# Development and Validation of a Short Measure of Hardiness

Defense Technical Information Center Report

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December 12th, 2003

Prepared in partial fulfillment of Non-personnel Services Solicitation DABN03-03-T-0462.

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# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*



| **1. REPORT DATE** *(DD-MM-YYYY)* | **2. REPORT TYPE** | **3. DATES COVERED** *(From - To)* |
|---|---|---|
| 12-12-2004 | Research | 2004-2006 |

**4. TITLE AND SUBTITLE**

**Development and Validation of a Short Measure of Hardiness**

**5a. CONTRACT NUMBER**
W81xWH-05-0002

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**6. AUTHOR(S)**

Robert R. Sinclair and Celina M. Oliver

**5d. PROJECT NUMBER**

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

Military Psychiatry, Center for Military Psychiatry
and Neuroscience, Walter Reed
Army Institute of Research
(WRAIR)Silver Spring, MD

**8. PERFORMING ORGANIZATION REPORT NUMBER**

DABN03-03-T-0462

**9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)**

**10. SPONSOR/MONITOR'S ACRONYM(S)**

**11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**

Distribution A – Approved for public release.

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**

This study investigated the psychometric properties of a measure of hardiness designed for military applications. Our findings showed fairly strong support for most of the scale properties we investigated. The confirmatory factor analyses supported the hypothesized 6-factor structure for the scale and the reliability analyses established the acceptable internal consistency levels of the scales.

**15. SUBJECT TERMS** Hardiness refers to the characteristic ways people interpret potentially stressful events. The Soldier Adaptation Model (SAM) is a theoretical framework describing the key stages of the stress response process.

| **16. SECURITY CLASSIFICATION OF:** | | | **17. LIMITATION OF ABSTRACT** | **18. NUMBER OF PAGES** | **19a. NAME OF RESPONSIBLE PERSON** |
|---|---|---|---|---|---|
| **a. REPORT** | **b. ABSTRACT** | **c. THIS PAGE** | | | Harold Lewis, Jr. |
| Unclassified | Unclassified | unclassified | UU | 40 | **19b. TELEPHONE NUMBER** *(include area code)* (301) 961-1544 |

## Summary

The contemporary military environment can be characterized as one of steadily increasing mission demands coupled with declining levels of resources allocated to meet those demands. There are many strategic and tactical implications of this environment, not the least of which is the stress experienced by soldiers as they attempt to fulfill their unit missions. Consequently, military researchers have begun to investigate a wide array of personal and situational factors influencing how soldiers respond to stress. Ultimately, the goal of this research program is to develop empirically-supported interventions to combat the deleterious effects of stress on military personnel. This research has several potential benefits to the military, including development of pre-deployment screening protocols to identify and treat potential stress causalities, monitoring deployed units to address stress-related health and performance concerns before they affect the unit's ability to fulfill its mission, and evaluations of post-deployment interventions intended to treat stress-related causalities.

One direction for current military research on stress concerns hardiness. Hardiness refers to the characteristic ways people interpret potentially stressful events. Higher levels of hardiness are thought to protect people from experiencing some of the adverse consequences of stress. This report describes the development and validation of a measure of hardiness for military applications. The goal of the research was to develop a reasonably short scale with strong reliability and validity evidence. Based on initial work in college student populations, we developed an 18-item hardiness instrument. We administered this scale to 1,465 members of an activated National Guard unit about to be deployed to Europe to augment base security operations. Our research supported the basic psychometric properties of this scale, including evidence of internal consistency reliability, confirmatory factor analytic support for the hypothesized structure of the scale, and evidence of the ability of the scale to predict levels of stress and stress-related outcomes such as psychological well-being, attachment to the military, and combat readiness.

# Development and Validation of a Short Measure of Hardiness

## Acknowledgements

This research was based on the Taskforce Keystone WRAIR Protocol (Bliese & Durand, 2001) conducted by the Department of Psychiatry and Behavioral Sciences, Division of Neuropsychiatry, of the Walter Reed Army Institute for Research (WRAIR) in Washington, DC. Melba Stetz, Carl Castro, Paul Hanges, Lloyd Shanklin, Lolita Burrell, and Gary Adams also provided valuable support for the project at various phases of project design and implementation. We also thank Ellen Skinner for her suggestions and feedback on this research. All of these people made important contributions to this research and we are grateful for their assistance.

## Introduction

The contemporary military environment can be characterized as one of steadily increasing mission demands coupled with declining levels of resources allocated to meet those demands. The stressful nature of this environment, led to this phenomenon being termed OPTEMPO. Concerns about OPTEMPO-related phenomena have intensified as recent military interventions (e.g., Operations *Enduring Freedom* & *Iraqi Freedom*) have placed further demands on already stretched military forces. These demands include longer and more frequent deployments, increased combat casualties (as compared with most other post-Vietnam era deployments), challenges associated with humanitarian and peace keeping missions, and non-traditional modes of enemy engagement, such as terrorist attacks on deployed personnel.

There are many strategic and tactical implications of these demands, not the least of which is the stress experienced by soldiers as they attempt to fulfill their unit missions. Consequently, military researchers have begun to investigate a wide array of personal and situational factors influencing how soldiers respond to stress. This research has documented the effects of stress on unit readiness, soldier psychological and physical health, and attachment to the military and identified several personal and situational factors that contribute to adverse stress-related consequences.

Ultimately, the Army's stress research program seeks empirically-supported interventions to combat the deleterious effects of stress on military personnel. This research has several potential benefits to the US military, including development of pre-deployment screening protocols to identify and treat potential stress causalities, monitoring deployed units to address stress-related health and performance concerns before they affect the unit's ability to fulfill its mission, and evaluations of post-deployment interventions intended to treat stress-related causalities.

With these goals in mind, this paper describes the development and validation of a short measure of hardiness designed for a wide array of military and civilian applications. We will review the general research framework used by the Army to study stress, present a new theory of the relationship between personality and occupational stress, describe hardiness as a personality construct previously shown to be an important influence on soldiers' reactions to potentially stressful events, propose a new model of hardiness for military stress research, and present the results of an empirical research study designed to evaluate a scale intended to assess hardiness in military applications.

## The Soldier Adaptation Model

Bliese and Castro (2003) proposed the Soldier Adaptation Model to facilitate the integration of military stress research with other existing stress literature. The Soldier Adaptation Model (SAM) is a theoretical framework describing the key stages of the stress response process. The SAM was initially adapted from the Institute for Social Research Model (Katz & Kahn, 1978) and also draws from work by Lazarus and Folkman (1984). The SAM synthesizes the core ideas of each of these approaches with a body of supporting empirical research conducted by Army stress researchers. In this regard, the SAM represents an applied research framework intended to

organize stress research into classes of variables rather than proposing a set of specific research hypotheses.

The SAM differentiates between experiencing an event (stressor), negative psychological and physical reactions to events appraised as stressful (strain), and more distal health and performance outcomes of stress. The SAM also articulates a set of potential relationships among different aspects of the stress response process and identifies a set of intervening variables (e.g., soldier individual differences, psychological climate) thought to account for individual differences in the stress response process. Our paper extends past work on the SAM by focusing on the effects of hardiness on soldiers' stress during military deployments. Thus, we investigate the role of hardiness as an intervening variable in the context of the SAM framework.

*Figure 1. Modified Soldier Adaptation Model*

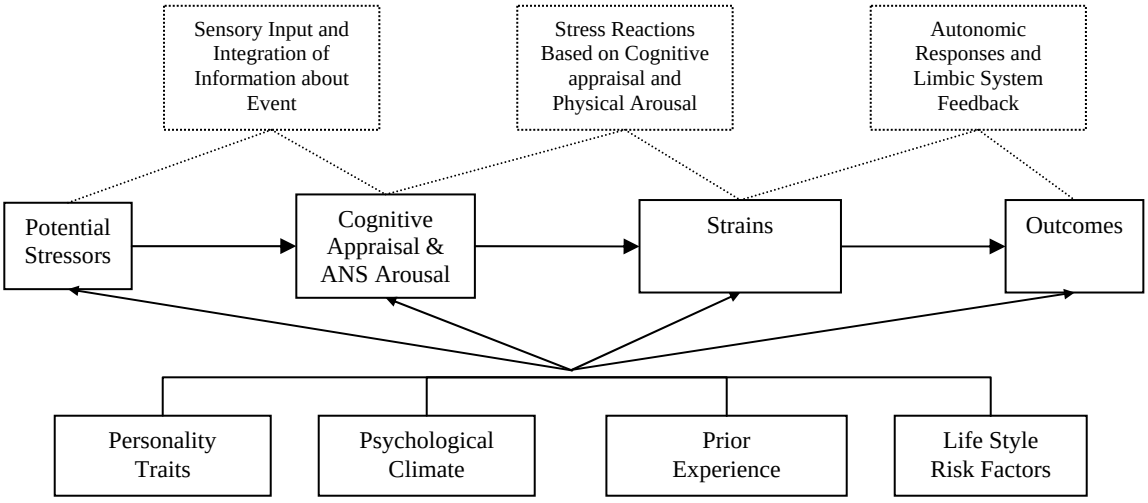



Figure 1 presents the core features of the SAM along with extensions recently proposed by Thomas, Sinclair, and Bliese (2003). The SAM assumes that stress influences health and performance outcomes through a four-stage process including Potential stressors (i.e., events that might or might not be interpreted as stressful), Cognitive appraisals (i.e., of whether events represent threats), Strains (psychological and physical consequences of stressors), and Outcomes (i.e., health, well-being and performance related concerns caused by excessive strain). Although the mechanisms of the stress response process are similar for all people, there is considerable variation in how individuals respond to a particular stressor. One of the core purposes of the SAM is to identify the main sources of that variation. Toward this end, the SAM assumes an interactionist perspective on stress, such that soldiers' stress responses are viewed as a function of interactions among objective characteristics of the stressor, the environmental context of the stressor, and individual differences in soldiers' characteristic reactions to stress.

One set of research questions related to the SAM concerns the role of various intervening variables in the stress-response process. Thomas et al. (2003), identified four general sets of

intervening variables that play a role in the stress-response process: personality traits, organizational climate factors, past personal experiences, and life-style related health risk factors. Each of these factors may directly influence one or more stages in the stress-response process or may act as a mediator or moderator in the relationship between two stages of the SAM. The present paper focuses on the role of hardiness in the context of this model. We will describe a framework for studying multiple effects of personality variables in the stress response process, illustrate the role that hardiness plays in the context of this model, as well as in the stress response process, and describe the development and validation of a brief scale intended to measure hardiness.

**A stress-CARE model of personality effects on the stress-response processes**

The stress-CARE model of personality effects on individual soldiers' stress response processes guided the present research. The stress-CARE model assumes that personality traits reflect characteristic styles of **C**ognitive, **A**ffective, and self-**RE**gulatory processes that guide how an individual responds to an event. As a personality model, the stress-CARE model assumes that these styles are *reasonably* stable over time. However, these traits are viewed as reasonably plastic or dynamic, in that, with experience or active intervention (e.g., training), peoples' characteristic styles of responding to the world may develop, decline, or remain somewhat constant. Thus, stress-CARE traits are viewed as similar to muscles in that they may develop or decline depending on the nature of an individual's interactions with his/her environment.

The stress-CARE model assumes that personality traits have both general and situation specific components. That is, traits have variance components that are reasonably general across situations as well as components that are somewhat unique to each particular social role. This implies that general personality questions are appropriate to best explain behavior across a wide variety of roles and that specific questions are appropriate to best explain behavior in the context of a narrowly defined role.

One implication of the framework outlined in the SAM is that to identify appropriate personality traits, researchers need to consider the nature of the stress response process and identify traits linked to each stage of the process. This general approach guides much recent research on the relationship between personality and health (cf. Bolger & Zuckerman, 1995; Moyle, 1995). As described earlier, the stress response process involves four key stages: exposure to potential stressors, cognitive appraisal, strain, and outcomes. Thus the traits identified in the stress-CARE model may exert mediating, moderating, or direct effects on some, none, or all of these stages.

The stress-CARE model outlines three types of personality traits that influence how people respond to stress: Cognitive appraisal styles, Affective dispositions, and self-REgulatory mechanisms. Cognitive appraisal styles refer to people's characteristic patterns of interpreting events in the world around them as well as their characteristic patterns of self-evaluations and perceptions. Cognitive appraisal styles should primarily influence the people's stress-related interpretations of events. Two concepts effectively capture the notion of cognitive appraisal styles: Hardiness (the focus of this paper) and Judge and colleagues' (e.g., Judge & Bono, 2001; Judge, Locke, & Durham, 1997) concept of Core Self-evaluations. Hardiness is described in detail below. Judge and colleagues use the term Core self-evaluations to describe a meta-

construct consisting of self-esteem (i.e., global evaluations of self-worth), self-efficacy, neuroticism, and locus of control. Judge and colleagues incorporate locus of control and neuroticism into their model of core self-evaluations. Our approach differs from theirs in that we view neuroticism as a largely affective state that may influence self-evaluations, but that is conceptually distinct from self-evaluations. Further, both hardiness and core self-evaluations research mention locus of control as part of their models. We place locus of control in our model of hardiness because it generally refers to externally directed cognitions, in the sense that locus of control reflects peoples' capacity to influence situations in their world. Thus, hardiness is externally-directed and core self-evaluations are internally-directed.

Affective dispositions are among the most heavily studied personality constructs in the stress literature (Contrada & Guyall, 2001; Ouellette & DiPacido, 2001; Smith & Gallo, 2001). Affective dispositions refer to characteristic patterns of emotional reactions to events. Thus, affective dispositions should primarily influence the strain associated with events people appraise as stressful. Many affect researchers believe two broad dispositions capture most affective traits: positive and negative affect. People high in *positive affect* tend to experience many positive emotions and are described by others as outgoing, energetic, and cheerful. People high in *negative affect* tend to experience many negative emotions and are described by other people as anxious, worrisome, or depressed. Past research demonstrates that these traits are distinct dimensions such that people can have high levels of both, either, or neither of them (cf. Watson, Clark, & Tellegen, 1988).

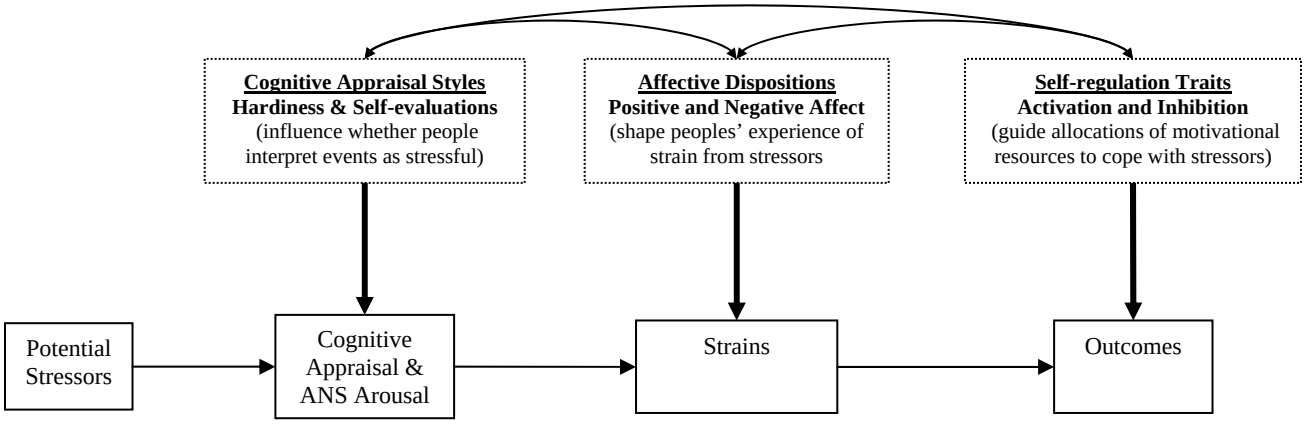
Self-regulatory traits describe the characteristic patterns of resource allocations people use as they attempt to cope with stressors. Thus, self-regulatory traits should primarily affect whether people are able to continue to function effectively under strain. Self-regulatory processes are sometimes described as ego-control processes or ego resources. People with weaker ego resources are less likely to be able to persist on a core job task under stress, more likely to struggle with managing their work behavior, be less effective at maintaining interpersonal behavior when under stress, and less likely to engage in health maintenance behavior that helps them avoid adverse effects of stress. Similarly, people with strong self-regulatory capacity should be able to function more effectively and for longer periods of time under stress. Regarding the SAM model, these traits should be particularly important for predicting self-regulatory strain and distal outcomes.

Sinclair et al. (2003) described two broad sets of self-regulatory traits: activation traits and inhibition traits. Activation traits reflect motivational resources soldiers can draw upon to engage in a task (e.g., initiation of a task) and to engage in sustained effort when facing intense resource demands, such as when under stress (persistence). Inhibition refers to the effects of stress on self-control processes. Thus, people with low levels of inhibition traits should easily lose control under stress and be characterized by impatience and impulsiveness.

Figure 2 summarizes our basic propositions about the relationship between traits in the stress-CARE personality model and the response processes of the SAM. The arrows from the personality traits to the stress-response process reflect primary propositions about the role of personality in stress. However, each class of trait may have multiple and potentially interacting effects on the stress response process. Moreover, the relationship between personality and stress

is likely to be dynamic, such that an individual's experience of the stress response process is likely to exert influences on later personality development. For example, individuals who successfully cope with stressors are likely to strengthen their hardiness with respect to later events. Similarly, individuals who experience intense traumatic stressors may become hypersensitive to later trauma – in part through changes to their general affective dispositions. In this context, the central purpose of our empirical research was to develop and validate a brief measure of hardiness to capture that portion of the stress-CARE model. The remainder of the paper will focus exclusively on the role of hardiness in the stress-response process.

*Figure 2 – Primary propositions of the stress-CARE model of personality effects on stress.*




**Hardiness and the stress response process**

Hardiness (sometimes referred to as dispositional resilience) refers to a cognitive personality variable reflecting the typical way soldiers interpret potentially stressful events. Hardiness is thought to consist of three sets of cognitive styles – characteristic ways people interpret the world (cf. Maddi, 1990). Commitment reflects ones' tendency to find meaning and purpose in potentially stressful events. Control refers to the tendency to believe that one is capable of managing the response to a stressful event. Challenge describes the tendency to see potentially threatening events as opportunities for personal growth. Thus, more hardy soldiers are thought to be more resilient to the potential demands of stressors because they tend to see meaning in their lives, tend to feel in control of events which might affect them, and prefer challenging environments over safety and security.

Although personality variables often are viewed as relatively static and unchangeable, we assume that hardiness may be influenced through active intervention. This view conceptualizes personality development as somewhat similar to muscular development. Thus, hardiness research offers the potential for military researchers to develop training interventions aimed at developing less harmful styles of interpreting events. A full-review of hardiness literature is beyond the

scope of this report. However, Appendix A contains a recommended reading list for hardiness that includes conceptual articles, articles focused on military or paramilitary samples, and intervention studies.

### *The dual process model of hardiness*

Sinclair and colleagues (Sinclair & Tetrick, 2000; Sinclair, Oliver, Ippolito, & Ascalon, 2003) proposed a dual-process view of hardiness. They suggested the positive and negative poles of hardiness dimensions represent distinct cognitive constructs, potentially with different patterns of antecedents and outcomes. The dual process model reflects the idea that cognitive personality traits include patterns of both positive and negative cognitions. Thus, people may access either positive or negative cognitive patterns (or both) as they go through stressful episodes. Thus, rather than canceling out their effects by averaging positive and negatively worded items, Sinclair argues that researchers should study both positive and negative appraisal styles as discrete concepts. Initial empirical work supported the dual-process view and suggested the need for further refinements to hardiness measures to incorporate positive and negative hardiness dimensions. The present study represents another test of this model.

In unpublished work, Sinclair, Oliver, Ippolito, and Ascalon (2003) developed a new hardiness scale intended to address these issues. They generated a pool of 72 items based on their earlier work and Bartone's Dispositional Resilience Scale (Bartone, Ursano, Wright, & Ingraham, 1989). Through a set of cross-validated exploratory and confirmatory factor analyses and internal consistency and test-retest reliability analyses, they reduced this pool to a set of 30 items capturing positive and negative commitment (i.e., alienation), positive and negative control (i.e., powerlessness) and positive and negative challenge (i.e., rigidity). Our work focuses on 18 of these items, which were selected from the larger set of 30 based on preliminary reliability and validity evidence from a college student sample studied by Sinclair et al. (2003). We term this scale the Dispositional Resilience Scale-II (DRS-II), in part, to recognize the contributions of Bartone's earlier work in this area.

## Present study

The present study had three goals:

(1) Investigate the factor structure of the 18-item DRS-II. Our research tests the dual process theory of hardiness by investigating whether the structure of the DRS-II corresponds to a single factor view of hardiness (as is often used in current research), the original three dimensional view of hardiness proposed by hardiness theorists, a two dimensional view which reflects positive and negative hardiness, rather than the three content-focused dimensions, or a six dimensional view which reflects both positive and negative aspects of hardiness, *and* the three content domains (i.e., positive and negative commitment, positive and negative control, and positive and negative challenge).

(2) Investigate additional psychometric properties of the DRS-II. Based on the 'best supported' factor structure that we identify in our factor analytic work, the second purpose of the study was to investigate additional psychometric properties for the DRS-II. These included standard

descriptive statistics, reliability analyses, and patterns of correlations among the hardiness subscales.

(3) Investigate the validity of the DRS-II for military applications. The stress-strain-outcome processes described in the SAM imply several hypothesized mechanisms through which hardiness might affect soldiers' stress, health, and performance. *Preventative effects* refer to the effects of hardiness on stressful experiences. *Therapeutic effects* refer the effects of hardiness on soldiers' experience of strain or other stress-related outcomes. *Buffering effects* refer to the effects of hardiness on stress-strain relationships. The third purpose of this paper was to assess the presence or absence of these effects for the dimensions of the DRS-II with respect to several military stressors and strains.

## Method

### Participants

Survey data were collected from 1,465 members an activated National Guard unit about to be deployed to Europe to assist with security augmentation at US Military installations. Personal and work related demographic characteristics of study participants are shown in Table 1. Study participants were mostly Caucasian (83%) and mostly men (95%). Ages ranged from 18 to 58 with an average of age of 31.51 years (SD = 9.08). Most participants either were high school graduates (32%) or had some college or technical training (34%). Slightly over half of the participants were married (52%). Most participants were junior enlisted personnel (44%) or NCOs (49%), with an average tenure in the military of 11 years (SD = 8).

**Table 1**
***Characteristics of Research Participants***

| Variable | *N* | *%* | Variable | N | % |
|---|---|---|---|---|---|
| *Ethnicity* | | | *Rank* | | |
| Caucasian | 1217 | 88.0 | Enlisted | 566 | 43.5% |
| African American | 93 | 6.7 | NCO | 641 | 49.3% |
| Hispanic | 43 | 3.1 | Warrant Officer | 10 | 0.8% |
| Asian/Pacific Islander | 8 | 0.5 | Officer | 83 | 6.4% |
| Other | 22 | 1.6 | | | |
| *Age* | | | *Military Tenure* | | |
| (M = 31.51, SD = 9.08) | | | (M = 11.01, SD = 8.03) | | |
| 18-24 | 397 | 29% | 0 – 5 years | 442 | 31.5% |
| 25-35 | 518 | 38% | 6 – 10 years | 311 | 22.1% |
| 36-58 | 453 | 33% | 11-19 years | 468 | 33.4% |
| | | | 20 or more years | 183 | 12.8% |
| *Education* | | | *Marital Status* | | |
| Some High School | 10 | 0.7% | Single | 579 | 40.2% |
| GED | 60 | 4.1% | Married | 756 | 51.6% |
| High School Graduate | 472 | 32.2% | Separated/Divorced | 94 | 6.4% |
| Some College or Technical Training | 502 | 34.3% | | | |
| College Graduate | 216 | 14.7% | *Gender* | | |
| Post-Graduate | 72 | 5.0% | Male | 1318 | 95% |
| | | | Female | 76 | 5% |

## Measures

### *Hardiness*

The 18-item version of the DRS-II was the focal hardiness instrument (Sinclair, Oliver, Ippolito, & Ascalon, 2003). This instrument contains six subscales or facets designed to measure *Control ($\alpha$ = .79):* General feelings of self-efficacy (an attitude of "I can do…") and beliefs that one will be able to influence most situations; *Powerlessness ($\alpha$ = .93):* Feelings of powerlessness and a sense of fatalism; *Commitment ($\alpha$ = .79):* Being interested in and fully engaged with life's activities; *Alienation* ($\alpha$ = .88): A sense of meaninglessness and isolation; *Challenge ($\alpha$ = .77):* A tendency to view stresses as challenges rather than as threats; and *Rigidity ($\alpha$ = .66):* Lack of flexibility and resistance to change. A 5-point response scale was used (1 = "definitely false" to 5 = "definitely true").

***Stressors***

*Work Overload.* We assessed overload with a 3-item ($\alpha$ = .85) scale modified by Thomas and Bliese (2000) and previously used in military research by Jex and Thomas (2003; e.g., "I have so much work to do, I cannot do everything well"). Two of these items were adapted from the Michigan Organizational Assessment Questionnaire (MOAQ) Role Overload Scale (Cammann, Fichman, Jenkins, & Klesh, 1983). A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

*Job Control*. We used a 3-item ($\alpha$ = .69) job control scale developed by Castro, Adler, Bienvenu, Huffman, Dolan, Wright, and Thomas (1998). The scale was adapted from the Job Diagnostic Survey General Satisfaction Scale (Hackman & Oldham, 1975) and measured perceptions of personal control on-the-job (e.g., "I have personal control over my job performance"). A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

*Predictability*. We assessed predictability with a 4-item ($\alpha$ = .82) scale developed by Castro and Adler (2001). These items addressed issues such as soldiers' ability to predict what their daily schedules would be, knowing what duties they would be performing day-to-day, being able to plan on being able to take requested leave time, and being able to plan their schedules for at least six months. A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

*Internal Conflict.* We used the 4-item ($\alpha$ = .87) Interpersonal Conflict at Work Scale (Spector & Jex, 1998) to assess the frequency of interpersonal conflicts such as arguments, yelling, rudeness, and retaliatory behaviors within the unit (e.g., "How often do people in your unit get into arguments with each other at work?"). A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

***Outcomes***

We assessed three classes of outcome measures in this study: Readiness (i.e., Collective efficacy, APFT scores, and morale), Attachment (affective commitment, retention intentions, and level of engagement), and Affective well-being (general well-being, psychological distress, and depression).

*Collective efficacy*. We used a 4-item ($\alpha$ = .91) scale developed by Marlowe, Furukawa, Griffith, Ingraham, Kirkland, Martin, et al. (1985) and later refined by Vaitkus (1994). Several studies have successfully used this scale to assess collective efficacy in military contexts (e.g., Jex & Bliese, 1999; Jex & Thomas, 2003). Questions in this instrument focus on issues relating to soldiers' confidence in their units' the level of training and ability to perform in combat (e.g., "I think my unit would do a better job in combat than most U.S. Army units"). A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

*Physical fitness.* We used self-reported APFT scores as a measure of physical fitness (i.e., physical readiness). The following response scale was used:

1 = Did not pass
2 = 180-220
3 = 221-260
4 = 261-300
5 = Over 300

*Morale.* We used a 5-item scale ($\alpha$ = .89) adapted from Castro, Bienvenu, Huffman, and Adler (2000) based on items developed by Britt (1998) to assess soldiers' levels of motivation, energy, and overall morale as well as perceptions of unit morale (e.g., "Rate the following: Your personal morale"). A 5-point response scale was used (1 = "very low" to 5 = "very high").

*Affective commitment.* We measured attachment using a 4-item ($\alpha$ = .90) scale developed by Gade, Tiggle, and Schumm, (2003). This instrument measures feelings of emotional attachment and sense of belonging to the Army (e.g., "The Army has a great deal of personal meaning to me"). A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

*Retention intentions.* We used a 6-point single item measure developed and widely used at WRAIR (e.g., Castro, Adler, Bienvenu, Huffman, Dolan, Wright, & Thomas, 1998; Thomas & Bliese, 2000) to measure retention intentions. Participants are asked to rate how likely they are to remain with the Army. Response options range from leaving immediately upon completion of their current assignment to definitely staying until they are eligible for retirement. All of the response options are shown below:

1 = Definitely leave upon completion of current obligation
2 = Probably leave upon completion of current obligation
3 = Undecided about staying beyond current obligation
4 = Definitely stay beyond current obligation, but not necessarily until retirement
5 = Probably stay until retirement
6 = Definitely stay until retirement eligible (or longer)

*Involvement/Engagement.* We measured job engagement with Britt's (1998; 1999) 6-item ($\alpha$ = .86) Job Involvement Scale (e.g., "I feel responsible for my job performance"). A 5-point response scale was used (1 = "strongly agree" to 5 = "strongly disagree").

*Subjective well-being and psychological distress.* We measured perceptions of subjective well-being with *($\alpha$ = .79) and psychological distress ($\alpha$ = .80) with the 12-item version of Goldberg's General Health Questionnaire (1972). This instrument is traditionally used as a measure of distress. However, factor analysis of the data revealed two clearly defined, orthogonal factors. Well-being items assessed feelings of general self-efficacy, enjoyment, and affective well-being (e.g., "been feeling reasonably happy, all things considered"). Psychological distress items focused on anxiety and depression, feelings of worthlessness and loss of confidence, and perceptions of strain (e.g., "felt constantly under strain").* A five-item response scale was used (1 = "not at all" to 5 = "a lot more than usual").

*Depression.* We used the 9-item ($\alpha$ = .89) depression subscale of the Patient Health Questionnaire (Spitzer, Kroenke, & Williams, 1999) to measure symptoms of depression such as

feelings of low self-esteem, fatigue, hopelessness, listlessness, appetite changes, etc. A 4-item response scale was used (1 = “not at all” to 4 = “nearly every day”).

## Results

### Structure of Hardiness

*Models tested*

In order to explore the underlying structure of the hardiness meta-construct, we compared four alternative models of the hardiness scale. Each model represents a different conceptualization of the underlying factor structure.

*1-factor model*. This model assumes that hardiness represents a single underlying construct.

*2-factor model.* This model conceptualizes hardiness as being comprised of two underlying latent variables – one providing strengths or resources (i.e., positive hardiness) to aid in combating the stress process while the other increases an individual’s vulnerability (i.e., negative hardiness).

*3-factor model.* This model reflects the hardiness construct as originally conceptualized with individuals ranging from high to low on control, commitment, and challenge. Vulnerability items are expected to load negatively on their respective factors.

*6-factor model.* The 6-factor model corresponds to the theoretical perspective on hardiness described above. Each of the six proposed hardiness dimensions (control, powerlessness, commitment, alienation, challenge, and rigidity) is represented by a separate latent variable.

*Model fit assessments*

Models were compared based on two criteria: overall model fit and parsimony. Overall model fit was assessed using the comparative fit index (CFI) and the Akaike information criterion (AIC), as recommended by Gerbing and Anderson (1993) and Hu and Bentler (1998). CFI values approaching 1.00 indicate good fit. The AIC examines both model fit and complexity. Models that display poorer fit or greater complexity (more factors in the model) generate higher AIC values and are evaluated less favorably. Parsimony indices provide information about how well the model fits relative to the degrees of freedom consumed in estimating the model. The parsimony adjusted comparative fit index (PCFI) adjusts the CFI for the degrees of freedom with values closer to 1.00 being desired. The Root Mean Square Error of Approximation (RMSEA) is a measure of error per degree of freedom. Values of .08 or lower indicate adequate fit while values below .05 indicate good fit; values above .10 are considered unacceptable (Browne & Cudek, 1993).

**Table 2a**
***Confirmatory Factor Analysis Fit Indices (N = 1465)***

| | $\chi^2$ | *df* | AIC | CFI | PCFI | RMSEA |
|---|---|---|---|---|---|---|
| 1 Factor Model | 4724.58 | 135 | 4832.58 | .63 | .50 | .15 |
| 2 Factor Model | 2293.05 | 134 | 2403.05 | .83 | .65 | .11 |
| 3 Factor Model | 3663.93 | 132 | 3777.93 | .72 | .55 | .13 |
| 6 Factor Model | 473.43 | 120 | 611.43 | .97 | .68 | .05 |

As shown in Table 2a, the results of the confirmatory factor analysis clearly indicated that the 6-factor model provided the best fit to the data. The $\chi^2$ and AIC values were considerably smaller in this model; moreover, the CFI, PCFI, and RMSEA show good to excellent fit for the 6-factor model and unacceptably poor fit with the 1, 2 and 3-factor models. These findings support our hypothesized model of hardiness. Thus, the 6-factor model was used for all subsequent analyses.

**Table 2b**
***Loadings for six factor model of hardiness***

| Variable Name | λ | Squared Multiple Correlation |
|---|---|---|
| Control1 | .71 | .50 |
| Control2 | .79 | .63 |
| Control3 | .75 | .56 |
| | | |
| Powerlessness1 | .90 | .81 |
| Powerlessness2 | .92 | .85 |
| Powerlessness3 | .89 | .80 |
| | | |
| Commitment1 | .77 | .59 |
| Commitment2 | .75 | .57 |
| Commitment3 | .74 | .54 |
| | | |
| Alienation1 | .79 | .63 |
| Alienation2 | .85 | .73 |
| Alienation3 | .91 | .84 |
| | | |
| Challenge1 | .74 | .54 |
| Challenge2 | .77 | .59 |
| Challenge3 | .69 | .48 |
| | | |
| Rigidity1 | .73 | .53 |
| Rigidity2 | .85 | .72 |
| Rigidity3 | .34 | .11 |

As shown in Table 2b, factor loadings and squared multiple correlations (SMCs) were high for most of the measured variables included in the model. All but one of the SMCs exceeded .45 with correspondingly high loadings on their respective latent variables. However, one rigidity item (rigidity3) showed a small SMC (.11) with a relatively low factor loading (.34). This suggests that further effort to refine this dimension might yield even better overall model fit.

**Basic Psychometric Properties of Hardiness Scales**

**Table 3**
***Descriptive Statistics and Correlations: Hardiness Facets***

| | Mean | SD | Control | Powerless | Commit. | Alienation | Challenge | Rigidity |
|---|---|---|---|---|---|---|---|---|
| Control | 4.24 | 0.57 | (.79) | | | | | |
| Powerlessness | 1.60 | 0.80 | -.41** | (.93) | | | | |
| Commitment | 4.09 | 0.58 | .44** | -.35** | (.79) | | | |
| Alienation | 1.66 | 0.85 | -.34** | .81** | -.37** | (.88) | | |
| Challenge | 3.96 | 0.63 | .44** | -.33** | .63** | -.30** | (.77) | |
| Rigidity | 3.17 | 0.80 | .06* | .14** | .05 | .15** | .08** | (.66) |

***Note:*** Reliabilities are shown on the diagonal.
*$p < .05$
**$p < .01$

Descriptive statistics and correlations between hardiness scales are shown in Table 3. When examining a meta-construct such as hardiness, moderate correlations between dimensions (scales) are usually expected. Most of the correlations between scales were moderate to moderately strong and in the expected direction. Very high correlations suggest lower discriminant validity between the hardiness scales. Only one very high correlation was noted, between alienation and powerlessness, with a fairly high correlation between challenge and commitment. We also noted that the correlations between rigidity and some of the other dimensions were smaller than the others, suggesting that the rigidity subscale may be capturing a very different conceptual domain. Moreover, contrary to our expectations, correlations between rigidity and the positive hardiness dimensions were positive. The standard deviations for the scales ranged from .57 to .85. For five-item scales this level of variability is lower than what might be desired, but there appears to be sufficient variability to conduct further analyses with these scales. Finally, the internal consistency coefficients for the hardiness scales all were in acceptable ranges. The rigidity scale obtained the lowest internal consistency coefficient (.66). While this level of internal consistency is not surprising for a three-item scale and not necessarily a concern, the reliability findings parallel the confirmatory factor analytic findings, suggesting that further research efforts should explore ways to improve the quality of the rigidity scale.

**Relationships Between Hardiness Dimensions and Military Stressors**

**Table 4**
***Descriptive Statistics for Stressors and Outcomes***

| | Mean | SD | α |
|---|---|---|---|
| Work Overload | 2.56 | 0.77 | .85 |
| Job Control | 3.85 | 0.67 | .69 |
| Predictability | 3.06 | 0.81 | .82 |
| Internal Conflict | 2.38 | 0.72 | .87 |
| Collective Efficacy | 3.60 | 0.80 | .91 |
| APFT Score[a] | 2.72 | 0.91 | - |
| Morale | 3.75 | 0.69 | .89 |
| Affective Commitment | 3.87 | 0.72 | .90 |
| Retention Intentions[a] | 4.67 | 1.61 | - |
| Engagement | 4.27 | 0.56 | .86 |
| Subjective Well-Being | 2.33 | 0.50 | .79 |
| Psychological Distress | 1.74 | 0.51 | .80 |
| Depression | 1.31 | 0.45 | .89 |

[a] Single item measure.

Descriptive statistics and reliabilities are displayed in Table 4. Means and standard deviations for the scales are in the expected range. Reliabilities were adequate to excellent.

**Table 5**
***Correlations for Hardiness Facets with Stressors and Outcomes***

| | Control | Powerlessness | Commitment | Alienation | Challenge | Rigidity |
|---|---|---|---|---|---|---|
| Work Overload | -.14** | .22** | -.10** | .19** | -.11** | .14** |
| Job Control | .21** | -.22** | .19** | -.16** | .19** | -.07* |
| Predictability | .03 | -.05 | .16** | -.08** | .09** | .01 |
| Internal Conflict | -.10** | .15** | -.17** | .17** | -.09** | .05 |
| Collective Efficacy | .08** | -.10** | .23** | -.11** | .16** | -.04 |
| APFT Score | .08** | -.08** | .09** | -.06* | .13** | .03 |
| Morale | .34** | -.28** | .43** | -.28** | .42** | -.05 |
| Affective Commitment | .29** | -.24** | .32** | -.21** | .32** | -.05 |
| Retention Intentions | .09** | -.08** | .14** | -.09** | .13** | -.06* |
| Engagement | .32** | -.25** | .26** | -.21** | .31** | -.04 |
| Well-Being | .20** | -.16** | .27** | -.14** | .27** | -.03** |
| Psychological Distress | -.19** | .31** | -.21** | .31** | -.22** | .08** |
| Depression | -.16** | .31** | -.22** | .33** | -.22** | .18** |

*$p < .05$
**$p < .01$

Table 5 shows correlations between the hardiness dimensions and the stressor and outcome scales. Most of the correlations are in the small to moderate range and all significant correlations were in the expected direction. Control was positively related to job control, collective efficacy, APFT scores, morale, affective commitment, retention intentions, and subjective well-being, and was negatively correlated with work overload and internal conflict. Powerlessness was positively related to work overload, internal conflict, psychological distress and depression and was negatively associated with perceptions of job control, Collective efficacy, APFT scores, morale, affective commitment, level of engagement, and well being. Commitment was positively related to job control, predictability, collective efficacy, APFT scores, morale, affective commitment, retention intentions, and well-being and showed negative relationships with work overload, internal conflict, psychological distress and depression. Alienation showed positive relationships with work overload, internal conflict, psychological distress and depression and was negatively

correlated with job control, predictability, collective efficacy, APFT scores, morale, affective commitment, retention intentions, engagement and well-being. Challenge was positively correlated with job control, predictability, collective efficacy, APFT scores, morale, affective commitment, retention intentions, engagement, and well-being and was negatively related to work overload, internal conflict, psychological distress, and depression. Rigidity was positively related to work overload, psychological distress, and depression and showed negative relationships with job control, retention intentions, and well-being. Taken as a whole, these correlations show the ability of the hardiness measure to predict health outcomes. Further, the multiple regression results reported below show the ability of each scale to predict health and performance outcomes when all of the other dimensions of hardiness are considered.

**Table 6**
***Regression Results: Hardiness Facets as Predictors of Stressors***

| | **Work Overload** | **Job Control** | **Predictability** | **Internal Conflict** |
|---|---|---|---|---|
| *N* | 1201 | 1199 | 1242 | 1240 |
| Overall $R^2$ | .07** | .08** | .03** | .05** |
| Control β | -.05 | .10** | -.06 | -.00 |
| Powerlessness β | .15** | -.19** | .02 | .05 |
| Commitment β | -.02 | .08* | .18** | -.16** |
| Alienation β | .03 | .09 | -.04 | .06 |
| Challenge β | -.03 | .06 | .00 | .04 |
| Rigidity β | .13** | -.08** | .00 | .06* |

*$p < .05$
**$p < .01$

Table 6 shows regression results using hardiness dimensions to predict perceptions of exposure to stressors (work overload, job control, predictability, and internal conflict). The overall $R^2$ was significant for all of the stressors with the proportion of variance explained by the hardiness measures ranging from .03 to .08. Interestingly, different hardiness dimensions were related to each of the stress measures. The control dimension of hardiness was a significant predictor of perceptions of higher levels of job control. Powerlessness significantly predicted higher levels of work overload and lower levels of job control. Higher levels of commitment were associated with higher levels of job control and predictability and lower levels of internal conflict. Alienation and challenge did not significantly predict any of the stressors used in this study. Higher levels of rigidity were associated with experiencing more work overload, less job control, and higher levels of internal conflict.

**Effects of Hardiness on Stress-Related Outcomes**

**Table 7a**
***Regression Results: Hardiness Facets as Predictors of Combat Readiness Outcomes***

| | Collective efficacy | APFT Score | Morale |
|---|---|---|---|
| *N* | 1248 | 1200 | 1221 |
| Overall $R^2$ | .06** | .02** | .26** |
| Control | -.03 | .01 | .12** |
| Powerlessness β | -.01 | -.04 | -.05 |
| Commitment β | .20** | -.01 | .21** |
| Alienation β | -.01 | .00 | -.05 |
| Challenge β | .05 | .12** | .22** |
| Rigidity β | -.06* | .03 | -.07** |

*$p < .05$
**$p < .01$

Table 7a shows regression results using hardiness dimensions to predict combat readiness outcomes (collective efficacy, APFT scores, and morale). The overall $R^2$ was significant for all three combat readiness outcomes, ranging from .02 to .26. As can be seen above, control was a significant predictor of morale (higher levels of control were associated with higher morale) and commitment predicted collective efficacy and morale. Challenge predicted higher APFT scores and higher levels of morale while higher levels of rigidity were associated with lower levels of collective efficacy and morale. Powerlessness and alienation were not significant predictors for any of the readiness outcomes.

**Table 7b**
***Regression Results: Hardiness Facets and Stressors as Predictors of Attachment Outcomes***

| | **Affective Commitment** | **Retention Intentions** | **Engagement** |
|---|---|---|---|
| *N* | 1215 | 1192 | 1257 |
| Overall $R^2$ | .15** | .03** | .15** |
| Control | .13** | .03 | .18** |
| Powerlessness β | -.07 | .02 | -.11* |
| Commitment β | .13** | .09* | .04 |
| Alienation β | .01 | -.03 | .01 |
| Challenge β | .17** | .07 | .18** |
| Rigidity β | -.08** | -.07* | -.06* |

*$p < .05$
**$p < .01$

Table 7b shows regression results for hardiness dimensions as predictors of the attachment outcomes. Overall $R^2$ was significant for all three attachment outcomes, ranging from .03 to .15. Control significantly predicted higher levels of affective commitment and engagement while higher levels of powerlessness were associated with less engagement. Commitment significantly predicted affective commitment and retention intentions while challenge predicted affective commitment and engagement. Rigidity was negatively associated with all three attachment outcomes. Alienation was not a significant predictor for attachment.

**Table 7c**
***Regression Results: Hardiness Facets as Predictors of Well-Being Outcomes***

| | Well-Being | Psychological Distress | Depression |
|---|---|---|---|
| *N* | 1233 | 1231 | 1229 |
| Overall $R^2$ | .10** | .14** | .14** |
| Control | .05 | -.04 | .01 |
| Powerlessness β | -..05 | .11* | .07 |
| Commitment β | .16** | -.05 | -.08* |
| Alienation β | -.03 | .13** | .19** |
| Challenge β | .14** | -.10** | -.10** |
| Rigidity β | -.05 | .15** | .12** |

*$p < .05$
**$p < .01$

Regression results for hardiness facets as predictors of affective well-being outcomes are shown in Table 7c. Overall $R^2$ was significant for all three measures of well-being. Powerlessness was associated with higher levels of psychological distress. Commitment predicted greater well-being and lower levels of depression while higher levels of alienation were associated with higher levels of psychological distress and depression. Challenge significantly predicted greater well-being and lower levels of psychological distress and depression. Rigidity predicted psychological distress and depression. Control was not a significant predictor for outcomes related to well-being.

**Incremental and Buffering Effects of Hardiness on Stress-Outcome Relationships**

Tables 8a through 8f show results of hierarchical regression analyses. For these regressions, stressors (work overload, job control, predictability, and internal conflict) were entered on Step 1 and hardiness scales (control, powerlessness, commitment, alienation, challenge, and rigidity) were entered on Step 2. Interaction terms (stressor*hardiness dimension) were added at Step 3. Tables 8a through 8c show the results of Steps 1 and 2. Standardized beta weights for hardiness dimensions at Step 2 are displayed. Tables 8d through 8f show the results of regression analyses designed to examine hardiness as a buffer. Standardized beta weights for significant interactions are shown.

**Table 8a**

***Hierarchical Regression Results: Hardiness Facets and Stressors as Predictors of Readiness Outcomes Controlling for the Effects of Stressors***

| | **Collective efficacy** | **APFT Score** | **Morale** |
|---|---|---|---|
| *N* | 1100 | 1055 | 1071 |
| Step 1 $R^2$ | .20** | .00 | .13** |
| Step 2 $\Delta R^2$ | .02** | .02** | .19** |
| Control β | -.03 | .00 | .09** |
| Powerlessness β | -.02 | -.08 | -.05 |
| Commitment β | .13** | -.01 | .16** |
| Alienation β | .03 | .02 | -.04 |
| Challenge β | .04 | .13** | .25** |
| Rigidity β | -.01 | .01 | -.05 |

*$p < .05$
**$p < .01$

Table 8a shows hardiness dimensions as predictors of readiness outcomes, controlling for the effects of stressors. As shown above, stressors explained a significant amount of the variance in the collective efficacy and morale outcomes but virtually none of the variance in APFT scores. Hardiness explained a significant amount of additional variance for all three of the readiness outcomes after controlling for the effects of the stressors. The control dimension was a significant predictor for morale. Commitment significantly predicted both collective efficacy and morale. Challenge predicted APFT scores and morale. None of the negative dimensions of hardiness significantly predicted any of the readiness outcomes when the effects of stressors were controlled for.

**Table 8b**

***Hierarchical Regression Results: Hardiness Facets and Stressors as Predictors of Attachment Outcomes Controlling for the Effects of Stressors***

| | Affective Commitment | Retention Intentions | Engagement |
|---|---|---|---|
| *N* | 1069 | 1051 | 1100 |
| Step 1 $R^2$ | .11** | .07** | .14** |
| Step 2 $\Delta R^2$ | .11** | .02** | .10** |
| Control β | .10** | .01 | .14** |
| Powerlessness β | -.07 | .04 | -.07 |
| Commitment β | .07* | .06 | .03 |
| Alienation β | .02 | -.04 | -.02 |
| Challenge β | .19** | .07 | .17** |
| Rigidity β | -.06* | -.09** | -.04 |

*$p < .05$
**$p < .01$

Table 8b shows hardiness dimensions as predictors of attachment outcomes when the effects of stressors are controlled. The Step 1 $R^2$ showed a significant amount of variance explained by the stressors for each of the attachment outcomes. The Step 2 change in $R^2$ was also significant for all of the attachment outcomes, indicating a significant amount of additional variance was explained after controlling for the effects of the stressors. Control and challenge were significant predictors for affective commitment and engagement. Commitment predicted affective commitment as well. Rigidity negatively predicted affective commitment and retention intentions. The powerlessness and alienation dimensions did not significantly predict attachment outcomes when the effects of stressors were controlled.

**Table 8c**

***Hierarchical Regression Results: Hardiness Facets and Stressors as Predictors of Affective Well-Being Outcomes Controlling for the Effects of Stressors***

| | **Well-Being** | **Psychological Distress** | **Depression** |
|---|---|---|---|
| *N* | 1130 | 1129 | 1079 |
| Step 1 $R^2$ | .06** | .11** | .12** |
| Step 2 $\Delta R^2$ | .06** | .10** | .09** |
| Control β | .05 | -.01 | .05 |
| Powerlessness β | -.04 | .12* | .05 |
| Commitment β | .13** | -.01 | -.06 |
| Alienation β | .05 | .13** | .19** |
| Challenge β | .13** | -.11** | -.11** |
| Rigidity β | -.04** | .14** | .11** |

*$p < .05$
**$p < .01$

Table 8c shows hardiness dimensions as predictors of affective well-being outcomes when the effects of stressors are controlled. The Step 1 $R^2$ indicates a significant amount of variance explained by the stressors in all of the measures of well-being. Hardiness explained a significant amount of additional variance for all of the well-being outcomes. Powerlessness was a significant for psychological distress. Commitment predicted well-being and alienation predicted psychological distress and depression. Challenge and rigidity significantly predicted all three well-being outcomes. Control was not a significant predictor for any of the affective well-being outcomes when the effects of stressors were controlled.

**Table 8d**

***Hierarchical Regression Results: Hardiness as a Buffer Between Stressors and Readiness Outcomes (Only Significant Interactions Shown)***

| | Collective Efficacy | APFT Score | Morale |
|---|---|---|---|
| Step 3 $\Delta R^2$ | .04** | .02 | .02* |
| **Control*** | | | |
| Job Control β | -.08* | | |
| Internal Conflict β | -.09* | | |
| **Powerlessness*** | | | |
| Work Overload β | .12* | | |
| Job Control β | | | .11* |
| Predictability β | | | .14** |
| **Alienation*** | | | |
| Work Overload β | -.13** | | |
| Predictability β | .10* | | |
| **Challenge*** | | | |
| Job Control β | .10** | | |

*$p < .05$; **$p < .01$

**Table 8e**

***Hierarchical Regression Results: Hardiness as a Buffer Between Stressors and Attachment Outcomes (Only Significant Interactions Shown)***

| | Affective Commitment | Retention Intentions | Engagement |
|---|---|---|---|
| Step 3 $\Delta R^2$ | .03* | .02 | .02 |
| **Control*** | | | |
| Predictability β | .07* | | |
| **Alienation*** | | | |
| Work Overload β | -.16** | | |
| **Rigidity*** | | | |
| Job Control β | .08** | | |

*$p < .05$; **$p < .01$

**Table 8f**

***Hierarchical Regression Results: Hardiness as a Buffer Between Stressors and Affective Well-Being Outcomes (Only Significant Interactions Shown)***

| | Well-Being | Psychological Distress | Depression |
|---|---|---|---|
| Step 3 $\Delta R^2$ | .02 | .02 | .06** |
| **Powerlessness*** | | | |
| Work Overload β | | | .15** |
| Predictability β | | -.13* | -.12* |
| **Rigidity*** | | | |
| Overload | -.07* | | |

*$p < .05$;
**$p < .01$

**Tests of Buffering Effects of Hardiness on Stress-Outcome Relationships**

Tables 8d-f show the results of the hierarchical regression analyses testing the hypothesized buffering effects of hardiness. To streamline the presentation, only significant interaction terms are shown. However, it is important to note that all of these effects were entered into the regression equation simultaneously. There were no buffering effects noted for the APFT score, retention intentions, or engagement as the interaction terms did not explain significant proportions of variance in the self-reported test scores. However, we noted significant interactions for collective efficacy, morale, affective commitment, well-being, psychological distress, and depression. These analyses provide support for hardiness as a buffer of several of the stress-outcome relationships.

## Summary and Conclusions

This study investigated the psychometric properties of a measure of hardiness designed for military applications. Our findings showed fairly strong support for most of the scale properties we investigated. The confirmatory factor analyses supported the hypothesized 6-factor structure for the scale and the reliability analyses established the acceptable internal consistency levels of the scales. In other unpublished research with college student populations we have found similarly supportive evidence for these scales, including good test-retest reliabilities at two-month intervals. Together, this research stream provides fairly strong evidence for the construct validity of the hardiness scale.

The correlation and regression analyses investigated several hypotheses concerning the preventative, therapeutic, and buffering effects of hardiness on a variety of measures of stress and strain. The hardiness scales predicted several measures of stress and strain. Moreover, the moderated regression analyses showed that the hardiness dimensions buffer several of the stress-outcome relationships. These findings differed across each stressor-outcome relationship, as well as across the dimensions of hardiness. Thus, further research and theoretical developments could focus on narrowing the scope of hardiness research. For example, we found fewer and weaker preventative effects for hardiness than we did therapeutic and buffering effects. This suggests that future research and theoretical developments should focus on developing greater understanding of the therapeutic and buffering effects of hardiness.

In general then, we recommend the hardiness scale for further military and civilian applications. There are many interesting directions for this research. One important direction will be to establish the relationship between the DRS-II and the other dimensions of the stress-CARE theory of personality effects on the stress-response process. This research has a great deal of potential to provide further insights into the nature of military stressors in general and specifically to improve understanding of the soldier adaptation model. We recommend conducting longitudinal studies to document the effects of hardiness over time and provide stronger evidence about the causal pathways through which hardiness affects stress-related outcomes. Further, other models of the hardiness dimensions might be worthy of investigation. For example, Sinclair and Tetrick (2000) found some evidence for interactions between hardiness dimensions. Finally, future work to establish scale norms for different populations might be particularly useful to aid the construction of hardiness-based interventions. Ultimately, we hope that greater understanding of hardiness, as well as understanding of the stress-CARE model, will help military planners design effective stress-related interventions.

## References

Bartone, P. T., Ursano, R. J., Wright, K. M., & Ingraham, L. H. (1989). The impact of a military air disaster on the health of assistance workers. *Journal of Nervous and Mental Disease, 177,* 317-328.

Bliese, P. D., & Castro, C. A. (2003). The Soldier Adaptation Model (SAM): Applications to Behavioral Science Peacekeeping Research. In T. W. Britt & A. B. Adler (Eds.), *The psychology of the peacekeeper: A multinational perspective* (pp. 185 – 203). Westport, CT: Praeger Press.

Bliese, P. D. & Durand, D. (2001). *Enhancing the well-being and readiness of soldiers and families defending the homeland.* Unpublished research protocol prepared for Walter Reed Army Institute of Research.

Bolger, N., & Zuckerman, A. (1995). A framework for studying personality in the stress process. *Journal of Personality and Social Psychology, 69,* 890-902.

Britt, T. W. (1998). Responsibility, morale and commitment during military operations. *Military Review, 1,* 77-82.

Britt, T. W. (1999). Engaging the self in the field: Testing the triangle model of responsibility. *Personality and Social Psychology Bulletin, 25,* 696-706.

Browne, M.W. & Cudek, R. (1993). Alternative ways of assessing model fit. In K. Bollen & J.S. Long (Eds.), *Testing structural equation models* (pp. 445-455). Newbury Park: CA: Sage.

Cammann, C., Fichman, M., Jenkins, G. D., & Klesh, J. (1983). Michigan organizational assessment questionnaire. In S. E. Seashore, E. E. Lawler, P. H. Mirvis, & C. Cammann (Eds.), *Assessing organizational change: A guide to methods, measures, and practices* (pp. 71-138). New York: Wiley.

Castro, C. A., & Adler, A. B. (2001). The impact of operations tempo: Issues in measurement. *Defense Technical Information Center [DTIC] No. ADA 388336.* Alexandria, VA: Defense Technical Information Center.

Castro, C. A., Adler, A. B., Bienvenu, R. V., Huffman, A. H., Dolan, C., Wright, K., & Thomas, J. L. (1998). A human dimensions assessment of the impact of OPTEMPO on the forward-deployed soldier. Research protocol prepared for Walter Reed Army Institute of Research [WRAIR], #700. Washington, DC: WRAIR

Castro, C. A., Bienvenu, R., Huffman, A. H., & Adler, A. B. (2000). Soldier dimensions and operational readiness in U.S. Army forces deployed in Kosovo. *International Review of Armed Forces Medical Services, 73,* 191-199.

Contrada, R. J., & Guyll, M. (2001). On who gets sick and why: The role of personality and stress. In A. Baum, T. A. Revenson, & J. E. Singer (Eds.), *Handbook of Health Psychology* (pp. 59-84). Mahwah, NJ: Erlbaum.

Gade, P. A., Schumm, W. R., & Tiggle, R. (2003). The measurement and consequences of military organizational commitment in soldiers and spouses. *Military Psychology, 15,* 191-207.

Gerbing, D. and Anderson, J. (1993). Monte Carlo evaluations of Goodness-of-fit Indices, In K. A. Bollen and J. S. Long (Eds.), *Testing structural equation models.* (pp. 40-65). London: Sage

Goldberg, D. P. (1972). *The detection of psychiatric illness by questionnaire.* (Maudsley Monograph 21). London: Oxford University Press.

Hackman, J. R., & Oldham, G. R. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology, 60,* 159-170.

Halverson, R. R., Bliese, P. D., Moore, R. E., & Castro, C. A. (1995). Psychological well-being and physical health symptoms of soldiers deployed for Operation Uphold Democracy: A summary of the human dimensions research in Haiti. *Defense Technical Information Center [DTIC] No. ADA 198125.* Alexandria, VA: Defense Technical Information Center.

Jex, S. M., & Bliese, P. D. (1999). Efficacy beliefs as a moderator of the impact of work-related stressors: A multilevel study. *Journal of Applied Psychology, 84(3),* 349-361.

Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1-55.

Jex, S. M., & Thomas, J. L. (2003). Relations between stress and group perceptions: Main and mediating effects. *Work and Stress, 17,* 158-169.

Judge, T. A. & Bono, J. E. (2001). A rose by any other name: Are self-esteem, generalized self-efficacy, neuroticism, and locus of control indicators of a common construct? In B. W. Roberts & R. Hogan (Eds.), *Personality Psychology in the Workplace* (pp. 93-118). Washington DC: APA Books.

Judge, T. A., Bono, J. E., & Locke, E. (2000). Personality and job satisfaction: The mediating role of job characteristics. *Journal of Applied Psychology, 87,* 237-249.

Maddi, S. R. (1990). Issues and interventions in stress mastery. In H. S. Friedman (Ed.), *Personality and disease* (pp. 121-154). New York: Wiley.

Marlowe, D. H., Furukawa, T. P., Griffith, J. E., Ingraham, L. H., Kirkland, F. R., Martin, J. A., Schneider, R. J., & Teitelbaum, J. M. (1985). *New Manning System Field Evaluation: Technical Report No. 1*. Washington, DC: Walter Reed Army Institute of Research.

Moyle, P. (1995). The role of negative affectivity in the stress process: Tests of alternative models. *Journal of Organizational Behavior, 16,* 647-668.

Ouellette, S. C., & DiPacido, J. (2001). Personality's role in the protection and enhancement of health: Where the research has been, where it is stuck, how it might move. In A. Baum, T. A. Revenson, & J. E. Singer (Eds.), *Handbook of Health Psychology* (pp. 175-194). Mahwah, NJ: Erlbaum.

Shamir, B., Brainin, E., Zakay, E., & Popper, M. (2000). Perceived combat readiness as collective efficacy: Individual- and group-level analysis. *Military Psychology, 12,* 105-119.

Sinclair, R. R., Oliver, C., Ippolito, J., & Ascalon, E. (2003). *Development of a fourth-generation hardiness measure*. Manuscript in preparation.

Sinclair, R. R., & Tetrick, L. E. (2000). Item wording effects on hardiness dimensionality, reliability, and relations with neuroticism. *Journal of Research in Personality, 34,* 1-25.

Smith, T. W., & Gallo, L. C. (2001). Personality traits as risk factors for physical illness. In A. Baum, T. A. Revenson, & J. E. Singer (Eds.), *Handbook of Health Psychology* (pp. 139-174). Mahwah, NJ: Erlbaum.

Spector, P. E., & Jex, S. M. (1998). Development of four self-report measures of job stressors and strain: Interpersonal Conflict at Work Scale, Organizational Constraints Scale, Quantitative Workload Inventory, and Physical Symptoms Inventory. *Journal of Occupational Health Psychology, 3,* 356-367.

Spitzer, R. L., Kroenke, K., & Williams, J. B. W. (1999). Validation and utility of a self-report of PRIME-MD: The PHQ Primary Care Study. *Journal of the American Medical Association, 282,* 1737-1744.

Thomas, J. L., & Bliese, P. D. (2000). *360-degree leadership assessment and unit climate: A collaborative research effort between Walter Reed Army Institute of Research and the Center for Army Leadership.* Research protocol prepared for Walter Reed Army Institute of Research [WRAIR], #785. Washington, DC: WRAIR

Thomas, J. L., Sinclair, R. R., & Bliese, P. B. (2003) *Understanding Solider Resilience: A Multiple Method Study of the Relationship between Stress, Health, and Performance.* Unpublished research protocol prepared for Walter Reed Army Institute of Research.

Vaitkus, M. (1994). Unit Manning System: Human dimensions field evaluation of the COHORT company replacement model. *Defense Technical Information Center [DTIC] No. ADA 285942*. Alexandria, VA: Defense Technical Information Center.

Ware, J. E., Kosinski, M., & Keller, S. D. (1994). *SF-36 Physical and Mental Health Summary Scales: A User's Manual.* Boston: Medical Outcomes Trust.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.

## Appendix A.
## Suggested Hardiness Readings

***Conceptual Articles***

Allred, K. D., & Smith T. W. (1989). The hardy personality: Cognitive and physiological responses to evaluative threat. *Journal of Personality and Social Psychology,* 56(2), 257-266.

Benishek, L. A., & Lopez, F. G. (1997). Critical evaluation of hardiness theory: Gender differences, perception of life events, and neuroticism. *Work and Stress, 11(1),* 33-45.

Funk, S. C. (1992). Hardiness: A review of theory and research. *Health Psychology, 11(5),* 335-345.

Hull, J. G., Van Treuren, R. R., & Virnelli, S. (1987). Hardiness and health: A critique and alternative approach. *Journal of Personality and Social Psychology, 53(3),* 518-530.

Kobasa, S. C. (1982). The hardy personality: Toward a social psychology of stress and health. In G. S. Sauders & J. Suls (Eds.), *Social Psychology of Health and Illness* (pp. 3-32). Hillsdale, NJ: Lawrence Erlbaum.

Kobasa, S. C. O. (1987). Stress responses and personality. In R. C. Barnett & L. Biener (Eds.), *Gender and Stress* (pp. 308-329). New York: The Free Press.

Maddi, S. R. (1999). The personality construct of hardiness: I. Effects on experiencing, coping and strain. *Consulting Psychology Journal: Practice and Research, 51(2),* 83-94.

Maddi, S. R., & Kobasa, S. C. (1984). Sources of resistance to stressful events. In *The hardy executive: Health under stress* (pp. 26-45). Chicago, IL: Dorsey Professional Books.

Maddi, S. R., & Kobasa, S. C. (1984). Overview of research results and Appendix A: Some details of research results. In *The hardy executive: Health under stress* (pp. 97-116). Chicago, IL: Dorsey Professional Books.

Maddi. S. R., Khoshaba, D. M., Perisco, M., Lu, J. Harvey, R., Bleecker, F. (2002). The personality construct of hardiness: II. Relationships with comprehensive tests of personality and psychopathology. *Journal of Research in Personality, 36,* 72-85.

Orr, E., & Westman, M. (1990). Does hardiness moderate stress, and how? A review. In M. Rosenbaum (Ed.), *Learned resourcefulness: On coping skills, self-control, and adaptive behavior* (pp. 64-94). New York: Springer Publishing.

Ouellette, S. C. (1993). Inquiries into hardiness. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (2nd ed., pp. 77-100). New York: The Free Press.

Rhodewalt, F., & Zone, J. B. (1989). Appraisal of life change, depression, and illness in hardy and non-hardy women. *Journal of Personality, 56(1),* 81-88.

Tetrick, L. E., & Sinclair, R. R. (2000). Implications for item wording for hardiness structure, relation with neuroticism, and stress buffering. *Journal of Research in Personality, 34,* 1-25.

Wiebe, D. J. (1991). Hardiness and stress moderation: A test of proposed mechanisms. *Journal of Personality and Social Psychology, 60(1),* 88-99.

Wiebe, D. J., & Williams, P. G. (1992). Hardiness and health: A social psychophysiological perspective on stress and adaptation. *Journal of Social and Clinical Psychology, 11(3),* 238-252.

Williams, P. G., Wiebe, D. J., & Smith, T. W. (1992). Coping processes as mediators of the relationships between hardiness and health, *Journal of Behavioral Medicine, 15(3),* 237-255.

***Studies Using Military and Paramilitary (Police, Firefighters, etc.) Samples***

Atwater, L. E., Dionne, S. D., Avolio, B., Camobreco, J. F., & Lau, A. W. (1999). A longitudinal study of the leadership development process: Individual differences predicting leader effectiveness. *Human Relations, 52(12),* 1543-1562.

Bartone, P. T. (1999). Hardiness protects against war-related stress in Army Reserve forces. *Consulting Psychology Journal, 51(2),* 72-82.

Bartone, P. T. (2000). Hardiness as a resiliency factor for United States forces in the Gulf War. In J. M. Violante & D. Paton (Eds.), *Posttraumatic stress intervention: Challenges, issues, and perspectives* (pp. 115-133). Springfield, IL: Charles C. Thomas, Publisher.

Bartone, P. T. (1989). The impact of a military disaster on the health of assistance workers: A prospective study. *Journal of Nervous and Mental Disease, 177(6),* 317-328.

Britt, T. W., Adler, A. B., Bartone, P. T. (2001). Deriving benefits from stressful events: The role of engagement in meaningful work and hardiness. *Journal of Occupational Health Psychology, 6(1),* 53-63.

DePew, C. L., Gordon, M., Yoder, L. H., & Goodwin, C. W. (1999). The relationship of burnout, stress, and hardiness in nurses in a military medical center: A replicated descriptive study. *Journal of Burn Care and Rehabilitation, 20(6),* 515-522.

Florian, V., Mikulincer, M., & Taubman, O. (1995). Does hardiness contribute to mental health during a stressful real-life situation? The roles of appraisal and coping. *Journal of Personality and Social Psychology, 68(4),* 687-695.

Hall, W. H. (1986). Health and personality among army officers. *Australian Army Psychology Research Unit Report, 4/86, Aug. 1986, 127.* Australia: 1st Psychological Research Unit.

Hills, H., & Norvell, N. (1991). An examination of hardiness and neuroticism as potential moderators of stress outcomes. *Behavioral Medicine, 17(1),* 31-38.

King, D. W., King, L. A., Foy, D. W., Keane, T. M., Fairbank, J. A. (1999). Post-traumatic stress disorder in a national sample of female and male Vietnam veterans: Risk factors, war-zone stressors, and resilience-recovery variables. *Journal of Abnormal Psychology, 108(1),* 164-170.

King, L. A., King, D. W., Fairbank, J. A., & Adams, G. A. (1998). Resilience-recovery factors in post-traumatic stress disorder among female and male Vietnam veterans: Hardiness, post-war social support, and additional stressful life events. *Journal of Personality and Social Psychology, 74(2),* 420-434.

Neria, Y., Guttman-Steinmetz, S., Koenen, K., Zakin, L. L., Zakin, G., & Dekel, R. (2001). Do attachment and hardiness relate to each other and to mental health in real-life stress? *Journal of Social and Personal Relationships, 18(6),* 844-858.

Rosen, L. N., Wright, K., Marlow, D., Bartone, P., Gifford, R. K. (1999). Gender differences in subjective distress attributable to anticipation of combat among U.S. Army soldiers deployed in the Persian Gulf during Operation Desert Storm. *Military Medicine, 164(11),* 753-757.

Sutker, P. B., Davis, J. M., Uddo, J. M., Ditta, S. R. (1995). War zone stress, personal resources, and PTSD in Persian Gulf War returnees. *Journal of Abnormal Psychology, 104(3),* 444-452.

Taft, C. T., Stern, A. S., King, L. A., King, D. W. (1999). Modeling physical health and functional health status: The role of combat exposure, posttraumatic stress disorder, and personal resource attributes. *Journal of Traumatic Stress, 12(1),* 3-23.

Tang, T. L. P., & Hammontree, M. L. (1992). The effects of hardiness, police stress, and life stress on police officers' illness and absenteeism. *Public Personnel Management, 21(4),* 493-510.

Westman, M. (1990). The relationship between stress and performance: The moderating effect of hardiness. *Human Performance, 3(3),* 141-155.

***Hardiness Intervention Evaluations***

Maddi, S. R. (1987). Hardiness training at Illinois Bell Telephone. In J. P. Opatz (Ed.), *Health promotion evaluation: Measuring the organizational impact* (pp. 101-115). Stevens Point: WI: National Wellness Institute.

Maddi, S. R. (1990). Issues and interventions in stress mastery. In H. S. Friedman (Ed.), *Personality and Disease* (pp. 121-154). New York: John Wiley & Sons.

Maddi, S. R., Kahn, S., Maddi, K. L. (1998). The effectiveness of hardiness training. *Consulting Psychology Journal: Practice and Research, 50(2),* 78-86.

Maddi. S. R., & Kobasa, S. C. (1984). Hardiness and the industrial setting. In *The hardy executive: Health under stress* (pp. 76-87). Chicago, IL: Dorsey Professional Books.

**Appendix B**
**Recommended 18 items and scale format for the DRS-II (short-form)**

**Instructions:** Each of these statements reflects ways people sometimes feel. Please carefully read each statement and use the scale below to indicate the extent to which you feel each statement is true.

| 1 = Definitely False | 2 = Mostly False | 3 = Don't know | 4 = Mostly True | 5= Definitely True |
|---|---|---|---|---|

| | | |
|---|---|---|
| 1. | ____ | My successes are because of my effort and ability. |
| 2. | ____ | No matter how hard I try, my efforts usually accomplish nothing. |
| 3. | ____ | I enjoy most things in life. |
| 4. | ____ | Sometimes, life seems meaningless to me. |
| 5. | ____ | I take a head-on approach to facing problems in my life. |
| 6. | ____ | It bothers me when my daily routine gets interrupted. |
| 7. | ____ | I feel confident I can handle just about any challenge. |
| 8. | ____ | I often feel helpless. |
| 9. | ____ | Most of my life gets spent doing things that are worthwhile. |
| 10. | ____ | I often feel alienated from the people around me. |
| 11. | ____ | I see really stressful events as opportunities to grow personally. |
| 12. | ____ | I don't like to make changes in my everyday schedule. |
| 13. | ____ | My successes are related to the choices I make. |
| 14. | ____ | Trying hard doesn't pay since most things still don't turn out right. |
| 15. | ____ | Most days, life is really interesting. |
| 16. | ____ | I usually feel all alone in the world. |
| 17. | ____ | I often wake up eager to take up my life wherever it left off. |
| 18. | ____ | I carefully plan just about everything I do. |

**DRS-II Scoring key:**
Each facet contains three items. Facet scores are computed by summing or averaging the items as follows (all items are positively keyed):

| | |
|---|---|
| *Control* | 1, 7, 13 |
| *Powerlessness* | 2, 8, 14 |
| *Commitment* | 3, 9, 15 |
| *Alienation* | 4, 10, 16 |
| *Challenge* | 5, 11, 17 |
| *Rigidity* | 6, 12, 18 |

The “positive” dimensions (Control, Commitment, Challenge) indicate more resources are available for combating stress. Higher scores on these dimensions are associated with higher levels of hardiness.

The “negative” dimensions (Powerlessness, Alienation, Rigidity) indicate greater vulnerability to stress. Lower scores on these dimensions are associated with higher levels of hardiness.