During the same period, reliance on reserve forces has increased steadily, from 35% to 38% of the uniformed force (Office of the Secretary of Defense, 1997). Even more than these numbers suggest, reserve and National Guard forces play an increasingly important role in the total force and in military deployments of all types (Griffith, 1995). Whether for disaster relief, peacekeeping operations, nation building, or armed conflict, reserve forces are called upon with ever greater frequency (Wilson, 1985). The Persian Gulf War of 1991 exemplified the trend: Reserve and National Guard forces comprised 18% of all American soldiers deployed (102,000 out of 569,285; Lakhani & Fugita, 1993). When mobilized, as in the Gulf War, members of these units must leave homes, jobs, and families, often for extended periods of time. How these individuals respond to the multiple stressors of mobilization and deployment is thus an issue of pressing concern for the organization, especially as reliance on reserve forces promises to increase in the future (Walker, 1992).

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A growing body of research has documented the negative health consequences of exposure to war zone stress during the Gulf War (e.g., Bartone, 1993; Elder, Shanahan, & Clipp, 1997; Lehman, 1993). Many of these studies examined National Guard or reserve units and generally found higher levels of psychological symptoms related to stress exposure (Ford et al., 1993; Holmes, Tariot, & Cox, 1998; Stuart & Bliese, 1998; Sutker, Uddo, Brailey, & Allain, 1993; Wolfe, Keane, & Young, 1996). However, although these studies agreed regarding the increased risk for ill effects associated with exposure to war-related stress, little attention was paid to understanding differential responses to stress and why so many exposed individuals remain healthy. For example, Holmes, Tariot, and Cox (1998) reported that in an Air National Guard unit mobilized during the Gulf War, 6.8% of those who deployed to the Gulf showed elevated posttraumatic stress disorder (PTSD) scores afterwards as compared with only 1.7% of those who were not deployed. Apart from pointing out the clear effects of deployment status, these authors made no attempt to explain differences in reported PTSD symptoms or why the vast majority of those deployed apparently did not develop symptoms. This is typical of such studies, where the focus is on ill health and psychiatric breakdown rather than good health and resilience. The present study assessed possible ill effects of war-related stress, but went further by also seeking to explain continued good health in exposed soldiers. To do this, stress and symptoms were examined in a group of Army reserve medical units that were mobilized for the Gulf War, and the potential stress-mediating role of personality hardiness was explored.

Conceptually, hardiness is best considered as a personality variable that develops early in life and is reasonably stable over time, although it is amenable to change under certain conditions (Maddi & Kobasa, 1984). Hardy persons have a high sense of life and work commitment, a greater feeling of control, and are more open to change and challenges in life. They tend to interpret stressful and painful experiences as a normal aspect of existence—part of life that is overall interesting and worthwhile. Research studies with a variety of occupational groups have found this dimension of hardiness appears to function as a significant moderator or buffer of stress (e.g., Bartone, 1989; Contrada, 1989; Kobasa, Maddi, & Kahn, 1982; Roth, Wiebe, Fillingim, & Shay, 1989; Wiebe, 1991). In military groups, hardiness has also been identified as a significant moderator of combat exposure stress in U.S. Gulf War soldiers (Bartone, 1993).

Method

Procedure

A self-report, voluntary questionnaire was distributed to six Army National Guard and reserve medical units in three states (Wisconsin, Utah, and Arkansas) during May–June 1992, shortly after the end of the Gulf War. All six units represented Army field hospitals that had been mobilized for the war effort. The survey had the approval and endorsement of the U.S. Army and the Wisconsin State Area Reserve Forces Command and was distributed through local unit command channels. Participation ranged from an estimated 25% to 75% across the six units involved in the study. The Wisconsin-based units showed the highest participation rates, and the Arkansas units had the lowest. The somewhat lower response rates for the Arkansas units were most likely due to incomplete distribution of the survey within those units. Across all units, the relatively high response rates assured a representative sample for units of this type (National Guard/reserve medical). In the final sample, 45% came from the two Wisconsin units, 37% from the two Utah units, and 18% from the two Arkansas units. Three of the units deployed to Saudi Arabia; one deployed to Germany as back-up for Germany-based units that deployed to the Persian Gulf; and two units, though mobilized, remained in the United States. The sample was made up of 45% women, which although high for Army units in general is not unusual for medi-

Table 1
Sample Demographics

Variable	*n*	%
Gender		
Male	427	55
Female	350	45
Race		
White	660	88
Black	71	9
Other	21	3
Rank		
Enlisted	270	34
NCO	265	34
Officer	252	32
Marital status		
Married	434	55
Single	265	34
Divorced or separated	86	11
Education		
High school	185	24
Some college	323	42
College degree	170	22
Graduate degree	92	12

Note. Overall $N = 787$. The average age was 34 years (SD = 10.6). NCO = noncommissioned officer.

cal units. Other characteristics of the sample were as follows: mean age was 34 years (SD = 10.6); in terms of military rank, 68% were enlisted and noncommissioned officers and 32% were officers; 55% were married; and 32% had college or graduate degrees. Table 1 summarizes sample demographics.

Measures

The questionnaire included items on demographic and background variables, such as military rank, age, education, gender, ethnic background, and marital status. Several questions on family situation (e.g., number of children) and marital satisfaction were also included. The remainder of the survey covered three general areas: (a) sources of stress, (b) coping resources, and (c) health.

Measures of stress. The measures of stress included the Holmes–Rahe Major Stressful Life Events Scale (Holmes & Rahe, 1967) and a 15-item scale of war-zone stressors specific to the Gulf War experience (e.g., "Threat of enemy missile attack"; "Exposure to dead or dying"; "Caring for traumatically injured patients").

Hardiness. To measure hardiness, I used a 15-item scale that derives from the original scales used to measure hardiness by Kobasa (1979) and Maddi and Kobasa (1984). Item and reliability analyses led to a shortened and improved 45-item hardiness measure (Bartone, 1989), which was subsequently further condensed and improved psychometrically using data from a variety of samples (Bartone, 1995; Bartone et al., 1989). This 15-item scale includes positively and negatively keyed items and covers the three conceptually important facets of commitment, control, and challenge. Cronbach's alpha coefficient for the total measure was .82 in the present sample and was .77 for commitment, .68 for control, and .69 for challenge. In a sample of 105 (West Point) college students, the 3-week test–retest reliability coefficient for this scale was .78 (Bartone, 1998).

Health measures. The health measures included a 20-item symptom checklist derived from various studies of soldiers (Bartone, Ursano, Wright, & Ingraham, 1989; Stouffer et al., 1949); a longer measure of psychiatric symptoms known as the Brief Symptom Inventory (Derogatis & Melisaratos, 1983); and the Impact of Events Scale (IES; Horowitz, Wilner, & Alvarez, 1979).

Results

Most of the sample (n = 389) reported having deployed to the Persian Gulf (Saudi Arabia or Kuwait), whereas 145 deployed to U.S. Army stations in Germany. Another 236, though mobilized and engaged full-time in reserve unit duties, remained in the United States. The first set of analyses examined levels of reported stress and symptoms across the deployment groups. I expected that those soldiers deployed closest to the combat situation (i.e., Saudi Arabia) would experience the highest levels of combat stress as well as any related symptoms or health problems. Table 2 compares the three groups in terms of combat and life stress and on the three primary health indicators: symptoms (sum of 20 items), Global Severity Index (GSI) of the Brief Symptom Inventory

Table 2

Means and Standard Deviations for Stress and Health Measures for Three Deployment Groups

	Deployment group					
	1: Not deployed outside United States (n = 236)		2: Deployed to Germany (n = 145)		3: Deployed to Persian Gulf (n = 389)	
Health measure	*M*	*SD*	*M*	*SD*	*M*	*SD*
Stressful Life Events	8.2_a	5.6	8.5_a	5.1	9.3_b	5.6
Combat stress exposure	0.2_a	1.1	8.5_b	3.9	13.5_c	2.4
Symptoms	27.7_a	7.9	27.9_a	8.1	31.2_b	10.3
Global Severity Index	0.31_a	0.4	0.34_a	0.46	0.48_b	0.59
Impact of Events Scale	4.0_a	7.2	9.3_b	9.7	13.8_c	9.7

Note. Means in the same row that do not share subscripts differ at $p < .05$ in the least squares difference post hoc test. Homogeneity of variance was verified across groups for all measures.

(the average of responses to all 53 items; Derogatis, 1993), and the total score of the IES.

The results confirmed that proximity to the battlefield was associated with significantly higher levels of combat stress exposure as well as with increased symptoms on all three health indicators. In general, the U.S.-based group reported the lowest levels of stress and health complaints, the group deployed to Germany reported the next highest, and the group deployed to the Persian Gulf reported the highest levels of all. The Germany-deployed group was not different from the U.S. group in stressful life events reported or GSI scores. The increased number of major stressful life events reported by the group deployed to the Persian Gulf may have been a function of their deployed status affecting their financial, work, and social circumstances.

To test the possible mediating roles of stress and hardiness, scores were entered into a series of (direct, or simultaneous entry) regression models along with relevant interaction terms, predicting negative health outcomes. Results are summarized in Table 3 (predicting symptoms), Table 4 (predicting GSI), and Table 5 (predicting IES). The pattern of results in each of the three regression models was similar, with main effects for hardiness predicting continued good health and for combat-related stress and life stress predicting ill health across the total group. In addition, hardiness generally interacted with stress to predict symptoms. In what follows, these regression results are presented in greater detail.

Table 3

Multiple Regression of Stress and Hardiness Variables Predicting Symptoms (Checklist)

Predictor variable	β	$t(772)$	$p <$
Hardiness	-.17	-2.93	.01
Stressful life events	.54	4.74	.001
Combat stress exposure	.28	2.03	.04
Hardiness × Stressful Life Events	-.19	-1.53	*ns*
Hardiness × Combat Stress Exposure	-.30	-2.01	.04
Hardiness × Combat Stress × Stressful Life Events	.21	3.08	.01

Note. $R = .61$; $R^2 = .38$; $F(6, 767) = 77.42$, $p <$ .001.

Table 4

Multiple Regression of Stress and Hardiness Variables Predicting Global Severity Index

Predictor variable	β	$t(773)$	$p <$
Hardiness	-.14	-2.4	.02
Stressful life events	.68	6.16	.001
Combat stress exposure	.47	3.49	.001
Hardiness × Stressful Life Events	-.38	-3.13	.002
Hardiness × Combat Stress Exposure	-.51	-3.45	.001
Hardiness × Combat Stress × Stressful Life Events	.15	2.21	.03

Note. $R = .63$; $R^2 = .39$; $F(6, 768) = 83.58$, $p <$ .001.

Table 5
Multiple Regression of Stress and Hardiness Variables Predicting Impact of Events Scale

Predictor variable	β	$t(599)$	$p <$
Hardiness	-.07	-0.68	*ns*
Stressful life events	-.10	-0.73	*ns*
Combat stress exposure	.72	3.95	.001
Hardiness × Stressful Life Events	.35	1.99	.05
Hardiness × Combat Stress Exposure	-.50	-2.37	.02
Hardiness × Combat Stress × Stressful Life Events	.07	0.55	*ns*

Note. $R = .50$; $R^2 = .25$; $F(6, 594) = 76.07$, $p < .001$.

Examining the results for the symptoms measure more closely (Table 3), I found significant main effects for stressful life events and combat stress and (negative) hardiness. In addition to these main effects, hardiness also interacted with combat stress (but not stressful life events) to predict symptoms. Furthermore, a three-way interaction was found between hardiness, combat stress, and stressful life events.

Figure 1a explores more closely the two-way interaction between hardiness and combat exposure stress predicting symptoms. Separate regression lines for combat stress exposure on symptoms are plotted for low- and high-hardiness groups (applying a median split). Figure 1a makes it apparent that as combat stress exposure increased, so did symptoms. The figure also shows that the low-hardiness group reported more symptoms than the high-hardiness group and that the divergence between hardiness groups in reported symptoms was greater under high combat stress exposure conditions.

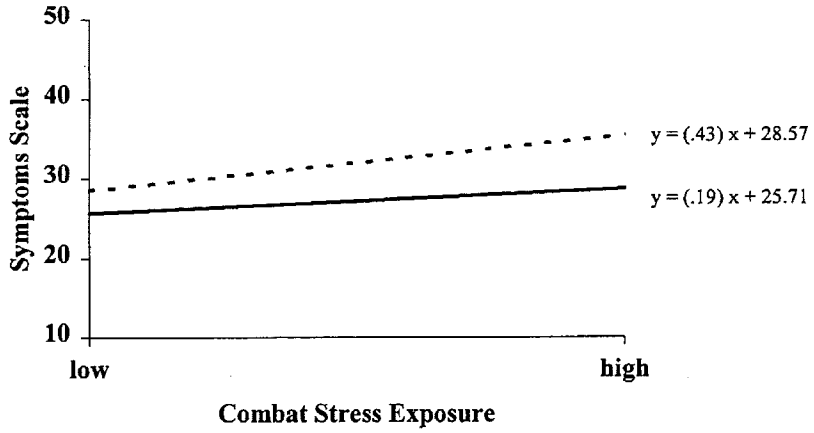
To better understand the observed three-way interaction between hardiness, combat stress, and stressful life events predicting symptoms, once again the simple regression results were computed for appropriate subgroups and plotted. Looking first only at those low in reported stressful life events (median split) the effects of combat stress exposure on symptoms were plotted separately for the low-hardiness and high-hardiness groups (Figure 1b). Figure 1b reveals a modest increase in reported symptoms with increased combat stress exposure, with a more pronounced difference between the low- and high-hardiness groups and a differential that holds rather steady. When the same results are plotted for the high stressful life events group (Figure 1c), the more typical pattern is seen. In this case, symptoms are higher for the low-hardiness group and at high combat stress exposure, and the effects of hardiness are more pronounced under high combat stress conditions.

The next model, predicting GSI (Table 4), echos these findings but in this case with all predictor terms emerging significant. Main effects were seen for (negative) hardiness, stressful life events, and combat stress exposure. Both two-way interaction terms were also significant: Hardiness × Stressful Life Events and Hardiness × Combat Stress Exposure. Finally, a significant three-way interaction term was obtained for Hardiness × Combat Stress Exposure × Stressful Life Events.

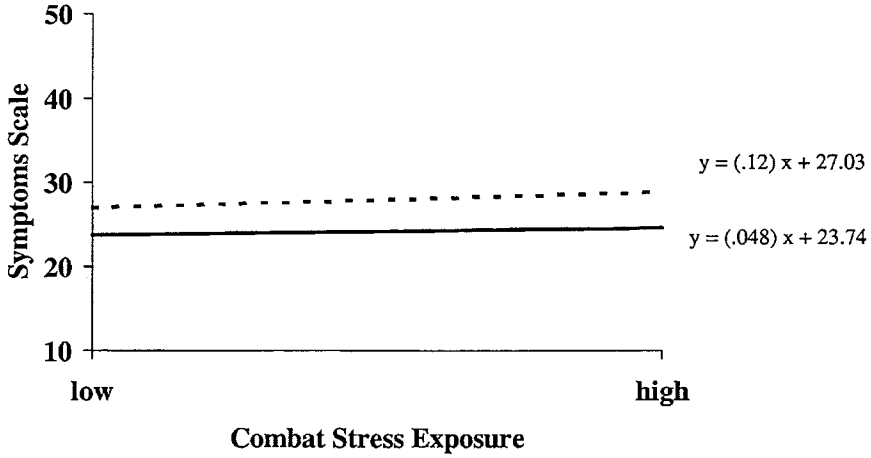
Again, to clarify the directionality of interaction effects, the regression lines were plotted for high- and low–hardiness groups separately, first with stressful life events predicting GSI (Figure 2) and next with com-

Figure 1 (opposite). (a) Combat stress exposure predicting symptoms for low- and high-hardiness groups (Hardiness × Combat Stress Exposure interaction, $p < .04$, unstandardized betas). (b) Combat stress exposure predicting symptoms for low- and high-hardiness groups (low stressful life events only). (c) Combat stress exposure predicting symptoms for low- and high-hardiness groups (high stressful life events only). Low hardiness is indicated by a dashed line, high hardiness by a solid line.

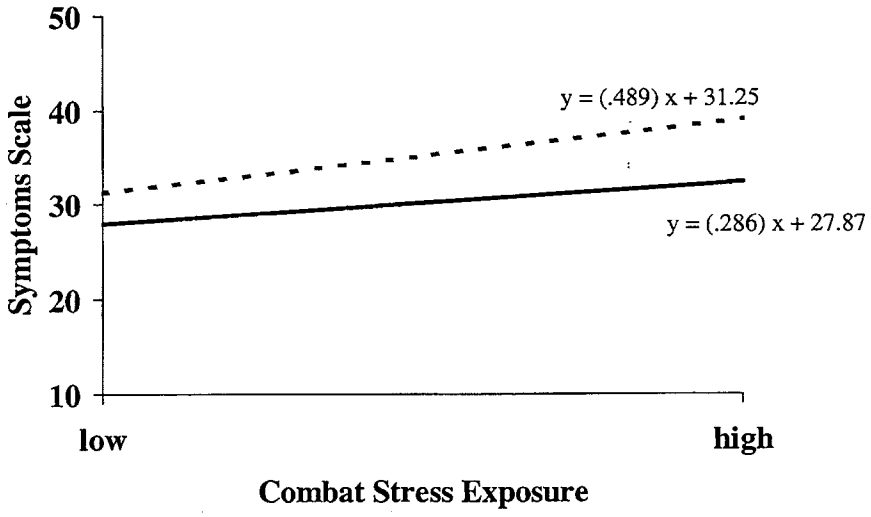
a


50
40
30
20
10
Symptoms Scale
y = (.43) x + 28.57
y = (.19) x + 25.71
low
high
Combat Stress Exposure

b


50
40
30
20
10
Symptoms Scale
y = (.12) x + 27.03
y = (.048) x + 23.74
low
high
Combat Stress Exposure

c


50
40
30
20
10
Symptoms Scale
y = (.489) x + 31.25
y = (.286) x + 27.87
low
high
Combat Stress Exposure

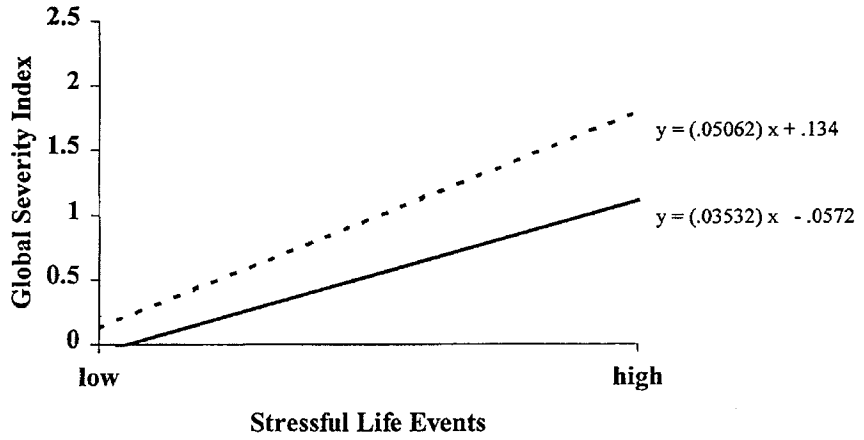


Figure 2. Stressful life events predicting Global Severity Index for low- and high-hardiness groups (Hardiness x Stressful Life Events interaction, $p < .002$, unstandardized betas). Low hardiness is indicated by a dashed line, high hardiness by a solid line.

bat stress exposure predicting GSI (Figure 3). These plotted lines made it clear that hardiness had more potent effects as stress levels increased. At the same time, the overall impact of stressful life events on symptoms, as indexed by the GSI measure, appeared greater than that of combat stress exposure.

The final model predicting IES (Table 5), although still significant, was less powerful in accounting for variance in the dependent variable. Main effects were noted only for combat stress, whereas hardiness interacted with combat stress to predict IES scores. The interaction of hardiness and stressful life events predicting IES scores just reached significance ($p < .05$), but the direction of the effect is opposite from the expected hardiness effect.

Figure 4 shows the plotted regression lines for high- and low-hardiness groups for the two significant two-way interactions. With stressful life events predicting IES (Figure 4), the direction of the Hardy × Stress interaction was positive, in contrast to all the other two-way interaction terms with hardiness. Figure 4 shows the high-hardiness group reporting less PTSD symptomatology (by the IES indicator) under low stress conditions but in an unusual pattern, the high- and low-hardiness groups converged as stress increased. Figure 5, with combat stress exposure predicting IES scores, shows the more typical pattern. Here again, the effects of hardiness increased as combat stress exposure increased.

Discussion

This study demonstrated that the stresses of exposure to combat as well as to major stressful life events were substantially related to health outcomes (reported symptoms) in a large group of Army reserve personnel mobilized for the Persian Gulf War. Yet as others have observed, the relation between war-related stress and illness was far from perfect, and a majority of those exposed showed no ill effects at all (Rundell & Ursano, 1996). Many of the soldiers in the present sample experienced life- and combat-related stress with no apparent negative health consequences. The present results suggest that personality variables, such as hardiness, can at least partly explain why some soldiers remain healthy under war-related stress. In this study, hardiness emerged as a significant predictor of health across a variety of health indicators. More important,

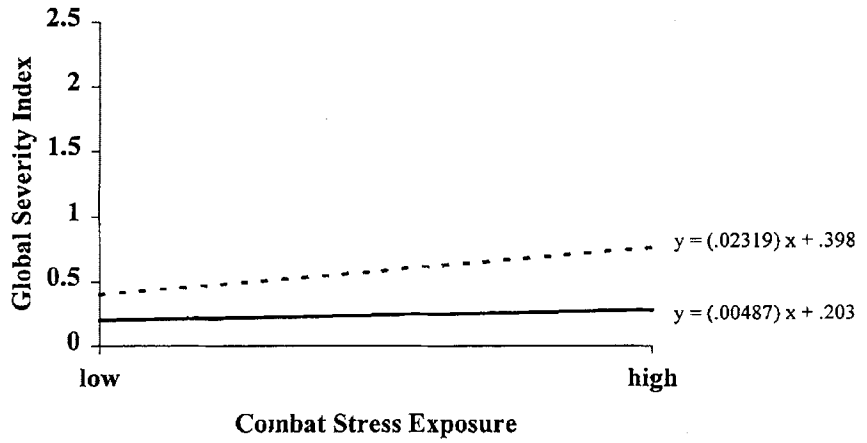


Figure 3. Combat stress exposure predicting Global Severity Index for low- and high-hardiness groups (Hardiness x Combat Stress Exposure interaction, $p < .001$, unstandardized betas). Low hardiness is indicated by a dashed line, high hardiness by a solid line.

hardiness was found to interact with combat stress to predict fewer symptoms under stress. The pattern of results further suggests that those who are experiencing, or have recently experienced, significant major stressful life events, in addition to being exposed to combat stressors, are at the greatest risk for psychological symptoms of various kinds. It also appears that although personality hardiness exerts modest salubrious effects under low-stress conditions, it generally has a stronger influence under high-stress conditions. This finding corresponds to similar findings in various occupational groups (Bartone, 1989; Bartone, 1996a; Contrada, 1989; Kobasa et al., 1982; Roth et al., 1989; Wiebe, 1991).

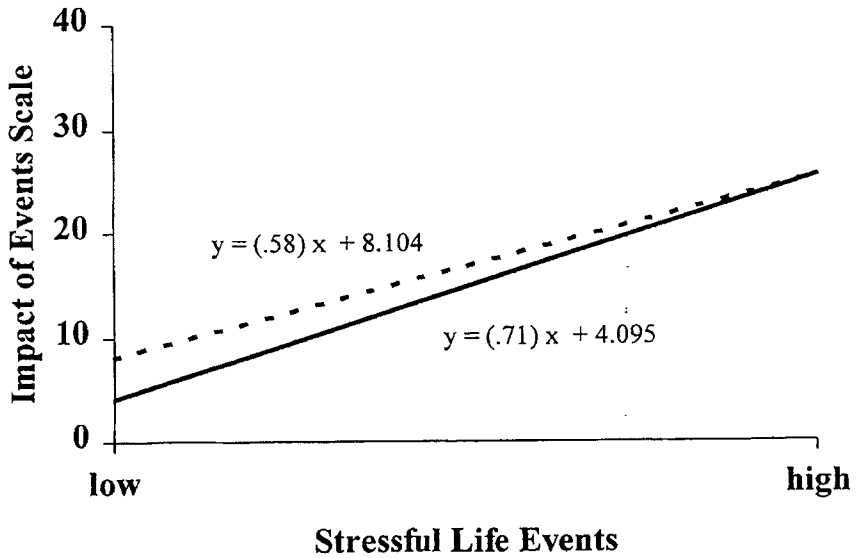


Figure 4. Stressful life events predicting Impact of Events Scale for low- and high-hardiness groups (Hardiness x Stressful Life Events interaction, $p < .002$, unstandardized betas). Low hardiness is indicated by a dashed line, high hardiness by a solid line.

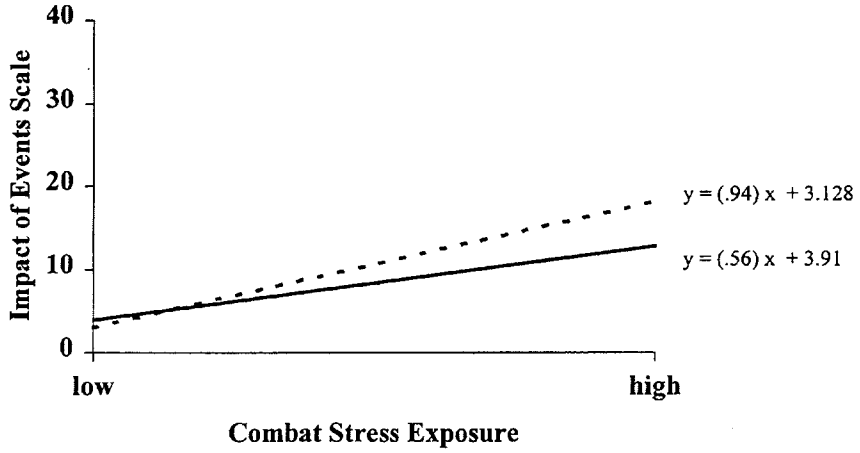


Figure 5. Combat stress exposure predicting Impact of Events Scale for low- and high-hardiness groups (Hardiness × Stressful Life Events interaction, $p < .002$, unstandardized betas). Low hardiness is indicated by a dashed line, high hardiness by a solid line.

How might hardiness influence the relationship between combat stress and health? A recent study of Vietnam War veterans suggests that hardiness operates through social support to increase resistance to PTSD (King, King, Fairbank, Keane, & Adams, 1998). Kobasa and Puccetti (1983) reported similar findings, with hardiness and social support interacting to predict continued good health in corporate managers. One possibility they suggested is that hardy persons are better able to develop and use social support resources.

Another possible mechanism for the positive hardiness effect involves the cognitive interpretation that individuals make when exposed to stressful events and life circumstances. The tendency to find positive meaning in life, especially at work, is a defining feature of personality hardiness (Kobasa, 1979; Maddi, 1967; Maddi & Kobasa, 1984). People with a hardy personality style are more inclined to attach or create positive meaning and importance to their work activities and are also less vulnerable to the ill effects of work and life stress (Kobasa et al., 1982). In a study of city bus drivers (Bartone, 1989), I found that those high in hardiness had a strong sense of meaningfulness and pride in their work and were also more resilient and healthy when subjected to work-related stressors. In several recent studies with military units performing contingency and peacekeeping operations, hardiness was found to reduce the impact of stress (including mission stressors like boredom) on depression and psychiatric symptoms (Bartone, 1996b; Bartone & Adler, 1999). Given the likelihood of boredom or loss of meaning during peacekeeping operations in particular and the apparent potential harm to morale, health and well-being, and mission performance (Siebold, 1996), more attention to this problem is needed. The results of the present study suggest that personality hardiness is an important variable contributing to continued soldier resiliency and good health across a range of missions and stressors. Although these results are suggestive regarding the underlying processes through which hardiness affects health, additional work is needed. Future studies should seek to clarify how and under what conditions hardiness protects soldiers against stress, as well as how hardy cognitive appraisals and behaviors might be increased among those who must undergo the severe stressors of deployment and war..

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