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14. ABSTRACT Military medical personnel deployed to war zones are dually burdened with stressors related to providing healthcare and combat and operational experiences. To better understand how different types and levels of stress exposure relate to positive and negative mental health outcomes among military medical personnel, the associations between combat and healthcare stress exposure and posttraumatic growth and posttraumatic stress disorder (PTSD) were examined among 253 Air Force medical personnel recently redeployed from Iraq. Both types of stress exposure were uniquely associated with increased PTSD symptomatology. However, combat exposure was linearly associated with PTSD, suggesting a doseresponse relationship, whereas the relationship between healthcare stress and PTSD was curvilinear. Both forms of stress exposure showed an inverted U-shaped relationship with posttraumatic growth.					
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Final Report
15 September 2011
Risk and Resilience in Deployed Air Force Medical Personnel Study
(Contract #FA7014-07-0036)

The following Final Report is submitted for the Risk and Resilience in Deployed Air Force Medical Personnel Study (Contract # FA7014-07-C-0036; USAF Operational Medicine Research Program) in accordance with the U.S. Air Force Surgeon General (SG) Reporting Requirements in Broad Agency Announcement 07-1.

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Scope

United States Air Force (USAF) medical personnel are often asked to deploy and provide health care in austere and sometimes dangerous locations where they are exposed to patients with significant traumatic injuries. Prior to the initiation of the current study, little was known about the impact of work in these high-stress and high-risk environments on military medical personnel. Previous retrospective studies of military nurses who worked in combat hospitals in Vietnam found rates of posttraumatic stress disorder (PTSD) at levels similar to those of Vietnam combat veterans.

Purpose

Ensuring the physical and mental health of our military personnel is of primary importance for the Air Force Medical Service (AFMS). Combat exposure has been shown to lead to a variety of mental health problems among our Operation Enduring Freedom(OEF)/Operation Iraqi Freedom (OIF)/Operation New Dawn (OND) military personnel, such as depression, anxiety, and posttraumatic stress disorder (PTSD; Hoge, Auchterlonie, Milliken, 2006). The purpose of this study was to conduct a prospective evaluation of risk, resilience, natural recovery, and posttraumatic growth in USAF medical personnel deployed to work at the 332nd Expeditionary Medical Group, Air Force Theater Hospital (AFTH), Joint Base Balad, Iraq. USAF medical personnel were first deployed to this location in August 2004 to take over the mission that was previously accomplished by a United States Army Combat Support Hospital at this location. The Principal Investigator for the current study, Alan Peterson, PhD, was with the first group of Air Force medical personnel to establish the AFTH at Balad. Since that time, the medical personnel deployed to work at the AFTH at Balad have been exposed to patients with severe traumatic injuries, mass casualties, human remains, and risk of personal injury from attacks by rockets, missiles, and snipers. The current study involved the completion of an anonymous survey during pre-deployment, mid-deployment, and at the 1-, 6-, and 12-month follow-up points after return from deployment. It also included the completion of focus groups with medical personnel after their return from deployment to assess additional factors related to psychological risk and resiliency across the deployment cycle.

We presumed at the initiation of this study that most military medical personnel would perform exceptionally well and recover effectively from deployment demands and stress. We also hypothesized that many would grow and mature and experience what is known as posttraumatic growth. However, we also hypothesized that a small but substantial percentage would manifest significant impairments that will affect their performance,

readiness, retention, mental health, and well-being. This study provided valuable information on various factors that predict impairment and resilience due to trauma exposure. Participants completed anonymous surveys during pre-deployment, mid-deployment, and at the 1-, 6-, and 12- month follow-up points after return from deployment. Survey items measured a number of variables including previous exposure to traumatic life events, PTSD symptoms, healthcare stressors unique to deployed military settings, general military attitudes and experiences, attitudes and beliefs about working with Iraqi patients, anxiety, depression, resilience, and posttraumatic growth.

Assessment Measures

Demographic Questionnaire: The Demographics Questionnaire measured standard demographics (race, gender, age) and military service information (e.g., military grade). Where appropriate, the demographics were measured in ranges rather than specific values (e.g., military grade O-1 to O-3) to help ensure the confidentiality of the participants when multiple demographic variables are combined. For example, a participant whose demographic variables were a 53-year-old African American female O-6 might easily be identifiable.

Life Events Checklist: The Life Events Checklist (LEC) includes a list of 16 different potentially traumatic life events that are commonly associated with PTSD symptoms. It is designed to assess previous exposure to trauma/traumatic events. Individuals were asked to respond whether a reported traumatic event happened to them personally, if they witnessed it, or if they learned about it happening to someone close to them. The LEC has been shown to have good temporal stability, convergent validity with other measures, and to be significantly correlated with psychological distress and PTSD symptoms among combat veterans (Gray, Litz, Hsu, & Lombardo, 2004).

Combat Experiences Scale: The Combat Experiences Scale is a 23-item checklist of a range of combat-related experiences (e.g., being attacked or ambushed, shooting or directing fire at the enemy, seeing dead or seriously injured Americans, handling or uncovering dead bodies or body parts, etc.). Respondents are asked to indicate which events they have experienced at any time during a deployment. Although this measure is designed primarily for individuals serving in a combat role, we thought it would be important to include in our study because it often has been used in previous studies of deployed military personnel (Hoge et al., 2004, 2008; Vogt et al., 2008; Wilk et al., 2010). The Combat Experiences Scale is a subscale of the larger Deployment Risk and Resilience Inventory (DRRI; King, King, Vogt, Knight, & Samper, 2006). The DRRI was developed and tested in three separate national samples of veterans of the first Gulf War. It has very good internal consistency ($\alpha = .85$ to $.89$) and construct validity. It has been revised and tested with OEF/OIF returnees (Vogt et al., 2008).

PTSD Checklist, Military Version: The PTSD Checklist (PCL-M; Weathe, Litz, Herman, Huska, & Keane, 1993) is a 17 item self-report measure that evaluates the severity of PTSD symptoms in the past month as a result of the stressful life events checked off by participants on the Life Events Checklist (LEC). The PCL-M has been found to have excellent psychometric properties (Blanchard, Jones-Alexander, Buckley & Forneris 1996). We used the PTSD caseness definition used by Hoge and colleagues (2004) to generate base rate estimates.

General Military Experience Scale: This 9-item measure includes a description of thoughts and feelings about current military experience. The measure was based on a previous measure used in a study of U.S. military personnel deployed to provide peacekeeping duties in Somalia (Litz, Orsillo, Friedman, Ehlich, & Batres, 1997). Items are completed using a Likert scale from 0 (not at all) to 4 (extremely).

Attitudes and Beliefs Scale: This scale includes a list of 7 items to assess attitudes and beliefs about military training and the military mission in Iraq. Items are completed using a Likert scale from 0 (strongly disagree) to 4 (strongly agree). Since there were no established and standardized scales that could be applied to measure various types of attitudes and beliefs specific to military medical missions in Iraq, a set of items was rationally derived. The items were designed to capture participants' appraisal of potentially positive and negative attitudes and beliefs of participating in the military medical mission in Iraq. The scale was developed using methods similar to those used in a previous study of military personnel deployed to Somalia (Litz, Orsillo, Friedman, Ehlich, & Batres, 1997).

Positive and Negative Affect Scale (PANAS): The PANAS (Crawford & Henry, 2004) is a 20-item self-report measure of positive and negative affect (Watson, Clark, & Tellegen, 1988). Positive and negative affect reflect personality dispositional dimensions. High-negative-affect individuals are epitomized by subjective distress and unpleasurable engagement in activities. Positive affect represents the extent to which an individual experiences

pleasurable engagement with the environment. Emotions such as enthusiasm and alertness are indicative of high positive affect, whereas low levels of positive affect are characterized by lethargy and sadness. The PANAS has been demonstrated to be a reliable and valid measure of the constructs it was intended to assess (Crawford & Henry, 2004).

List of Concerns Checklist: This scale includes a list of 13 items to assess general concerns and stressors experienced by military personnel related to deployment to Iraq. Individuals are asked to rate the level of trouble or concern they have with each of the potential stressors, and the items are completed using a Likert scale from 1 (very low) to 5 (very high). Since there were no established and standardized scales that could be applied to measure various types of general life concerns prior to a deployment to Iraq, the set of items was rationally derived. The items were designed to assess participants' positive and negative attitudes and beliefs about participating in the military medical mission in Iraq.

Brief Patient Health Questionnaire-Anxiety: Anxiety was assessed with a one-item measure of generalized anxiety that is part of the Brief Patient Health Questionnaire (Spitzer, Kroenke, & Williams, 1999; Spitzer, Williams, & Kroenke, 1999). The item is reported on a 4-point Likert scale from "not at all" to "nearly every day."

Patient Health Questionnaire-Depression (PHQ-9): The PHQ-9 is a 9-item depression scale (Spitzer, Kroenke, & Williams, 1999). The PHQ-9 is a scale used to diagnose depression, and it is based directly on the diagnostic criteria for major depressive disorder in the *Diagnostic and Statistical Manual Fourth Edition* (DSM-IV; American Psychiatric Association, 1994). Items are reported on a 4-point Likert scale from "not at all" to "nearly every day."

Alcohol Consumption Scale: This is a 5-item scale which measures the level of alcohol consumption over the previous 4 weeks, concerns about level of alcohol consumption, the need to cut-down on drinking, and the impact of alcohol consumption on work, training, and other daily activities.

The Connor-Davidson Resilience Scale (CD-RISC): The Connor-Davidson Resilience Scale (CD-RISC) is a 25-item questionnaire tapping attitudes toward coping with adversity (Connor & Davidson, 2003). Items require respondents to indicate their degree of endorsement on 5-point scales ranging from 0 ("not true at all") through 4 ("true nearly all the time"; e.g., "Having to cope with stress makes me stronger"). Connor and Davidson (2003) reported a Cronbach's alpha of .89 for 577 general population subjects, and a test-retest reliability of .87 among 24 patients with either PTSD or generalized anxiety disorder who had failed to respond favorably in a psychopharmacology clinical trial. Evidence for convergent and divergent validity include a positive correlation with a hardiness scale ($r = 0.83$) and a negative correlation with a perceived stress scale ($r = -0.76$). Three short forms were constructed by Strahan & Gerbasi (1972), and three by Reynolds (1982). Reynolds' 13-item form seems to have the most support (Reynolds, 1982; Zook & Sipes, 1985).

The Taylor Manifest Anxiety Scale (TMAS) Short Form: The Taylor Manifest Anxiety Scale (TMAS) is a questionnaire consisting of True/False items drawn from the Minnesota Multiphasic Personality Inventory (Taylor, 1953). A study of 59 undergraduates indicated a three-week test-retest reliability of $r = .89$ (Taylor, 1953), and a study of 64 neuropsychiatric patients yielded a validity coefficient of $r = .60$ between TMAS scores and clinician ratings of behavioral manifestations of anxiety (Buss, 1955). Psychometric scrutiny of individual questions led to deletion of items having questionable validity (Buss, 1955; Hoyt & Magoon, 1954), resulting in the 20-item short form of the TMAS (Bendig, 1956). Despite its brevity, the internal consistency reliability of the short form is indistinguishable from the original TMAS (r_s : .76 versus .82).

The Marlowe-Crowne Social Desirability Scale (MCSDS): The Marlowe-Crowne Social Desirability Scale (MCSDS) is a questionnaire comprising 33 True/False items that measures the tendency to present oneself in an unrealistically favorable light (i.e., "defensiveness"; Crowne & Marlowe, 1960). Items include "I have never intensely disliked someone" (T) and "I like to gossip at times" (F). Crowne and Marlowe (1960) reported a Kuder-Richardson internal consistency coefficient of .88 on 39 undergraduates, and a test-retest reliability of .89 for 31 of these students who completed the questionnaire one month later. Validation data for 39 undergraduates include correlations of .40 and .54 with the MMPI's K and L scales, respectively (Crowne & Marlowe, 1960). We used the 13-item Short Form measure of this scale (Fischer & Fick, 1993).

Role Functioning Quality of Life: Limitations in usual role activities because of emotional problems was measured using the 3-item Role-Emotional subscale of the SF-36 (Ware & Sherbourne, 1992). These items measure how frequently emotional problems have had an impact on the amount of time spent on work or other daily activities. Items are reported on a 5-point Likert scale from “all of the time” to “none of the time.”

Health Care Stressor Scale: The stressor scale is comprised of 21 items tapping typical stressors associated with military healthcare practice in the combat environment. This measure was specifically designed for this study because no similar measure existed to assess these variables. The items were developed and identified based on the results of a previous study focused on Critical Care Air Transport Team (CCATT) members who are exposed to significant medical trauma patients during CCATT missions. The previous study was conducted by one of our initial research collaborators at Wilford Hall Medical Center, Lt Col Theresa Dremsa-Brewer (2003, CCATT Nurses' Deployed Experience, Triservice Nursing Research Program, available at http://131.158.7.207/cgi-bin/tsnrp/search_studies.cgi?y=2003). The purpose of the CCATT study was to describe knowledge gained by CCATT medical personnel while providing patient care within a combat environment. Individual interviews were conducted with registered nurses, and focus groups were conducted with nurses, physicians, and respiratory therapists. These medical personnel who had deployed with CCATT missions shared their recent experience in a combat environment. Team members indicated that a major challenge of their job was related to the types of injuries they witnessed and treated. Items included in the Health Care Stressor Scale were the most common events reported from the CCATT study.

Attitudes and Beliefs about Iraqi Patients Scale: This is a 9-item scale to assess attitudes and beliefs about caring for or interacting with Iraqi patients. Items are completed using a Likert scale from 0 (strongly disagree) to 4 (strongly agree). This scale was developed after the Principal Investigator returned with the first rotation of deployers to the AFTH at Balad. During the first deployment, it became clear that a primary stressor for many military medical personnel at Balad involved interacting with Iraqi patients. These patients included Iraqi National Guard, Iraqi civilians (including men, women, and children), and Iraqi insurgents. Since there was not an established measure for these variables, a set of items was rationally derived using methods similar to those used in a previous study of military personnel deployed to Somalia (Litz, Orsillo, Friedman, Ehlich, & Batres, 1997).

Mental Health and Substance Abuse Services: This scale measures perceptions about the willingness to seek care from mental health and substance abuse services as well as the availability of these services. Items also measure the perceived stigma of seeking these services and perceptions about the potential for military career impact.

Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996): The PTGI is a 21-item measure designed to measure positive growth that may occur after exposure to a traumatic event. It includes a 6-point response format (0 = no change, 1 = a very small degree, 2 = a small degree, 3 = a moderate degree, 4 = a great degree, and 5 = a very great degree) that assesses positive outcomes following traumatic events. The PTGI includes 5 factors: appreciation of life (e.g., “My priorities about what is important in life”), relating to others (e.g., “Knowing that I can count on people in times of trouble”), new possibilities (e.g., “I established a new path for my life”), personal strength (e.g., “Knowing I can handle difficulties”), and spiritual change (e.g., “A better understanding of spiritual matters”). The internal consistency of the scale is .90, with an adequate test-retest reliability of .71.

Free Response Item: This item gave participants space to provide any additional written comments they had about their medical deployment experience.

Table 1: List of Measures and Assessment Timeline

Measure	Assessment Timeline (Pre-Deployment, Mid-Deployment, 1-Month Post-Deployment, 6-Months Post-Deployment, or 12-Months Post-Deployment)				
	Pre	Mid	1-Month	6-Month	12-Month
Demographics	X	X	X	X	X
Life Events Checklist	X				
Combat Experiences Scale		X	X	X	X
PCL-M	X	X	X	X	X
General Military Experiences	X	X	X	X	X
Attitudes and Beliefs	X	X	X	X	X
PANAS	X	X	X	X	X
List of Concerns	X	X	X	X	X
Brief PHQ-Anxiety	X	X	X	X	X
PHQ-9-Depression	X	X	X	X	X
Alcohol Consumption	X	X	X	X	X
Connor-Davidson	X				
Taylor Manifest Anxiety	X				
Marlowe-Crowne	X				
Role Functioning		X	X	X	X
Health Care Stressor Scale		X	X	X	X
Iraqi Patients Scale		X	X	X	X
Mental Health Services			X	X	X
Posttraumatic Growth			X	X	X
Free Response		X	X	X	X

Brief Review of the Scientific Literature

National prevalence rates, as assessed in the National Comorbidity Study (Kessler et al, 1995) suggest that approximately 7% of individuals meet the diagnostic criteria for PTSD. It is estimated that 60-90% of the general population will experience a “potentially traumatizing event” and that the prevalence of PTSD among those who have had traumatic experiences is around 9% (Breslau, Davis, & Andreski, 1998).

These statistics, although reflective of the general population, greatly increase for military personnel who experience combat-related traumatic events. The National Vietnam Veterans Readjustment Survey revealed lifetime prevalence rates of 30.9% for male veterans and 26.9% for female veterans. Additionally, 15.2% and 8.1% (males and females, respectively) Vietnam veterans continued to experience PTSD at the time of the survey, which was conducted between the years of 1986-1988.

Hoge and his colleagues (c.f., Hoge et al., 2004, 2006) have conducted a series of studies on the mental health of infantry soldiers returning from Iraq and Afghanistan deployments. Results of this research suggest that PTSD prevalence is strongly and positively correlated with combat experiences, such as being attacked or shot at, firing on or killing the enemy, and seeing or handling human remains. Although most research has targeted military combatants, a recent report indicated that the risk for combat-related PTSD exists even for those not officially identified as combatants (Peterson, Wong, Haynes, Bush, & Schillerstrom, 2010). Overall, published studies reporting the rates of combat-related PTSD and PTSD symptoms in OIF/OEF veterans vary considerably, with some reporting rates as low as 5% (Hoge et al., 2006; Smith et al., 2008) and others reporting rates as high as 30-45% (Helmer et al., 2007; Lapierre, Schwegler, & LaBauve, 2007). This wide range varies depending on the assessment approach used, the population evaluated, and the time frame of the evaluation (Peterson, Luethcke, Borah, Borah, & Young-McCaughan, 2011).

Emergency medical personnel working in trauma settings are often confronted with acute stressors or critical incidents and are at a greater risk for developing posttraumatic distress (van der Ploeg & Kleber, 2003; Schwan, 1998; Regehr, Hill, & Glancy, 2000; Marmar et al., 1999; Bryant & Harvey, 1996; Smith & Roberts, 2003;

Weiss, Marmar, Metzler, & Ronfeldt, 1995; Kerasiotis & Motta, 2004). Researchers estimate that the life-time prevalence of PTSD in emergency ambulance personnel is as high as 20% (Clohessy & Ehlers, 1999; Grevin, 1996; Weiss et al., 1995). However, this research is limited by being retrospective in nature.

One of the most difficult tasks that disaster workers can be assigned is that of working with dead bodies or human remains (Peterson et al., 2002). Several studies have found that individuals exposed to human remains report more symptoms of PTSD or psychological distress as compared to control groups who were not exposed (Jones, 1985; McCarroll, Ursano, & Fullerton 1995; McCarroll, Fullerton, Ursano, & Hermsen, 1996; Sutker, Uddo, Brailey, Allain, & Errera, 1994; Sutker, Uddo, Brailey, Vasterling, & Errera, 1994; Ursano et al., 1995; Epstein et al., 1998). Studies have suggested that a dose-response relationship exists between amount of exposure to human remains and degree of psychological distress (McCarroll, Ursano, & Fullerton, 1993; McCarroll, Fullerton, Ursano, & Hermsen, 1996; McCarroll, Ursano, Fullerton, Liu, & Lundy, 2001). Distress tends to increase with greater degrees of gruesomeness (McCarroll, Ursano, Fullerton, Oates, et al., 1995; Ursano & McCarroll, 1990), when dealing with deceased children (McCarroll, Ursano, Fullerton, Oates, et al., 1995; Ursano & McCarroll, 1990), and if disaster workers can somehow identify with the victims (Ursano et al., 1990). Inexperienced workers (McCarroll, Ursano, & Fullerton, 1993; McCarroll, Ursano, Fullerton, Liu, & Lundy, 2001; McCarroll, Ursano, Fullerton, & Lundy, 1993; McCarroll, Ursano, Fullerton, & Lundy, 1995; McCarroll, Ursano, Ventis, et al., 1993) and those who are not volunteers (McCarroll, Ursano, Fullerton, Liu, & Lundy, 2001) have been found to be at increased risk for psychological symptoms.

Several retrospective studies have investigated the psychological impact of serving in a war zone on nurses and medical workers who served in Vietnam. The psychological consequences for military nurses who served in Vietnam have been found to be similar to those suffered by combat veterans, despite significantly different stressors (Paul, 1985; Rogers & Nickolaus, 1987; Dewane, 1984; Stanton-Bandiero, 1998; Gurvits et al., 2002; Carson et al., 2000; Norman, 1988; Ravella, 1995; Horowitz, 1982). There is some evidence that the onset of posttraumatic stress symptoms may be delayed, in some cases by years, emerging when triggered by crises at a later time (Rogers & Nickolaus, 1987). Unfortunately, all of these studies were also retrospective.

Researchers at the San Diego Naval Medical Center have conducted a small study with medical personnel looking at the impact of deployment on mental health (Kolkow et al., 2007). They investigated the risk factors for PTSD and depression in 102 Navy medical personnel that were deployed to Iraq and Afghanistan. The results indicated that 9% of the respondents met the criteria of the PTSD Checklist for PTSD and 5% met the criteria for depression according to the Patient Health Questionnaire depression scale. The study also found the largest risk factor for PTSD symptoms was threat of personal harm. Exposure to wounded or dead was not found to increase risk of PTSD.

A 2008 study by Jones and colleagues explored the mental health differences in UK Armed Forces medical personnel and other military trades. Jones et al. (2008) found that overall, medical personnel deployed to Iraq between 18 Jan 2003 and 28 Jun 2003 were more likely to experience psychological distress and multiple physical symptoms than other Service personnel. Additionally, traumatic medical experiences explained the relationship with psychological distress, while traumatic combat experiences did not. However, the findings did not show that PTSD was associated specifically with the medical personnel. Jones and colleagues (2008) found that mental health personnel were worse off than other UK service members in terms of their unit cohesion, leadership, post deployment experiences, and exposure to wounded patients. These factors are important to resiliency and will be further explored in the present study.

To the best of our knowledge, only one previous study has conducted focus groups with previously deployed medical personnel. The focus groups were conducted with 39 Army medical personnel deployed in support of OIF/OEF and Operation Desert Storm (Mark et al., 2009). This study investigated deployment experiences; specifically leadership, readiness, patient care, redeployment, and communication were explored. The major finding in this study was in regards to leadership. Personnel were dissatisfied with leadership because they felt that situations arose where they felt their personal safety was compromised, giving the impression that leaders did not care for their subordinates. An additional finding was in regard to personnel's readiness for their deployment. Participants thought they were well-prepared except when it came to performing tasks in an unfamiliar setting (i.e., dentists triaging casualties). When it came to patient care, participants felt that they were not given enough information about how patients were going to be cared for and how the needs of the patients were being handled.

Summary of Scientific Presentations and Publications

The following is a brief review of the primary results and findings of our project. To date, our project has resulted in 19 presentations at scientific conferences and 4 scientific publications. We have three manuscripts which

have been submitted for publication and are currently under review. All of the scientific presentations and publications were coordinated for review and approval through the Wilford Hall Medical Center Public Affairs Office and IRB as well as AF/SGR. We anticipate publishing approximately 10 additional manuscripts from this project. Copies of each of the presentation abstracts and manuscripts described in this Final Report are included in the Appendix.

2005 Presentations

Maguen, S., Turcotte, D. M., Peterson, A. L., Dremsa, T. L., Garb, H. N., McNally, R. J., & Litz, B. T. (2005, November). *Risk and resilience factors prior to deployment to Iraq*. Paper presented at the 39th Annual Association for Advancement of Behavior Therapy Convention, Washington, D.C.

Risk and resilience factors that best predict pre-deployment PTSD and depression symptoms in Air Force medical personnel preparing for deployment to Iraq were examined. Results suggest that while risk factors may be more helpful in predicting PTSD symptoms that stem from life-course trauma and current stressors, resilience factors seem to play a protective role and are negatively associated with symptoms of depression.

Turcotte, D. M., Peterson, A. L., Dremsa, T. L., Garb, H. N., McNally, R. J., Maguen, S., & Litz, B. T. (2005, November). *The relationship between resilience, exposure to healthcare stressors in the war-zone in Iraq, and mental health*. Paper presented at the 39th Annual Association for Advancement of Behavior Therapy Convention, Washington, D.C.

The association between PTSD, depression, negative affect, healthcare stressor exposure (HSE), combat exposure, positive military experiences, and resilience in Air Force medical personnel deployed to the Iraq War was examined. The results suggest that the acute strain produced by ongoing HSE in the war-zone is likely to manifest as symptoms of depression, rather than PTSD. Results also suggest resilience factors may not play a role in mitigating the acute strain of HSE or combat experiences in the war zone.

2006 Presentations

Gentes, E., Papa, A., Peterson, A. L., Garb, H., McNally, R. & Litz, B (2006, November). *Unit cohesion buffers the impact of stress on PTSD in military personnel deployed to Iraq*. Poster presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, Hollywood, CA.

This study examined the ability of unit cohesion to buffer the relationship between life stressors and PTSD symptoms in military medical personnel deployed to Iraq. Unit cohesion interacted with life stressors to buffer the relationship between stress and total PTSD symptoms, re-experiencing symptoms, and avoidance symptoms, but not hyperarousal symptoms. In each case, higher levels of cohesion while experiencing increased life stressors was associated with less PTSD symptoms, while less cohesion while experiencing increased life stressors was associated with increased PTSD symptoms.

Hebenstreit, C., Turcotte, D., Papa, A., Peterson, A. L., McNally, R. & Litz, B (2006, November). *Attitudes about military service in military personnel deployed to Iraq: A longitudinal study*. Poster session presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, Hollywood, CA.

The extent to which age, race, gender, and PTSD affected the attitudes military personnel have towards the validity and efficacy of the operation in Iraq was examined. Results showed that increases in age predicted increased positive attitudes about the mission in Iraq at pre- and post-deployment. A significant relationship between higher reporting of PTSD symptoms and negative attitudes about the military was observed at pre- and mid-deployment. Male gender was associated with more positive attitudes towards the military at mid-deployment.

Turcotte, D., Papa, A., Peterson, A. L., Garb, H., McNally, R. & Litz, B (2006, November). *Effects of smoking on PTSD, stress, and negative affect in medical personnel deployed to Iraq*. Poster session presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, Hollywood, CA.

The relationship between PTSD, stress, negative affect, and the interaction of negative affect and stress on smoking behaviors in military medical personnel prior to their deployment was examined. Consistent with previous research, smokers were found to have more PTSD symptoms, stress, and negative affect than non-smokers. Increased probability of smoking behaviors were predicted by increased negative affect and increased stress. The interaction of negative affect and stress was marginally significant, indicating that under low stress conditions, high negative affectivity predicts increased probability of smoking, while under high stress the opposite was seen.

2008 Publications and Presentations

Benson, T., Conoscenti, L. M., Peterson, A., Litz, B. T., McNally, R. J., & Dickstein, B. (2008, November). *Trauma exposure and PTSD in military medical personnel*. Presentation given at the Annual Meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

A prospective evaluation of trauma exposure and psychological symptomatology in medical personnel deployed to work in a combat trauma hospital in Iraq was conducted. Preliminary analyses indicate that medical personnel are exposed to a range of potentially traumatic experiences during their deployments. Results show that medical military medical personnel endure the “dual burden” of occupational traumas and combat threats. As a result, many experience mental health problems during and after their deployment, including PTSD and major depression.

Cedillos, E.M., Luethcke, C., Benson, T. A., Conoscenti, L. M., Litz, B. T., McNally, R. J., Baker, M., Isler, W., Mintz, J., & Peterson, A. (2008, November). *Assessment and treatment of Iraqi trauma patients: Attitudes and beliefs of military medical personnel*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

Military medical personnel deployed to work at the Air Force Theater Hospital at Balad Air Base in Iraq completed the Attitudes and Beliefs about Iraqi Patients Questionnaire at

the mid-point of their deployment period. Results indicate that military personnel vary in their opinions regarding the preparation and training they received with regards to caring for and interacting with Iraqi patients before their deployment, with approximately 54% indicating they do not feel they received enough pre-deployment training. Additionally, a large number of personnel reported feeling uncomfortable or uneasy in their role caring for or interacting with Iraqi civilian patients (48.4%), Iraqi National Guard patients (59.3%), and Iraqi Security Internees (43.2%). This study allows the evaluation of the impact of work with Iraqi patients on U.S. medical personnel and also provides the military with valuable information regarding the possibilities for improvement in training programs.

Conoscenti, L. M., & Benson, T. (2008, August). *The impact of trauma exposure on deployed military medical personnel*. Invited presentation given at the Annual San Antonio Trauma Symposium, San Antonio, TX.

This presentation described pre-deployment risk factors for PTSD in military medical providers. Additionally, it identified specific stressors which increase the risk for the development of PTSD in military medical personnel, and outlined the most common symptoms experienced by this population.

Dickstein, B.D., Conoscenti, L. M., Litz, B. T., Baker, M., & Peterson, A. (2008, May). *Military unit cohesion and life stress as predictors of PTSD: A mediated model*. Poster session presented at the annual meeting of the Association for Psychological Science, Chicago, IL.

The hypothesis that the association between unit cohesion and PTSD would be mediated by life stressors in military medical personnel deployed to Operation Iraqi Freedom was examined and confirmed. It appears that unit cohesion's salutogenic effect may be specific to certain disorders, rather than generalizable, among medical personnel in war-zones; however further investigation is needed. The results help to better elucidate the mechanism by which unit cohesion and resilience to PTSD are related, suggesting that cohesion's palliative effect is due primarily to helping service members manage concurrent demands (e.g., home-life concerns) rather than war-zone stress.

Dickstein, B.D., Conoscenti, L., Litz, B., & Peterson, A. (2008, November). *The impact of military unit cohesion on PTSD symptom severity across varying levels of war zone stress exposure*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

The curvilinear function between unit cohesion and stress exposure in predicting PTSD using a sample of military medical personnel deployed as part of Operation Iraqi Freedom was examined. A hierarchical regression testing for quadratic moderation failed to find evidence of a curvilinear interaction, failing to support the model. However, exposure was found to moderate the relationship between unit cohesion and PTSD in a linear fashion.

Luethcke, C. A., Cedillos, E. M., Benson, T., Conoscenti, L. M., Litz, B. T., McNally, R. J., Baker, M., Isler, C., & Peterson, A. (2008, November). *U.S. military medics in Iraq: Prevalence and impact of healthcare trauma exposure*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

The prevalence of exposure to various healthcare stressors at a military theater hospital in Iraq and its relation to PTSD symptoms is described. Most respondents reported high levels of subjective impact of healthcare stressors. For 14 out of the 21 healthcare stress items, more than 50% of participants responded that the stressor had a “moderate” or “extreme” impact. Using a cutoff score of 44 on the PCL-M, 21% of the respondents scored in the clinically significant range. Exposure to the healthcare stressors was significantly correlated with PTSD symptom severity.

Maguen, S., Turcotte, D. M., Peterson, A. L., Dremsa, T. L., Garb, H. N., McNally, R. J., & Litz, B. T. (2008). Military medical personnel: Risk and resilience factors prior to deployment to Iraq. *Military Medicine*, 173(1), 1-9.

Military medical personnel preparing for deployment to Iraq participated in a survey concerning pre-deployment risk and resilience factors. Participants reported exposure to an average of 2.5 potentially traumatic events before deployment and 76% reported at least 2 current concerns about pre-deployment stressors. Fairly low levels of PTSD symptoms before deployment were reported and positive affect was significantly higher than reported negative affect. PTSD symptoms that were present before deployment were most strongly associated with risk factors, whereas positive affect was most strongly associated with resilience factors. Pre-deployment negative affect was associated with a combination of risk and resilience factors. These findings have implications for possible interventions and preparation of military medical personnel before military deployment.

McLean, C. P., Dickstein, B., Conoscenti, L. M., Benson, T., Litz, B. T., & Peterson, A. (2008, November). *Posttraumatic growth among military medical personnel*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.

Levels of posttraumatic growth (PTG) reported by military medical personnel deployed as part of Operation Iraqi Freedom was examined. Deployment-related and demographic predictors of PTG were also identified. Correlational analyses revealed both unit cohesion and length of time in the military were significantly related to PTG. A linear relationship between military healthcare exposure and PTG was found.

Peterson, A. L. (2008, July). *Risk and resiliency in medical personnel exposed to disaster trauma*. Invited address at the 2nd Annual Continental Divide Disaster Behavior Health Conference, Colorado Springs, CO.

Presentation reviewed risk and resiliency in medical personnel exposed to disaster trauma beginning with types of disaster trauma exposure that occurs in health care workers during natural disasters, terrorist attacks, mortuary duty, and military combat. Data from a large prospective study of over 1000 military medical personnel deployed to work at a combat trauma hospital in Iraq was also reviewed. Factors related to risk of psychological health problems such as PTSD as well as factors related to resiliency were presented. The impact of cultural factors in the provision of health care after disasters was discussed, and data was presented on the impact of working with Iraqi patients on U.S. military medical personnel. Potential programs to enhance resiliency in health care workers were also reviewed.

2009 Presentations

Cedillos, E. M., Krantz, L., Hatch, J., Baker, M., & Isler, W. (2009, November). *Predictors of resiliency for PTSD among military medical personnel*. Poster session presented at the annual meeting for the International Society for Traumatic Stress Studies, Atlanta, GA.

This study investigated the relationship between military medical personnel's trauma-related symptoms and attitudes and beliefs about OIF, specifically examining their belief in the mission and confidence in their training preparation. The results support the hypothesis that a belief in one's mission predicts a decrease in the severity of PTSD symptoms. Additionally, the results support the hypothesis that those who continue to feel their military training prepared them well for their deployment were less likely to develop symptoms of PTSD, suggesting that both belief in the mission and confidence in training may serve as resiliency factors.

Cedillos, E. M., Luethcke, C., Benson, T. A., Conoscenti, L. M., Baker, M., Isler, W., Peterson, A. L., Litz, B. T., McNally, R. J., & Dickstein, B. D. (2009, November). *Military medical personnel deployment experiences: Preliminary focus group findings*. Poster session presented at the annual meeting for the Association for Behavioral and Cognitive Therapies, New York, NY.

The present study presents preliminary findings from initial focus groups conducted with Air Force medical personnel regarding their deployment experiences. Meeting notes were examined by two evaluators who identified common themes among participants. Themes that were identified as common by both evaluators include, but are not limited to: feelings regarding pre-deployment mandatory training content, benefits regarding peer support and interaction, military support for family members, strategies for coping with deployment stress, and suggestions for adapting to post-deployment environment. It is anticipated that feedback from these focus groups will provide a broad range of information regarding unique stressors faced by military medical personnel across the deployment cycle.

Krantz, L., Cedillos, E. M., Dickstein, B., Litz, T. T., & Peterson, A. L. (2009, November). *Perceived barriers to mental health care in military medical personnel*. Poster session presented at the annual meeting of the International Society for Traumatic Stress Studies, Atlanta, GA.

Medical personnel completed a series of questionnaires following deployment to Joint Base Balad, Iraq. Overall, 49.6% of participants endorsed at least 1 barrier to care, and there was a low to moderate positive correlation between the number of barriers endorsed and overall score on the PCL-M. These results suggest that healthcare workers are not immune to barriers to care. In addition, healthcare workers exposed to high impact combat and operational stress were twice as likely to report concerns about stigmatization and other barriers to care.

McLean, C. P., Benson, T., Litz, B. T., Peterson, A. L., Baker, M. T., & Isler, W. C. (2009, November). *Gender differences in posttraumatic growth*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

Men and women respond differently to stress and trauma. Although partially explained by the severity and type of trauma exposure incurred, women are more prone to developing PTSD than men, but they also report more posttraumatic growth (PTG). We examined PTG in 174 Air Force medical personnel (90 men, 84 women) who deployed to Iraq. Consistent with previous research, women reported significantly higher levels of PTG than men. However, gender was not a predictor of growth, after accounting for demographic and deployment experiences. It appears that men and women are equally likely to grow after being challenged with helper roles and deployment stressors.

2010 Publications and Presentations

Dickstein, B. D., McLean, C. P., Mintz, J., Conoscenti, L., Steenkamp, M. M., Benson, T. A., Isler, W. C., Peterson, A. L., & Litz, B. T. (2010). Unit cohesion and PTSD symptom severity in Air Force medical personnel. *Military Medicine*, 175, 482-486.

Research suggests that military unit cohesion may protect against the development of posttraumatic stress disorder (PTSD). However, equivocal findings have led researchers to hypothesize a potential curvilinear interaction between unit cohesion and warzone stress. This hypothesis states that the protective effects of cohesion increase as warzone stress exposure intensifies from low to moderate levels, but at high levels of warzone stress exposure, cohesion loses its protective effects and is potentially detrimental. To test this theory, we conducted a test for curvilinear moderation using a sample of 533 Air Force medical personnel

deployed as part of Operation Iraqi Freedom. Results did not support the curvilinear interaction hypothesis, although evidence of cohesion's protective effects was found, suggesting that unit cohesion protects against PTSD regardless of level of stress exposure.

2011 Study Publications and Presentations

Bryan, C. J., Peterson, A. L., McNally, R. J., Baker, M. T., Cedillos, E. M., Luethcke, C. A., & Litz, B. T. (2011). Factors of combat experiences and associations with psychological symptoms among deployed military medical personnel. Manuscript submitted for publication in *Personality and Individual Differences*.

In this study, we considered the possibility that different subtypes of combat experiences might differentially relate to different forms of psychological and behavioral adaptation among 1,012 military medical providers halfway through their deployments to Iraq. Utilizing exploratory factor analysis with oblique rotation, we identified two distinct subtypes of combat events experienced by deployed medical providers: potentially hostile or threatening situations (named "Hostility") and exposure to severe injury and death (named "Death"). Both factors were significantly correlated with higher levels of trauma symptoms, depression symptoms, negative mood, and functional impairment, but they were unrelated to positive mood. Death events were more strongly correlated with depression symptoms, but Hostility events were more strongly associated with negative mood and functional impairment. Results suggest that different subtypes of combat experiences can be identified among deployed medical providers, and these subtypes are differentially related to various forms of psychopathology.

Dickstein, B. D., Krantz, L. H., Fang, A., Baker, M. T., Tansley, D. P., Peterson, A., & Litz, B. T. (2011, March). *Perceptions of mental healthcare and willingness to seek treatment among military medical personnel*. Poster session presented at the annual meeting of the American Psychopathological Association, New York, NY.

Stigma prevents service members with psychiatric disorders from seeking mental health treatment. However, it remains unclear whether service members are becoming more willing to seek mental health treatment. Accordingly, we examined trends in service members' willingness to seek care. Chi-square analysis revealed that participants in the second cohort (2007-09) reported greater willingness to seek care. No differences were found between cohorts on demographic variables, alcohol use, PTSD, or depression. It appears that efforts to reduce stigma are working; however, a salient minority of participants did not report a willingness to seek treatment. Thus, continued work is needed to address stigma among service members.

Luethcke, C. A., Cedillos, E. M., Hatch, J. P., Baker, M. T., Litz, B. T., McNally, R. J., Isler, W. C., & Peterson, A. L. (2011). Attitudes and beliefs of U.S. military personnel about providing health care for Iraqi patients in Operation Iraqi Freedom. Manuscript submitted for publication in *Military Medicine*.

The current study provides a descriptive overview of U.S. military medical personnel's attitudes toward Iraqi patients and beliefs about the U.S. mission to provide them with healthcare. Results suggest that the majority of medical personnel feel comfortable treating Iraqi patients and agree with the U.S. mission to provide them with healthcare. However, a large minority of participants responded that they were uncomfortable with Iraqi patients and struggled with conflicting beliefs about the mission.

Luethcke, C. A., Cedillos, E. M., Hatch, J. P., Isler, W. C., Litz, B. T., McNally, R. J., & Peterson, A. L. (2011). Impact of combat, healthcare, and family and personal stressors on symptoms of PTSD and depression in military medical personnel during deployment to Iraq. Manuscript submitted to *Military Medicine*.

This study examined surveys completed by military medical personnel during their deployment to Iraq to evaluate the association between these 3 classes of stressors (combat, healthcare, and personal/family stressors) and symptoms of posttraumatic stress disorder (PTSD) and depression. Symptoms of posttraumatic stress disorder and depression significantly correlated with each predictor (combat, healthcare, and personal/family stressors). However, combat exposure did not predict PTSD or depression symptoms after controlling for personal/family stressors and healthcare stressors.

McLean, C. P., Handa, S., Dickstein, B. D., Conoscenti, L. M., Benson, T. A., Baker, M. T., ... Litz, B. T. (2011). Posttraumatic growth and posttraumatic stress among military medical personnel. *Psychological Trauma: Theory, Research, Practice, and Policy*, 3 1-7. Advance online publication. doi:10.1037/a0022949

This study separately examined the relationships that combat and healthcare-related stress exposure each have with posttraumatic growth (PTG) and posttraumatic stress disorder (PTSD) symptom severity. Using a sample of 253 Air Force medical personnel recently redeployed from Iraq, we found that both types of war zone stress exposure were uniquely associated with increased PTSD symptomatology; however, while combat-related exposure demonstrated a positive, linear (i.e., standard dose-response) relationship with PTSD symptom severity, the relationship between healthcare-related stress and PTSD was curvilinear (i.e. U-shaped) in nature. In addition, both forms of stress exposure showed an inverted U-shaped relationship with PTG.

McNally, R. J., Hatch, J. P., Cedillos, E. M., Luethcke, C. A., Baker, M. T., Peterson, A. L., & Litz, B. T. (2011). Does the repressor coping style predict lower posttraumatic stress symptoms? *Military Medicine*, 176, 752-756.

We tested whether a continuous measure of repressor coping style predicted lower posttraumatic stress disorder (PTSD) symptoms in 122 healthcare professionals serving in Operation Iraqi Freedom. Zero-order correlational analyses indicated that pre-deployment repressor coping scores negatively predicted post-deployment PTSD symptoms, whereas pre-deployment CD-RISC scores did not. However, pre-deployment trait anxiety was chiefly responsible for the association between repressor coping and PTSD symptom severity. Four percent of the subjects qualified for a probable PTSD diagnosis. Although service members with relatively higher PTSD scores had lower repressor coping scores than did the other subjects, their level of pre-deployment anxiety was chiefly responsible for this relationship. Knowing someone's pre-deployment level of trait anxiety permits better prediction of PTSD symptoms among trauma-exposed service members than does knowing his or her level of repressive coping.

Summary of Data Collection

A total of 3268 surveys were collected and entered into a statistical database. Study participants were given surveys to complete at five separate time points (pre-deployment, mid-deployment, 1-, 6-, and 12- month follow-up). Table 1 describes the distribution of surveys across different time points. As anticipated, there was a decline in participation rates across time of survey administration. This is partly a function of ongoing data collection, as not all respondents have yet reached the final data collection points. The decline in participants across time is also a function of the common problems associated with longitudinal data collection, such as difficulty locating respondents, changes in survey administration procedures and locations across time, and personal variables that prevent surveys completion.

Table 1. Number of collected surveys per time period (T1= pre-deployment, T2 = mid-deployment, T3= 1 month follow-up, T4= 6 month follow-up, T5= 12 month follow-up). Summary of Surveys Entered

Summary of Surveys Entered	
Total # of Surveys Entered	3268
# of Surveys Entered at T1	1248
# of Surveys Entered at T2	1161
# of Surveys Entered at T3	390
# of Surveys Entered at T4	275
# of Surveys Entered at T5	194

The demographics for the participants are included in Table 2. The participants included an almost equal number of males (52%) and females (48%) and a good distribution of both officers (40%) and enlisted (60%). The largest percentage of participants (44%) were in the middle enlisted ranks between E-4 to E-6, and a large percentage of both officers and enlisted (40%) had less than 5 years total military time in service. There was a good representation of

minority participants (35%) including African American (14%), Hispanic (15%), and Asian (6%). There was a fairly equal age range of participants between 18-44 years of age, with almost half of the participants (46%) reporting they were between the ages of 18-29. The majority of participants were married (60%) with at least some college education (90%). Almost half of the participants (46%) had a college degree.

A number of initial surveys did not have a response for the participant’s gender. It is believed that this was primarily because earlier versions of the surveys included the gender item in a location that was overlooked during the completion of the surveys. It was subsequently changed with significantly increased completion rates of the gender item.

Table 2. Demographics of survey participants

Demographics	Percentage
Gender*	
Male	51.9%
Female	48.1%
Military Pay Grade	
E-1 to E-3	10.0%
E-4 to E-6	44.3%
E-7 to E-9	6.1%
O-1 to O-3	21.3%
O-4 to O-6	18.3%
Time in Service	
0-5 years	40.2%
6-10 years	22.2%
11-15 years	15.2%
16-20 years	14.6%
21-25 years	5.8%
25-30 years	1.8%
30+ years	0.2%
Age	
18-24 years	23.5%
25-29 years	22.2%
30-34 years	16.9%
35-39 years	16.2%
40-44 years	12.0%
45-49 years	6.3%
50-54 years	2.3%
55-59 years	0.7%
60-64 years	0.1%
65+ years	0%
Race/Ethnicity	
White	57.5%
African American	13.7%

Hispanic	15.3%
Asian	5.7%
Other	6.4%
Not Indicated	1.4%
Marital Status	
Married	59.8%
Engaged	2.8%
Single	24.8%
Divorced	9.6%
Separated	2.4%
Other	0.6%
Highest Education	
Some High School	0.4%
GED	0.1%
High School Diploma	10.1%
Some College	31.3%
Associates Degree	11.9%
4-year College Degree	21.5%
Masters Degree	11.8%
Doctoral Degree	12.9%

* Gender percentages based on the number of participants actually reporting their gender

One of the most noteworthy findings of our project was the large percentage of participants who reported that they were exposed to combat or medical trauma during their deployment. A number of previous studies have used the Combat Experiences Scale (Hoge et al., 2004, 2008; Vogt et al., 2008; Wilk et al., 2010) Table 3 summarizes the percentage of participants who indicated that they had been exposed to a variety of potentially traumatic combat events and that these events had an impact on them. These percentages are considerably less than those reported by combat infantry personnel (Hoge et al., 2004). The most commonly reported events are shaded in Table 3 and involved exposure to dead bodies and exposure to traumatized civilians, especially females and children.

Table 3. Percentage of survey participants who report experiencing and being impacted by combat exposure incidents as reported during one-month follow-up.

Incident	Percent who experienced and were impacted by
Being in an accident	7.5
Being attacked / ambushed	35.0
Seeing physical devastation	63.3
Being shot at	27.2
Seeing dead bodies	69.1
Handling dead bodies	45.0

Witnessing a serious accident	13.3
Witnessing hostility	10.0
Seeing dead Americans	82.9
Knowing someone seriously injured / killed	24.2
Having to help remove UXOs	5.6
Riding in areas with land mines	3.5
Receiving hostile reactions from civilians	27.2
Disarming civilians	4.0
Having contact with traumatized civilians	57.2
Witnessing hostility over property	4.0
Shooting at the enemy	0.8
Seeing children / mothers who were victims of war	81.5
Managing civilians in chaotic conditions	11.7

Table 4 summarizes the results of exposure to unique healthcare stressors seen at the AFTH at Balad. The most noteworthy observation is that the majority of the participants reported high levels of exposure to severely injured medical patients on 17 out of the 21 items.

Table 4. Percentage of survey participants who report experiencing and being impacted by medical-related exposure incidents as reported during one-month follow-up.

Incident	Percent who experienced and were impacted by
Exposure to patient who lost an arm	73.5
Exposure to patient who lost a leg	76.6
Exposure to a paralyzed patient	60.3
Exposure to a patient screaming in pain / fear	71.8
Exposure to a patient with facial tissue injury	75.4
Exposure to a patient with severe eye injury	67.5
Exposure to a patient with traumatic head injury	76.7
Exposure to a patient about to die	70.6
Exposure to a patient who lost a buddy	75.8
Exposure to a patient with severe burns	76.8
Exposure to a patient with gaping wounds	68.6
Exposure to a wounded female patient	64.9
Exposure to a wounded male patient	68.5
Exposure to patients who couldn't be stabilized	48.3
Exposure to a patient who had no hope	59.3
Never knowing how things turned out with a patient	61.0
Didn't know how to help a patient	37.9
Asked to perform duties one didn't receive training in	31.0
Exposure to women / children who were victims of war	76.4
Exposure to dead bodies	62.0
Exposure to body parts	52.0

Overall estimates of PTSD prevalence were assessed through PCL-M scores. The percentage of survey participants who report significant PTSD symptoms (a sum score of 50 or greater) are included in Table 5.

Table 5. Percentage of survey participants who reported significant symptoms of PTSD on the PCL-M.

Assessment Time	Percentage with Significant PTSD Symptoms (PCL-M > 50)
Pre-deployment	2.2%
Mid-deployment	5.1%
1-month post-deployment	6.9%
6-month post-deployment	3.0%
12-month post-deployment	3.8%

This data is consistent with data collected through the Post Deployment Health Assessment program using a 4-item PTSD screener (Martin, 2007). In the current study, PTSD symptom severity as measured by the PCL-M was significantly correlated with combat exposure [$r = .365, p < .01$ (mid-deployment); $r = .404, p < .01$ (1 month follow-up); $r = .372, p < .01$ (6 month follow-up)]. PTSD symptom severity was also significantly correlated with healthcare stressors exposure [$r = .494, p < .01$ (mid-deployment); $r = .494, p < .01$ (1 month follow-up); $r = .534, p < .01$ (6 month follow-up)].

In addition to the survey questionnaire portion of this study, we conducted focus group discussions with medical personnel previously deployed to the AFTH at Balad. A more detailed report of the results of the focus groups was provided in the Focus Groups White paper dated 6 June 2011. The goal of the focus groups was to identify risk and resilience factors related to (1) deployment readiness prior to deployment, (2) challenges in providing equivalent levels of medical care for all patient groups (e.g. injured American military personnel, Iraqi civilians, insurgents), (3) personal stress management and resilience during deployment, (4) personal difficulties during deployment, (5) perceived risk in fellow deployed members, and (6) ways in which to improve the deployment experience.

It was anticipated that the information collected from the focus groups would include factors related to risk and resiliency that are different from those that had been conceptualized by our investigators and that were assessed with our current survey measures. The focus groups allowed individuals who had returned from a deployment to tell us what factors they believed were related to psychological risk and resiliency for them and for others. Focus groups targeted a variety of previously deployed medical personnel including nurses, technicians, physicians, administrative staff, and other medical personnel, which provided a broad range of information regarding the unique deployment stressors faced by military medical personnel. Twelve focus groups were conducted with a total of 28 participants.

Military medical personnel assigned to a medical treatment facility in San Antonio who had previously deployed to the 332nd Expeditionary Medical Group at Joint Base Balad were invited to participate in focus groups. Individual focus interviews were offered to individuals who were unable to attend at scheduled focus group times because of limitations with their work schedule. We interviewed all eligible medical personnel who desired to participate in the study.

The majority of the focus groups were led by investigators who had previously deployed to Balad from Wilford Hall Medical Center (Dr. Peterson, Dr. Baker, and Mr. Belinfante). This provided additional credibility in moderating the focus groups and a better understanding of the many unique deployment-related acronyms and terms. Each group was led by two moderators. One moderator was primarily responsible for facilitating the group.

The other moderator was primarily to take notes and pay special attention to themes, specific quotations, emotions, and behaviors. Focus group contained one to four participants to ensure comfort, adequate discussion, and information gathering, as proposed by Kitzinger (1995).

The goal of the moderators was to create a comfortable and open atmosphere. Rules for communication such as encouraging all to participate, the importance of respecting the responses of others, and the need to protect the confidentiality of the participants were shared prior to beginning each focus group or focus interview. The moderators served to guide the group rather than dominating the group with questions. Participants were encouraged to talk among themselves and to amplify and build on comments made by other focus group members (Kitzinger, 1995). This resulted in a more comprehensive discussion regarding the attitudes and beliefs of American military medical personnel who assess, treat, and care for Iraqi patients. If indicated, probing questions such as “Could you tell me more about this?” or “Have others of you had a similar thoughts or feelings?” were used to solicit clarification, examples, or further description. If participants disagreed with one another, the researchers encouraged participants to share their views and clarify why they thought the way they did (Kitzinger, 1995). Each focus group lasted 60-90 minutes and the focus group discussion was audio taped. Table 6 shows the demographics of the participants according to their military grade, gender, age, ethnicity, and level of education. The majority of participants were officers in the 35-44 age range.

Table 6. Demographics of Focus Groups

Demographics	Total
Gender	
Female	15
Male	12
Age	
25-34	8
35-44	12
45-54	6
55-64+	2
Race/Ethnicity	
White/Caucasian	22
Hispanic/Latino	5
Black/African American	1
Military Pay Grade	
E-4 - E-9	11
O-1 - O-3	17
Education Obtained	
Some College	3
Associates Degree	4
Bachelors Degree	7
Masters Degree	8
Doctoral Degree	5

One of the most common recommendations from the focus groups was that there should be more pre-deployment cultural awareness training. Many participants indicated that when they arrived at Balad they did not have a good understanding of the Iraqi culture in general or of culturally relevant medical information. One interesting suggestion was to have the currently deployed medical group prepare a videotape introductory overview of the deployed location for

the incoming medical group. This videotape could be very up-to-date and could be viewed during the pre-deployment commander's briefing prior to deployment. Another recommendation was to improve the flow of specific job-related information from individuals who are currently deployed or have previously deployed to individuals preparing to deploy. Although this process often occurs with more senior officers and NCOs who work in specialty areas, many lower ranking individuals indicated there is little transfer of important information prior to deployment. Some focus group members indicated they were not prepared for exposure to a high number of completed suicides in U.S. military personnel processed through the Balad hospital. Focus group members indicated this exposure was quite distressing, especially considering that the majority of the suicides were self-inflicted gunshot wounds.

Another common recommendation was that there should be a careful screening and selection process for individuals serving in key leadership positions. This recommendation is consistent with one of our recently published manuscripts which indicated that strong leadership and unit cohesion were important protective factors to minimize the impact of medical trauma exposure during deployments (Dickstein et al., 2010, *Military Medicine*). Finally, one recommendation was to improve the work-site re-integration process after returning from a deployment. Many individuals indicated that they returned from a deployment to find out that their job responsibilities had changed, new unit policies had been implemented, and in some instances individuals indicated that they had been "replaced" while they were deployed and did not have a job when they first returned. Individuals indicated there should be more formal policies implemented to help streamline the re-integration process to allow them to get familiarized with their new duties, positions, or responsibilities.

It should be noted that some of the comments and recommendations by focus group members are likely to be related to isolated incidents and experiences of individuals and probably do not reflect the general experience of the majority of deployers. For example, one focus group member recommended that "Deployers should get a proper farewell and homecoming." Providing for a meaningful farewell and departure is likely to be a standard goal for individuals in leadership positions who support our deployers. In addition, significant differences likely occurred across the deployment cycle for many of the cohorts who have deployed between 2004-2011. Some comments may be related to events that occurred during specific deployments (e.g., Battle of Fallujah in 2004, the "surge" during the summer of 2007, and "responsible withdrawal" during 2011).

Obstacles and Challenges Experienced with the Project

Overall, our project received outstanding support from Wilford Hall Medical Center, the 33e EMDG, and our collaborating active-duty investigators. Nonetheless, we did experience a number of obstacles and challenges during the project. One challenge was the limited number of surveys returned at the 6- and 12-month post-deployment points. We believe this was primarily because individuals were very busy with their work and personal lives after returning from deployment and probably didn't feel they had time to complete one more survey. Because we chose to conduct our survey anonymously, we were not able to track individual participants who had not completed post-deployment surveys so that we could send them an additional request or reminder to complete the surveys. Previous research in civilian settings has shown significant increases in survey return rates by providing a small incentive (e.g., a \$2 bill) with the surveys. We had thought that providing a similar incentive, such as a military coin, would increase post-deployment completion rates. Unfortunately, Air Force budget guidelines for this project specifically forbid the use of any funds for participant incentives.

In an effort to increase participation in survey completions an Institutional Review Board (IRB) amendment was submitted on 22 June 2009 to include a letter of support from Maj Gen Travis, the Wilford Hall Medical Center Commander. A separate letter was prepared for the pre-, mid-, and post-deployment points to

highlight the importance of the study and to encourage participation in the study. Although IRB approval had been obtained for the use of these letters, Maj Gen Travis requested a medical-legal review of the request. As part of this review, we were informed in January 2010 that we needed to request an Air Force Survey Control numbers on all the study surveys before we could continue with our data collection. As a result, all data collection was stopped and the study protocol was placed on administrative hold at the WHMC IRB.

While data collection was stopped there were three cohorts that did not receive surveys according to the pre-determined timeline. The cohorts and surveys that were delayed were Cohort 14 (post 2 survey), Cohort 15 (post 1 survey), and Cohort 16 (mid-deployment survey). In March 2010 we received approval for the Air Force Survey Control number. Subsequently, all delayed surveys were distributed and normal data collection resumed. On 12 March 2010, Dr. Peterson briefed Maj Gen Travis and his group commanders on the status of the project and to request his support and the support of his staff to encourage better participation in completing surveys and focus groups. Strong support was expressed we believe that this resulted in increased subsequent participation rates. It should be noted that the survey completion and focus group participation were voluntary and anonymous. We were careful, per research regulatory guidelines, to ensure no undue pressure was made by commanders for service members to participate in either portion of these research activities. As a result of the delays that occurred while the project was place on hold while seeking an Air Force Survey Control number, a request for a no-cost extension was submitted to USAF/SGR to extend the length of the study period. This request was approved in June 2010.

Recommendations

1. Air Force medical personnel would benefit from enhanced cultural awareness training for interacting with and treating Iraqi patients. Presumably, this recommendation also applies to medical personnel who will deploy to Afghanistan. This enhanced cultural training could occur at several time points such as annual Medical Unit Readiness Training, the Readiness Skills Verification Program, the Defense Medical Readiness Training Institute at Ft Sam Houston, just-in-time pre-deployment training, and in-theater in-service training.
2. Junior officers and lower ranking enlisted medical personnel would benefit from improved communication of specific job-related information from individuals who are currently deployed or have previously deployed to the same location. Although this process often occurs with field grade officers and NCOs who work in specialty areas, many lower ranking individuals indicated there is little transfer of important information prior to deployment.
3. Air Force medical personnel should be prepared for possible exposure to completed suicides in U.S. military personnel. Focus group members indicated this exposure was quite distressing, especially considering that the majority of the suicides were self-inflicted gunshot wounds.
4. It is recommended that a careful screening and selection process be implemented for individuals serving as commanders and for other key leadership positions in deployed locations. Feedback from surveys and the focus groups indicated that there were many outstanding commanders, but there were also a few who were ineffective and poor role models. It was believed by many deployers that some individuals were selected for command positions because it would help them get promoted or be good for their career, rather than because they had the key leadership skills needed to lead a deployed medical unit. This recommendation is also supported by the results of our current project that found that unit cohesion and leadership were significant protective factors which enhanced resiliency.
5. The post-deployment individual work-site re-integration process should be improved. This is particularly important for Air Force medical personnel because many deploy as individual augmentees, rather than as a medical team deployed together from one location. More formal policies should be implemented to help streamline the re-integration process to allow returning medical personnel to re-integrate and get familiarized with their new duties, positions, or responsibilities.
6. The Air Force would benefit from the development and evaluation of a pre-deployment stress inoculation intervention for targeted high-risk groups such as pharmacy, laboratory, and patient administration. Our research indicated that these and a number of other allied health and medical support specialties that do not ordinarily interact with trauma patients are not adequately prepared for this type of exposure during deployments. These interventions

might include approaches such as graduated exposure to severe medical trauma cases (e.g., photos, videos, medical rounds, etc.) as part of pre-deployment training.

7. The Air Force would benefit from the development and evaluation of a brief, minimal-contact, web-based program for the treatment of partial PTSD (individuals who do not meet PTSD diagnostic criteria but have some PTSD symptoms that are impacting functioning) after returning from a deployment to a combat theater hospital.

Summary and Conclusions

The Risk and Resilience in Deployed Air Force Medical Personnel project is the first prospective evaluation of the impact on military medical personnel of working in a combat trauma hospital in a deployed location. Better understanding of these factors will help in the design of future education, training, prevention, and treatment programs to improve the performance and resilience of military medical personnel who are deployed to combat locations.

Overall, we believe that our project has been very successful. We have achieved all proposed research aims and goals. Our project has helped determine many key factors related to psychological risk and resiliency in military medical personnel deployed to serve at a combat trauma hospital in Iraq. The project has resulted in 19 presentations at scientific conferences, 4 scientific publications, and 3 manuscripts which are currently under review. We are continuing with our data analysis and anticipate publishing approximately 10 additional manuscripts from this project.

One of the primary findings of project is that the majority of deployed military medical personnel report a high level of exposure to severely injured medical patients and that this exposure has an impact on them. Exposure to these unique medical stressors is significantly correlated with symptoms of PTSD. Overall, between 3-6% of Air Force medical personnel who return from a deployment to Balad report significant PTSD symptoms during the first 12 months after returning. The primary manuscript from this data analysis is currently in preparation for submission for publication in the Journal of the American Medical Association.

The short- and long-term cost of healthcare trauma exposure may be significant in terms of potential decreased productivity, medical errors, decisions to separate from active duty after a difficult deployment, and medical discharges for deployment-related mental health conditions. The discharge of one active-duty military medic for a deployment-related mental health disorder such as PTSD can easily cost over \$500,000 in terms of medical disability, medical care, and costs to train a replacement.

The voluntary and anonymous completion of surveys for the current project does not allow us to specifically determine the number of military medical personnel who have deployed to the AFTH at Balad who have subsequently developed PTSD. Separate from this project, Dr. Peterson has successfully treated and provided clinical supervision and consultation to many Air Force medical personnel who developed PTSD as a result of their work at Balad. In addition, Dr. Peterson is the Director of the DoD-funded STRONG STAR Multidisciplinary PTSD Research Consortium (see www.strongstar.org). STRONG STAR (South Texas Research Organizational Network Guiding Studies on Trauma And Resiliency) is headquartered at the University of Texas Health Science Center at San Antonio and includes over 100 civilian and military investigators and 20 institutions located in Texas and across the nation. The primary goal of STRONG STAR is to develop and evaluate the most effective programs possible for the prevention and treatment of combat-related PTSD in active duty military and recently discharged OIF/OEF veterans. Indeed, we believe that combat-related PTSD can be treated into remission in many, if not most, cases and our Consortium clinical trials are currently ongoing to determine

the efficacy of these treatment programs. Two of the world's leading PTSD clinical researchers (Edna Foa, developer of Prolonged Exposure Therapy and Patricia Resick, developer of Cognitive Processing Therapy) are STRONG STAR Principal Investigators. A number of clinical trials are currently underway in San Antonio that would be appropriate for Air Force medical personnel who have developed PTSD as a result of their deployment to Balad.

During recent pre-deployment surveys at Wilford Hall Medical Center, it has been noted that there has been a significant decrease in the number of active-duty Air Force medical personnel who are deploying to the Air Force Theater Hospital at Balad. Many of these positions are now being filled by reservists, and an increasing number of active-duty Air Force medical personnel from Wilford Hall and other locations are deploying to the Craig Joint Theater Hospital at Bagram Air Base in Afghanistan. Upon the completion of the present study, we believe that it is important to consider the initiation of a similar study of risk and resiliency in military medical personnel deployed to the Craig Joint Theater Hospital at Bagram. Deployment to Iraq and Afghanistan involve a number of uniquely different factors related to both risk and resiliency in Air Force medical personnel. An investigation of medical personnel deployed to Afghanistan would likely provide additional information to better understand risk and resiliency that can be used for future medical readiness training and resiliency enhancement.

Respectfully Submitted,



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2 Attachments

1. References Cited
2. Study Scientific Publications and Presentations

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2005 Study Publications and Presentations

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- Turcotte, D. M., Peterson, A. L., Dremsa, T. L., Garb, H. N., McNally, R. J., Maguen, S., & Litz, B. T. (2005, November). *The relationship between resilience, exposure to healthcare stressors in the war-zone in Iraq, and mental health*. Paper presented at the 39th Annual Association for Advancement of Behavior Therapy Convention, Washington, D.C.

Risk and Resilience Factors Prior to Deployment to Iraq

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Paper presented at the 39th Annual Association for Advancement of Behavior Therapy Convention, November, 2005, Washington, D.C.

Military members preparing for deployment face multiple stressors, ranging from personal to professional, and previous studies demonstrate high rates of exposure to stress and prior traumatic events preceding deployment (e.g., Bolton et al., 2001). In addition to assessing current stressors and prior trauma at pre-deployment, it is important to understand resilience factors, whether dispositional or situational, that may act as protective mechanisms, and any comprehensive conceptualization should take both risk and resilience variables into account when assessing mental health outcome (e.g., King, Vogt, King, 2004).

In this preliminary study, we examined the risk and resilience factors that would best predict pre-deployment PTSD symptoms (Posttraumatic Stress Disorder Checklist, PCL, Weathers, Huska, & Keane, 1991) and depression symptoms (Patient Health Questionnaire, PHQ-9, Kroenke, Spitzer, & Williams, 2001) in Air Force medical personnel preparing for deployment to Iraq (n = 214). The *risk factors* we examined were trauma history (Life Events Checklist, LEC, Gray et al., 2004) and current stressors/adversities (CS, Litz et al., 1997), and the *resilience factors* we examined were positive military experiences (General Military Experiences, Litz et al., 1997), and trait resilience (Connor-Davidson Resilience Scale, CD-RISC, Connor & Davidson, 2003).

We conducted two multiple regression analyses, predicting PTSD and depression symptoms separately. We entered the LEC and CS (risk factors), followed by GME and trait resilience (resilience factors). The model predicting PTSD symptoms accounted for 12% of the variance, $F(4,126) = 4.11$. Both prior traumatic events ($B = .26, p < .01$) and current stressors ($B = .18, p < .05$) significantly predicted PTSD symptoms, indicating that risk factors may be more predictive of PTSD symptoms pre-deployment. In the model predicting depression symptoms pre-deployment, prior traumatic events ($B = .21, p < .05$) and trait resilience ($B = -.29, p < .01$) were significant predictors, and the model accounted for 14% of the variance in depression symptoms, $F(4,127) = 5.19$.

While risk factors may be more helpful in predicting PTSD symptoms that stems from life-course trauma and current stressors, resilience factors seem to play a protective role and are negatively associated with symptoms of depression. The limitations and implications of this research will be discussed.

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The Relationship between Resilience, Exposure to Healthcare Stressors in the War-Zone in Iraq, and Mental Health

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Paper presented at the 39th Annual Association for Advancement of Behavior Therapy Convention, November, 2005, Washington, D.C.

Healthcare workers in the war-zone in Iraq may face the dual burden of risk of exposure to combat and terrorist acts and the stress and strain of caring for severely injured service members and civilians. Exposure to war-zone stressors in Iraq is associated with risk for depression, anxiety, and PTSD (Hoge et al., 2004), and exposure to severe human suffering and death is a robust risk indicator for PTSD (Jones, 1985; Sutker et al., 1994). Although most individuals exposed to the threats and adversities in a war-zone either recover effectively or maintain resilience, a salient minority develop chronic posttraumatic distress and impairment. It is important to study the determinants of both risk and resilience in order to generate meaningful and innovative primary and secondary prevention strategies.

In this preliminary prospective study, we examined the association between PTSD (Posttraumatic Stress Disorder Checklist, PCL, Weathers, Litz, Huska, & Keane, 1991), depression (Patient Health Questionnaire, PHQ-9, Kroenke, Spitzer, & Williams, 2001), negative affect (Positive and Negative Affect Scales, PANAS, Watson, Clark, & Tellegen, 1988), healthcare stressor exposure (HSE; a scale rationally derived for this study), combat exposure (Combat Experiences Survey, Hoge et al., 2004), positive military experiences (General Military Experiences, Litz et al., 1997), and resilience (Connor-Davidson Resilience Scale, CD-RISC, Connor & Davidson, 2003) in Air Force medical personnel deployed to the Iraq War. Data were collected pre-deployment and three months into the deployment to Iraq. These service members will be followed post-deployment, and we will include those data subsequently.

Resilience was positively correlated with positive military experiences pre-deployment ($r = .30$, $p < .01$, $n = 77$) and mid-deployment ($r = .43$, $p < .05$, $n = 25$). Resilience also was negatively correlated with depression symptoms mid-deployment ($r = -.42$, $p < .05$, $n = 25$), negative affect pre-deployment ($r = -.34$, $p < .01$, $n = 76$), and negative affect mid-deployment ($r = -.39$, $p < .05$, $n = 25$). HSE was positively correlated with depression mid-deployment ($r = .42$, $p < .05$, $n = 26$); HSE and PTSD were marginally associated at mid-deployment ($r = .34$, $p = .09$, $n = 26$), and combat exposure was not associated with PTSD symptoms at mid-deployment ($r = .08$, $p = .71$, $n = 26$).

We partialled out the variance due to resilience and found that combat exposure was not associated with depression or PTSD; however, depression symptoms at mid-deployment remained correlated with HSE ($r = .45$, $p < .05$, $n = 21$). These preliminary results suggest that the acute strain produced by *ongoing* HSE in the war-zone is likely to be manifest as symptoms of depression, rather than PTSD. The results also suggest that resilience factors may not play a role in mitigating the acute strain of HSE or combat experiences *in the war-zone*. We will report the post-deployment data to determine if these relationships endure. The limitations and implications of the research will also be discussed.

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2006 Study Publications and Presentations

- Gentes, E., Papa, A., Peterson, A. L., Garb, H., McNally, R. & Litz, B (2006). *Unit cohesion buffers the impact of stress on PTSD in military personnel deployed to Iraq*. Poster presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, Hollywood, CA.
- Hebenstreit, C., Turcotte, D., Papa, A., Peterson, A. L., McNally, R. & Litz, B (2006). *Attitudes about military service in military personnel deployed to Iraq: A longitudinal study*. Poster session presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, Hollywood, CA.
- Turcotte, D., Papa, A., Peterson, A. L., Garb, H., McNally, R. & Litz, B (2006). *Effects of smoking on PTSD, stress, and negative affect in medical personnel deployed to Iraq*. Poster session presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, Hollywood, CA.

Unit Cohesion Buffers the Impact of Stress on PTSD in Military Personnel Deployed to Iraq

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Poster presented at the 22nd Annual International Society for
Traumatic Stress Studies Meeting, November 2006, Hollywood, CA.

Life events, such as relationship difficulties or health problems, may have an impact on adjustment of military personnel while deployed (Slusarcick, Ursano, Fullerton, & Dinneen, 1999). However, unit cohesion (e.g., how much one feels they “belong” in their unit) may buffer the relationship between life events and adjustment (Solomon & Mikulincer, 1990). We examined the ability of unit cohesion to buffer the relationship between life stressors and PTSD symptoms in 107 military medical personnel deployed in Iraq. We ran four regression models assessing the interaction of life stressors and unit cohesion on total PTSD symptoms and the three PTSD symptom clusters while controlling for combat exposure and pre-deployment PTSD symptoms. All models were significant. Unit cohesion interacted with life stressors to buffer the relationship between stress and total PTSD symptoms ($\beta = -1.0$, $p < .01$), re-experiencing symptoms ($\beta = -1.4$, $p < .01$), and avoidance symptoms ($\beta = .84$, $p < .01$), but not hyperarousal symptoms ($\beta = -.45$, $p = .14$). In each case, higher levels of cohesion while experiencing increased life stressors was associated with less PTSD symptoms, while less cohesion while experiencing increased life stressors was associated with increased PTSD symptoms. Implications of the research will be discussed.

Attitudes about Military Service in Military Personnel Deployed to Iraq: A Longitudinal Study

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Poster presented at the 22nd Annual International Society for Traumatic Stress Studies Meeting, November 2006, Hollywood, CA.

Traumatic experiences during deployment can have a profound impact on military medical personnel. We examined the extent to which age, race, gender, and PTSD affected the attitudes military personnel have towards the validity and efficacy of the operation in Iraq. Demographic information and PTSD symptoms were measured in 473 military medical personnel from Wilford Hall Medical Center and MacDill AFB Clinic before, during, and after their deployment to Iraq. We ran three regression models assessing the interaction of age, race, gender, and PTSD symptomatology on a measure of attitudes and beliefs about the roles of military missions and training for each time point assessed. We found that increases in age predicted increased positive attitudes about the mission in Iraq at pre- ($\beta = .20, p < .05$) and post-deployment ($\beta = .33, p < .05$). A significant relationship between higher reporting of PTSD symptoms and negative attitudes about the military was observed at pre- ($\beta = -.16, p < .05$) and mid-deployment ($\beta = -.47, p < .05$). Male gender was associated with more positive attitudes towards the military at mid-deployment ($\beta = .25, p < .05$).

Effects of Smoking on PTSD, Stress, and Negative Affect in Medical Personnel Deployed to Iraq

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Smoking is co-morbid with PTSD (Beckham, 1997). It is hypothesized that individuals smoke as a coping response to stress and negative affect characteristic of PTSD (Beckham, 1995; Beckham, 2005). In this study, we examined the relationship between PTSD, stress, negative affect, and the interaction of negative affect and stress on smoking behaviors in 424 military medical personnel prior to their deployment to Iraq. Consistent with previous research, smokers were found to have more PTSD symptoms, $t(336) = -2.54, p < .05$, stress, $t(328) = -3.25, p < .01$, and negative affect, $t(327) = -2.28, p < .05$, than non-smokers. Hierarchical logistic regression analysis controlling for PTSD symptoms was used to test if negative affect and stress interacted to predict smoking behaviors. The model was significant, $(3, 424) = 10.30, p < .05$. Increased probability of smoking behaviors were predicted by increased negative affect ($\beta = 4.66, p < .05$) and increased stress ($\beta = 3.47, p < .05$). The interaction of negative affect and stress ($\beta = 0.57, p = .055$) was marginally significant indicating that under low stress conditions, high negative affectivity predicts increased probability of smoking while under high stress the opposite was seen. The limitations and implications of the research will be discussed.

2008 Study Publications and Presentations

- Benson, T., Conoscenti, L. M., Peterson, A., Litz, B. T., McNally, R. J., & Dickstein, B. (2008, November). *Trauma exposure and PTSD in military medical personnel*. Presentation given at the Annual Meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Cedillos, E.M., Luethcke, C., Benson, T. A., Conoscenti, L. M., Litz, B. T., McNally, R. J., ... Peterson, A. (2008, November). *Assessment and treatment of Iraqi trauma patients: Attitudes and beliefs of military medical personnel*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Conoscenti, L. M., & Benson, T. (2008, August). *The impact of trauma exposure on deployed military medical personnel*. Invited presentation given at the Annual San Antonio Trauma Symposium, San Antonio, TX.
- Dickstein, B.D., Conoscenti, L. M., Litz, B. T., Baker, M., & Peterson, A. (2008, May). *Military unit cohesion and life stress as predictors of PTSD: A mediated model*. Poster session presented at the annual meeting of the Association for Psychological Science, Chicago, IL.
- Dickstein, B.D., Conoscenti, L., Litz, B., & Peterson, A. (2008, November). *The impact of military unit cohesion on PTSD symptom severity across varying levels of war zone stress exposure*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Luethcke, C. A., Cedillos, E. M., Benson, T., Conoscenti, L. M., Litz, B. T., McNally, R. J., ... Peterson, A. (2008, November). *U.S. military medics in Iraq: Prevalence and impact of healthcare trauma exposure*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Maguen, S., Turcotte, D. M., Peterson, A. L., Dremsa, T. L., Garb, H. N., McNally, R. J., & Litz, B. T. (2008). Military medical personnel: Risk and resilience factors prior to deployment to Iraq. *Military Medicine*, 173 (1), 1-9.
- McLean, C. P., Dickstein, B., Conoscenti, L. M., Benson, T., Litz, B. T., & Peterson, A. (2008, November). *Posttraumatic growth among military medical personnel*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, Orlando, FL.
- Peterson, A. L. (2008, July). *Risk and resiliency in medical personnel exposed to disaster trauma*. Invited Address at the 2nd Annual Continental Divide Disaster Behavior Health Conference, Colorado Springs, CO.

Trauma Exposure and PTSD in Military Medical Personnel

Trisha A. Benson, M.A., University of Texas Health Science Center at San Antonio, Lauren M. Conoscenti, Ph.D., VA Boston Healthcare System, Alan Peterson, Ph.D., University of Texas Health Science Center at San Antonio, Brett T. Litz, Ph.D., VA Boston Healthcare System, Richard J. McNally, Ph.D., Harvard University, & Ben Dickstein, B.A., Boston University

Military medical personnel face the “dual burden” of performing a highly stressful job while at risk for being harmed themselves. Medical personnel are responsible for working with combat casualties and human remains, including providing direct medical care to combat casualties in a hostile area, grave’s registration, or body handling and identification in an armed forces mortuary. At the same time, they are subject to the same risks as combat personnel, such as being fired at or taken hostage. Currently, there are minimal data examining the kinds of stressors military medical personnel face while working in a war zone or the psychological impact on medical personnel who work in these high stress/high risk environments.

We conducted a prospective evaluation of trauma exposure and psychological symptomatology in medical personnel deployed to work in a combat trauma hospital in Iraq. Cohorts of military medical personnel completed surveys at pre-deployment (N = 794), mid-deployment (N = 417), at 1 month post-deployment (N = 234) and at 6 months post-deployment (N = 88). As cohorts continue to return from Iraq, we expect the number of post-deployment surveys to increase.

Preliminary analyses indicate that medical personnel are exposed to a range of potentially traumatic experiences during their deployments. At the first post-deployment survey, approximately 40% reported being attacked or ambushed, 31% reported being shot at, and 18% reported being in accidents while deployed. Within their medical responsibilities, approximately 87% had exposure to patients who lost an arm as a result of their combat injuries, 90% had exposure to patients who lost a leg, 75% to patients with varying degrees of paralysis, and 90% to patients with traumatic head injuries. Additionally, nearly 96% had exposure to dead bodies during their deployment.

At pre-deployment, 2.2% of medical personnel met DSM-IV criteria for PTSD as measured by the PCL; at mid-deployment, 7% met criteria. At the first and second post-deployment measures, 9.7% and 7.8% met criteria, respectively. Additionally, 2.7% of medical personnel reported current major depression at pre-deployment; 5.6% reported current depression at mid-deployment, 3.8% at 1 month post-deployment, and 13.6% at 6 months post-deployment.

In conclusion, results show that military medical personnel endure the “dual burden” of occupational traumas and combat threats. As a result, many experience mental health problems during and after their deployment, including PTSD and major depression.

Assessment and Treatment of Iraqi Trauma Patients:
Attitudes and Beliefs of Military Medical Personnel

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Military medical personnel are often asked to provide health care services in dangerous locations and under extreme circumstances. Another common stressor in Iraq is exposure to working with Iraqi patients. Most personnel will have little or no prior experience in evaluating, treating, or having other contact with Iraqi patients. Military personnel typically view deployment as a rewarding and patriotic opportunity to treat U.S. military patients. The reality of the deployment setting is that frequently the majority of care provided is for non-U.S. patients. These patients will include Iraqi civilians (including women and children), Iraqi National Guard, Iraqi Police, and Iraqi insurgents (prisoners of war). Interactions with the Iraqi patients are often very strained and stressful because of difficulties with the language barrier, differences in gender expectations between Americans and Iraqis, and ethnic/cultural differences. Furthermore, mass casualty situations present circumstances in which all patients—including U.S. military, Iraqi military, and Iraqi civilians—must be triaged according to the Geneva Convention guidelines. Although all U.S. medical personnel are trained in and understand the Geneva Convention guidelines on the treatment of patients in a war-zone environment, the real-world impact of this guideline is not apparent until one is faced with it. The present study is the first report of the attitudes and beliefs of U.S. military medical personnel involved in the assessment and treatment of Iraqi medical trauma patients.

Military medical personnel ($n = 430$) deployed to work at the Air Force Theater Hospital at Balad Air Base in Iraq volunteered to anonymously complete the Attitudes and Beliefs About Iraqi Patients Questionnaire at the mid-point of their deployment period. This questionnaire was specifically developed as part of a battery of questionnaires designed to examine variables related to increased risk for the development of PTSD and protective factors related to resilience in a military medical personnel population. The Attitudes and Beliefs about Iraqi Patients Questionnaire includes nine items derived from interviews with and feedback from military medical personnel working at a combat support hospital in Iraq.

The results indicate that military personnel vary in their opinions regarding the preparation and training they received with regards to caring for and interacting with Iraqi patients before their deployment, with approximately 54% indicating they do not feel they received enough pre-deployment training. Additionally, a large number of personnel reported feeling uncomfortable or uneasy in their role caring for or interacting with Iraqi civilian patients (48.4%), Iraqi National Guard patients (59.3%), and Iraqi Security Internees (43.2%). Variables regarding belief in the use of U.S. military medical personnel to evaluate and treat Iraqi patients as well as reported distress regarding implementation of the Geneva Convention guidelines mandating equal priority for assessment and treatment of all patients, regardless of citizen status are also presented.

This study will allow us to evaluate the impact of work with Iraqi patients on U.S. medical personnel. Additionally, it will provide the military with valuable information regarding possibilities for improvement in training programs for military medical personnel.

The Impact of Trauma Exposure on Deployed Military Medical Personnel

Invited Address for the 14th Annual San Antonio Trauma Symposium, San Antonio, TX

Lauren Conoscenti, PhD, Trisha Benson, MA

Participating in military combat is a well acknowledged risk factor for developing PTSD. However, deployed personnel who are not active combatants may also develop PTSD symptoms. Medical personnel from Balad Air Base in Iraq have been surveyed, pre-, mid-, and post-deployment for PTSD. These surveys have confirmed that the unique traumatic experiences of these medical personnel, as well as the traumatic experiences that they share with combatants, increase the risk for the development of PTSD. This session will describe pre-deployment risk factors for PTSD in military medical providers. Additionally it will identify specific stressors which increase the risk for the development of PTSD in military medical personnel, and will outline the most common symptoms experienced by this population.

This session will describe pre-deployment risk factors, specific stressors that increase risk, and the most common symptoms of PTSD in military medical personnel.

Military Unit Cohesion and Life Stress as Predictors of PTSD: A Mediated Model

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Abstract: Unit cohesion has been shown to protect against war-zone stress. However, cohesion likely helps with a variety of concurrent stressors. We hypothesized that the association between unit cohesion and PTSD would be mediated by life stressors in military medical personnel deployed to Operation Iraqi Freedom. The results confirmed our expectations.

Supporting Summary: Unit cohesion has a salutogenic influence on PTSD symptom severity in service members exposed to deployment stressors (e.g., Whealin et al., 2007; Maguen & Litz, 2006; McTeague, McNally, & Litz, 2004). To date, researchers have not examined the role that unit cohesion plays in assisting service members manage additional life demands, such as conflict at home. Rather, it has been assumed that unit cohesion helps primarily by buffering the impact of war-zone stress. We hypothesized that the relationship between unit cohesion and PTSD symptom severity would be mediated by concurrent life stressors in forward deployed service personnel. Life stress was assessed by a rationally-derived measure comprised of items related to personal finances, health, family issues, relationship concerns, and occupational stress. More specifically, participants were asked to indicate the degree to which these stressors had caused them concern since their deployment, as opposed to whether participants simply acknowledged their existence. PTSD symptom severity was assessed using the PTSD Checklist Military Version (PCL-M; Weather, Litz, Huska, & Keane, 1991). We followed the steps described by Baron and Kenny (1986) to test for mediation, which entail a series of hierarchical regressions. We controlled for three variables known to be associated with PTSD symptomatology in forward deployed medical personnel: combat-exposure, exposure to treating patients wounded in combat, and depression. The four necessary conditions for mediation were met: (a) the predictor (unit cohesion) was significantly associated with the criterion (PTSD symptom severity; $t = -2.052, p < .05$), (b) the predictor (unit cohesion) was significantly associated with the mediator (life stress; $t = -3.619, p < .01$), (c) the criterion (PTSD symptom severity) was significantly associated with the mediator (life stress; $t = 5.041, p < .01$), and (d) once the mediator (life stress) entered into the regression equation, the relationship between the predictor (unit cohesion) and criterion (PTSD symptom severity) was significantly reduced ($t = -.698, p = .487$). Following the hierarchical regressions, a Sobel test was conducted to test whether the mediator significantly carried the influence of the predictor to the criterion. Results from this test were significant (Sobel's $t = -2.93, p < .01$). Because the relationship between predictor and criterion changed from being significant to non-significant when the mediator entered into the analysis, a fully mediated model is supported by these results. An additional analysis was conducted regressing unit cohesion onto depression rather than PTSD. For this analysis, controlled variables included: combat-exposure, exposure to treating patients wounded in combat, and PTSD symptom severity. Results from this analysis were non-significant. It appears that unit cohesion's salutogenic effect may be specific to certain disorders, rather than generalizable, among medical personnel in war-zones; however, further investigation is needed. The results of these analyses help to better elucidate the mechanism by which unit cohesion and resilience to PTSD are related, suggesting that cohesion's palliative effect is due primarily to helping service members manage concurrent demands (e.g., home-life concerns) rather than war-zone stress.

The Impact of Military Unit Cohesion on PTSD Symptom Severity across Varying Levels of War Zone Stress Exposure

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Although meta-analytic research suggests unit cohesion to have a significant positive relationship with general well-being among service members (Oliver, Harman, Hoover, Hayes, & Pandhi, 1999), the results from studies examining its potential as a protective factor against posttraumatic stress disorder (PTSD) have been mixed. For example, Fontana, Rosenheck, and Horvath (1997) found no significant relationship between unit cohesion and PTSD symptom severity in a sample of male theatre veterans taken from the National Vietnam Veterans Readjustment Study (NVVRS). In contrast, McTeague, McNally, and Litz (2004) reported a significant association between these variables in a sample of female Vietnam veteran health care providers also taken from the NVVRS.

These contradictory findings may be accounted for by Brailey, Vasterling, Proctor, Constans, and Friedman (2007), who suggest a curvilinear interaction between unit cohesion and exposure to war zone stress in predicting PTSD symptom severity. These authors base their model on work conducted by Suvak, Vogt, Savarese, King, and King (2002), who found a curvilinear association between level of stress exposure and coping in predicting quality of life, using the NVVRS database. In terms of unit cohesion, the theory is that high levels of military unit cohesion are useful as a buffer only at low to moderate levels of stress exposure; once a certain threshold is crossed, unit cohesion loses its salutogenic effect. It may be that the different findings about cohesion and PTSD can be explained by the fact that the male theatre veterans evaluated by Fontana et al. were exposed to higher levels of war zone stress compared with the female healthcare providers in the McTeague study.

Brailey and colleagues attempted to find support for their model using a sample of Army soldiers with no prior history of war zone deployment. They examined the relationship between previous life events and unit cohesion in predicting PTSD symptom severity. A curvilinear relationship was not found. The authors claimed that their results were nevertheless consistent with their hypothesis, stating, "...the levels of stressors typically associated with predeployment Army duty do not reach levels sufficiently severe as to overwhelm the positive coping function of high levels of unit cohesion" (Brailey et al., 2007, p. 500). There has been no other examination of the potential curvilinear relationship between unit cohesion and war zone stress exposure.

We examined the curvilinear function between unit cohesion and stress exposure in predicting PTSD using a sample of 414 military medical personnel deployed as part of Operation Iraqi Freedom. The sample included males and females, 28% of whom were non-white. A hierarchical regression testing for quadratic moderation failed to find evidence of a curvilinear interaction, failing to support the model. However, exposure was found to moderate the relationship between unit cohesion and PTSD in a linear fashion. The limitations and implications of these findings are discussed.

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U.S. Military Medics in Iraq:
Prevalence and Impact of Healthcare Trauma Exposure

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US military medical personnel in the theatre of operations in Iraq face two major sets of burdens or adversities: the various stressors and demands of providing care in war to civilians and service personnel and the potential exposure to serious life-threat. To date, the unique stressors associated with medical service have not been delineated. We describe the prevalence of exposure to various healthcare stressors at a military theater hospital in Iraq and its relation to PTSD symptoms. Military medical personnel ($n = 611$) deployed to the Air Force Theater Hospital at Balad Air Base in Iraq volunteered to anonymously complete the Medical Deployment Healthcare Stressor Scale and the PTSD Checklist, Military Version (PCL-M). The Medical Deployment Healthcare Stressor Scale is a rationally derived measure of 21 healthcare demands and adversities, including exposure to traumatic amputees, dead bodies, severe facial injuries, burns, etc. Most respondents reported high levels of subjective impact of healthcare stressors. For 14 out of the 21 healthcare stress items, more than 50% of participants responded that the stressor had a “moderate” or “extreme” impact. Using a cut-off score of 44 on the PCL-M, 21% of the respondents scored in the clinically significant range. Exposure to the healthcare stressors was significantly correlated with PTSD symptom severity ($r(609) = .34, p < .001$). When we divided the HCS into quintiles (i.e., 20th percentile or below, 20-40%, 40-60%, 60%-80%, above 80th percentile HCS), the rates of PCL-PTSD by quintile were 10%, 7%, 12%, 20% and 55% respectively ($\chi^2=125.8, df = 4, p < .0001$). U.S. military medical personnel are exposed to very high levels of healthcare stressors during deployments to Iraq, and this exposure is positively associated with reports of symptoms of PTSD. The study is limited in that it relies on self-report measures and did not include objective documentation of trauma exposure or a diagnostic screening for PTSD. The study is correlational so it is not possible to determine the direction of causal influence or rule out factors such as retrospective bias. Nevertheless, the study highlights the potential risk of healthcare trauma exposure during military deployment and the need for prospective studies and long-term follow-up.

MILITARY MEDICINE

ORIGINAL ARTICLES

Authors alone are responsible for opinions expressed in the contribution and for its clearance through their federal health agency, if required.

Description of Risk and Resilience Factors among Military Medical Personnel before Deployment to Iraq

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ABSTRACT Military medical personnel preparing for deployment to Iraq ($N = 328$) participated in a survey concerning predeployment risk and resilience factors. Participants reported exposure to an average of 2.5 potentially traumatic events before deployment and 76% ($n = 229$) reported at least two current concerns about predeployment stressors. Military personnel also endorsed a series of positive appraisals of the military, the mission, and their unit. Fairly low levels of post-traumatic stress disorder symptoms before deployment were reported and positive affect was significantly higher than reported negative affect. Post-traumatic stress disorder symptoms that were present before deployment were most strongly associated with risk factors, whereas positive affect was most strongly associated with resilience factors. Predeployment negative affect was associated with a combination of risk and resilience factors. These findings have implications for possible interventions and preparation of medical personnel before military deployment. A better understanding of the factors related to risk and resilience in military medical personnel will allow for improved screening, educational, training, and clinical programs aimed at increasing resilience before military deployments.

INTRODUCTION

Military medical personnel are at risk for developing psychological morbidity.¹ Among their stressful duties are providing direct, sometimes intensive, medical care to combat casualties in a hostile area (e.g., intervening simultaneously with multiple dying and disfigured individuals while experiencing personal life threat), clearing human remains from combat

zones under life-threatening conditions, being assigned to graves registration, and assisting with body handling and identification.²⁻⁴ Without an established front line, military medical personnel in Iraq are at risk of injury from mortar and rocket attacks, similar to other military personnel. Military medical personnel may arguably face additional risks, above and beyond those experienced by other military personnel, because of their dual and complex roles of healer and warrior. Traditionally military medical personnel focused on the former role but, because of the war zone conditions in Iraq and the proximity of the enemy, many must defend themselves while they heal others, thereby assuming the role of combatant as they work under life-threatening conditions.

Although the specific mental health risks of military medical personnel serving in Iraq are unknown, overall soldiers and Marines serving in Iraq are at a high risk of developing symptoms of depression, post-traumatic stress disorder (PTSD), and generalized anxiety disorders. An initial report by Hoge et al.⁵ indicated that 15.6% to 17.1% of returning Iraq combat veterans surveyed in 2003 met screening criteria for at least one of these disorders. However, these diagnoses are provisional and based on self-report questionnaires, rather than clinical interviews, and these estimates come from elite units engaged in extensive, direct, combat operations. Other

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studies conducted with U.K. military personnel found lower rates of mental health problems. Hotopf et al.⁶ found that 4% of soldiers returning from a 2003 deployment to Iraq met criteria for PTSD. However, it is likely that more U.S. than British troops were exposed to potentially traumatic events.⁷ In a more recent study, Hoge et al.⁸ found that the prevalence of screening positive for a mental health problem between 2003 and 2004 was 19.1% among service members returning from Iraq, compared with 11.3% among those returning from Afghanistan. Mental health problems reported on the postdeployment assessment were significantly associated with combat experiences.

Hoge et al.⁵ also found that 9.3% of soldiers and Marines deployed to Iraq met probable criteria for one of these mental health disorders before deployment to the Middle East, which is slightly higher than the 7.8% prevalence rates of PTSD found among the general population.⁹ Furthermore, other research found evidence that predeployment mental health symptoms predicted health-related quality of life among Persian Gulf War veterans¹⁰ and later mental health problems.¹¹

Although the mental health focus has been on symptoms and quality of life following exposure to potentially traumatic events in the war zone, there is also ample evidence that troops poised for deployment may experience considerable anticipatory anxiety and distress,¹²⁻¹⁴ which may place them at higher risk for mental health difficulties after deployment. Among 2,947 military personnel poised for peacekeeping deployment to Somalia in 1995, 6% exceeded screening criteria for PTSD and 43% endorsed elevated levels of psychological distress.¹² In a sample of peacekeepers poised for deployment to Kosovo in 2000, 13% of soldiers met probable criteria for PTSD.¹⁴ Furthermore, rates of previous exposure to potentially traumatic events (PTE) were high among soldiers poised for deployment; 74% reported exposure to at least one PTE with exposure to a mean of 2.38 PTEs before deployment.¹²

There are several possible reasons for elevated levels of mental health symptoms before deployment. First, before departing on a deployment, military personnel face a number of stressors that may cause nonspecific distress. Saying goodbye to family members and friends, preparing to be away for an indefinite amount of time, making sure that finances are in order, dealing with last minute business, and preparing for an emotionally challenging deployment are among the predeployment stressors that military personnel may face. Second, military personnel who have participated in previous deployments may be reminded of prior traumatic events as they prepare for future deployment. For example, military medical personnel may recall those whom they were unable to save in the past or may have memories of being injured while caring for a comrade. Slusarcick et al.¹⁵ found that, in a military medical personnel sample, occupational experiences with the dying and the dead were significant predictors of adverse mental health responses. A third possibility is that anticipatory stress may cause elevated levels of mental health symp-

toms in military personnel. Finally, predeployment stressors may have residual effects that elevate symptoms. Before Operation Desert Storm, health care personnel reported a mean of 1.44 negative life events in the past year and those stressors were related to anxiety, depression, and PTSD symptoms.¹⁶

Despite the evidence for elevated mental health symptoms before deployment, few studies have examined the predictors of these symptoms before deployment. Most studies focus on postdeployment predictors of mental health sequelae. In this study, we examined risk and resilience factors that may affect mental health and well-being in military medical personnel before deployment, including recent stressors, potentially traumatic events, and positive military experiences. We also examined whether risk factors (predeployment stressors and potentially traumatic events) or resilience factors (positive military experiences and trait resilience) best predicted PTSD symptoms before deployment.

Predictors of negative and positive affectivity before deployment were also examined, given that negative affectivity predicts PTSD¹⁷ and positive affectivity plays a protective role in the context of negative experiences¹⁸ and in the promotion of coping, health, personal resources, and overall well-being.^{19,20} In fact, positive emotions may account for the relationship between pretrauma resilience and later development of mental health symptoms.²⁰

Given the scarcity of research on protective factors before deployment, especially in military medical personnel, we predicted that risk factors would account for a significant proportion of the variance in PTSD symptoms and that resilience factors would account for a small but significant proportion of the variance, above and beyond risk factors. We also predicted that negative affectivity before deployment would be most strongly associated with risk factors, whereas positive affectivity would be most strongly associated with resilience factors.

METHODS

Procedures

U.S. Air Force medical personnel, who were deployed to Iraq to serve as part of the 332nd Expeditionary Medical Group at Balad Air Base in the period between September 2004 and September 2005, were asked to voluntarily complete a survey. A total of 494 U.S. Air Force medical personnel was given a copy of the survey and asked to participate on the day of deployment, a few hours before departure, and 328 (66%) of these individuals agreed to participate. One of the investigators at Wilford Hall Medical Center provided a description and overview of the study. The first page of the survey provided instructions, informed participants that their participation was voluntary, and ensured the confidentiality of their responses. All completed and uncompleted surveys were placed in large envelopes by participants before return so that the investigators were unaware of which participants com-

pleted the surveys. The institutional review boards at Wilford Hall Medical Center and the Boston Department of Veterans Affairs Health Care System approved all procedures and materials.

Military medical personnel completed the survey in an auditorium under standardized conditions, with an investigator present to provide instructions and to answer questions. The questionnaire took ~45 minutes to complete and participants were asked to indicate whether they would be willing to be recontacted to complete mid-deployment and postdeployment surveys.

Participants

Participants were U.S. Air Force medical personnel ($N = 328$) being processed through Lackland Air Force Base (San Antonio, Texas) before their deployment to Iraq. Most were from Wilford Hall Medical Center (Lackland Air Force Base), although other participants were from >20 other military medical treatment facilities around the United States. This cohort was selected because the subjects were all deploying to work at the same hospital setting and because the largest proportion of the 332nd Expeditionary Medical Group staff members were scheduled to deploy from Lackland Air Force Base. In terms of general demographic features, the cohort was representative of the 332nd Expeditionary Medical Group as a whole. Participants were mostly male (58%; $n = 106$), with a sizable female sample (42%; $n = 78$). Participants were 63% ($n = 205$) Caucasian, 12% ($n = 40$) African American, 14% ($n = 45$) Latino, 9% ($n = 28$) Asian American, and 2% ($n = 8$) identified as being of another ethnicity. The majority of participants reported being married (58%; $n = 190$).

Participant varied in age, with 24% ($n = 78$) reporting ages between 18 and 24 years, 19% ($n = 61$) reporting ages between 25 and 29 years, 17% ($n = 56$) reporting ages between 30 and 34 years, 13% ($n = 41$) reporting ages between 35 and 39 years, 17% ($n = 56$) reporting ages between 40 and 44 years, and 10% ($n = 32$) reporting ages of ≥ 45 years. The majority of participants (59%; $n = 191$) were junior enlisted personnel (E1–E4) or noncommissioned officers (E5–E9), with 41% ($n = 135$) reporting a rank of officer (O1–O6). It is important to note that the percentage of officers in the medical corps is much higher than in the military in general, because of the numbers of physicians, nurses, and allied health workers in these units, most of whom are officers. The highest educational level attained varied, with ~1% ($n = 2$) reporting less than high school completion, 10% ($n = 30$) reporting completion of high school, 41% ($n = 127$) reporting some college or an associate's degree, 24% ($n = 76$) reporting a 4-year college degree, and 24% ($n = 75$) reporting a master's degree or higher.

Measures

Predeployment Stressors

Predeployment stressors are defined as ongoing problems or concerns (e.g., financial problems or health problems of fam-

ily members) endorsed at the predeployment assessment. The 13-item scale lists a number of potential predeployment stressors, with a 5-point response format ranging from "very low" to "very high." This measure was rationally derived and modified from the study of peacekeepers from Somalia (Cronbach's $\alpha = 0.84$) reported by Litz et al.²¹ and the study of peacekeepers from Kosovo (Cronbach's $\alpha = 0.87$) reported by Maguen et al.¹⁴ Cronbach's α for the current sample was 0.76.

Life Events Checklist

The Life Events Checklist (LEC) was developed concurrently with the Clinician-Administered PTSD Scale and was designed to be administered before the Clinician-Administered PTSD Scale to screen for potentially traumatizing events that respondents might have experienced at any time in their lives. The LEC consists of 16 items inquiring about the experience of potentially traumatizing events known to result in PTSD or other post-traumatic symptoms, with a response format ranging from "happened to me" to "does not apply." For each LEC item, a score of 1 was assigned only if the respondent reported directly experiencing an event; a 0 was assigned if any other response option was endorsed. One study found that the LEC exhibits excellent test-retest reliability and good convergence with existing measures of trauma history.²² In a clinical sample of combat veterans, LEC results were significantly correlated with measures of psychological distress and were more strongly predictive of PTSD symptoms than was a measure of combat exposure.²²

Positive Military Experiences

Positive military experiences include thoughts and appraisals of the respondent's current military experience (e.g., respect for officers in the unit, trust for soldiers in the unit, extent to which the unit feels like a family, and feelings of belonging in the unit). This nine-item scale includes a 5-point response format ranging from "not at all" to "extremely." This measure was rationally derived for the current conflict. The internal validity for the current sample was 0.83.

Connor-Davidson Resilience Scale

The Connor-Davidson Resilience Scale is a 25-item questionnaire assessing attitudes about coping with adversity (e.g., "having to cope with stress makes me stronger"). Items require respondents to indicate their degree of endorsement on a 5-point scales ranging from "not true at all" to "true nearly all the time." Connor and Davidson²³ reported Cronbach's α of 0.89 for a validation sample of general-population subjects. Cronbach's α for the current sample was 0.92.

PTSD Checklist-Military Version

PTSD symptoms were assessed with a 15-item, modified version of the PTSD Checklist (PCL).²⁴ This questionnaire, the PCL-Military Version (PCL-M), uses a 5-point Likert scale ranging from "not at all" to "extremely" to evaluate the

severity of the PTSD symptoms in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (e.g., repeated, disturbing dreams of the stressful experience). PTSD symptoms include reexperiencing symptoms, avoidance and emotional numbing symptoms, and hyperarousal symptoms. Two items were excluded from the PCL in error (i.e., “your future will be cut short” and irritability symptoms). These items were treated as missing data, and PTSD symptom item means for each individual were substituted for these two items to compute total PCL scores. The PCL-M has excellent internal validity (Cronbach’s $\alpha = 0.97$) and reliability ($\kappa = 0.96$) and good sensitivity (0.82) and specificity (0.83).²⁵⁻²⁷ Cronbach’s α for the current sample was 0.86.

Positive and Negative Affectivity Schedule

Positive and negative moods were assessed with the 20-item Positive and Negative Affectivity Schedule,²⁸ which contains positive activation (10 items; active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, and strong) and negative activation (10 items; afraid, ashamed, distressed, guilty, hostile, irritable, jittery, nervous, scared, and upset) subscales. Participants were asked to rate the extent to which they felt each emotion “in the last week” on a 5-point Likert scale ranging from “very slightly or not at all” to “extremely.” Watson et al.²⁸ reported Cronbach’s α values ranging from 0.86 to 0.90 for positive affect and from 0.84 to 0.87 for negative affect, depending on the time frame assessed. The internal consistency in this study was 0.89 for positive affect and 0.86 for negative affect.

TABLE I. Predeployment Stressors

Item	Proportion (%) Who Endorsed Item as Medium, High, or Very High Concern
Being separated from family members and friends	76 (<i>n</i> = 229)
Completing personal business before I deploy	51 (<i>n</i> = 151)
Family responsibilities	50 (<i>n</i> = 150)
Health problems of family members	34 (<i>n</i> = 102)
Financial problems	34 (<i>n</i> = 103)
Death of close friend or family member	15 (<i>n</i> = 44)
Not having friends to talk to or do things with	10 (<i>n</i> = 29)
Problems with co-workers	10 (<i>n</i> = 29)
Being unfairly treated in my relationship	9 (<i>n</i> = 26)
Personal health problems	8 (<i>n</i> = 24)
Lack of support from my family	5 (<i>n</i> = 16)
Emotional or mental abuse in my relationship	3 (<i>n</i> = 9)
Physical abuse in my relationship	<1 (<i>n</i> = 2)

Percentages reflect endorsements of medium, high, or very high for each item. For each item, the response options were as follows: 1, very low; 2, low; 3, medium; 4, high; 5, very high. The mean score for the full scale was 1.66 (SD, 0.54); *N* = 328, but values may vary slightly from item to item because of missing data.

TABLE II. Exposure to Potentially Traumatic Events before Deployment

LEC Exposure Item	Proportion (%) Who Endorsed Exposure
Transportation accident (e.g., car accident, boat accident, train wreck, or plane crash)	63 (<i>n</i> = 203)
Natural disaster (e.g., flood, hurricane, tornado, or earthquake)	50 (<i>n</i> = 161)
Physical assault (e.g., attacked, hit, slapped, kicked, or beaten)	37 (<i>n</i> = 119)
Sudden unexpected death of someone close to you	33 (<i>n</i> = 82)
Witnessed sudden violent death (e.g., homicide or suicide)	20 (<i>n</i> = 54)
Unwanted or uncomfortable sexual experience (excluding sexual assault)	17 (<i>n</i> = 52)
Combat or exposure to war zone	17 (<i>n</i> = 52)
Fire or explosion	15 (<i>n</i> = 49)
Serious accident at work, at home, or during recreational activity	14 (<i>n</i> = 44)
Assault with weapon (for example, being shot, stabbed, or threatened with knife, gun, or bomb)	14 (<i>n</i> = 45)
Exposure to toxic substance (e.g., dangerous chemicals or radiation)	11 (<i>n</i> = 34)
Sexual assault (e.g., rape, attempted rape, or made to perform any type of sexual act through force or threat of harm)	10 (<i>n</i> = 31)
Life-threatening illness or injury	8 (<i>n</i> = 26)
Severe human suffering	3 (<i>n</i> = 11)
Serious injury, harm, or death you caused to someone else	<1 (<i>n</i> = 1)
Captivity (for example, being kidnapped, abducted, held hostage, or prisoner of war)	<1 (<i>n</i> = 1)

For each item, the response options were as follows: 0, not applicable; 1, no impact; 2, little negative impact; 3, moderate negative impact; 4, extremely negative impact. The mean score for the full scale was 0.61 (SD, 1.23); *N* = 328, but values may vary slightly from item to item because of missing data.

RESULTS

Predeployment Stressors

Military medical personnel reported a host of predeployment stressors (Table I). The majority of participants reported significant concern over being separated from family members and friends (76%; *n* = 229), completing personal business before deploying (51%; *n* = 151), and family responsibilities (50%; *n* = 150). Additionally, 90% (*n* = 275) of participants reported at least one concerning predeployment stressor, 76% (*n* = 229) reported at least two concerning stressors, and 57% (*n* = 174) reported three or more concerning stressors before deployment.

Predeployment Trauma

Military personnel reported that a number of potentially traumatic events had occurred in their lifetime, before their deployment (Table II). The majority of military personnel reported experiencing a serious transportation accident (63%;

TABLE III. Positive Military Experiences

Item	Proportion (%) Who Endorsed Item as Quite a Bit or Extremely
How proud do you feel your family members and friends are of your military service?	93 (<i>n</i> = 285)
Do you respect the officers in your unit?	81 (<i>n</i> = 254)
Do you trust the other airmen in your unit?	68 (<i>n</i> = 210)
How good are the available role models and leaders in your unit?	66 (<i>n</i> = 205)
To what extent do you feel you "belong" in your present unit?	64 (<i>n</i> = 200)
How much do you feel the nation supports the military these days?	62 (<i>n</i> = 193)
Do you believe Americans appreciate the importance of military duty in the post-9/11 world?	59 (<i>n</i> = 185)
To what extent is your unit like a family to you?	39 (<i>n</i> = 123)
How isolated do you feel within your unit?	22 (<i>n</i> = 70)

For each item, the response options were as follows: 0, not at all; 1, a little bit; 2, moderately; 3, quite a bit; 4, extremely. The mean score for the full scale was 2.87 (SD, 0.61); *N* = 328, but values may vary slightly from item to item because of missing data.

n = 203) or a natural disaster (50%; *n* = 161), with more than one-third experiencing a physical assault (37%; *n* = 119) or the sudden death of someone close (33%; *n* = 82). Participants reported an average of 2.5 potentially traumatic events (SD, 1.91 events), with 87% (*n* = 284) of participants reporting at least one event, 67% (*n* = 219) reporting at least two events, and 42% (*n* = 136) reporting three or more events. These rates are slightly higher than those based on population studies. Breslau and Kessler²⁹ found that ~74% of individuals reported direct exposure to potentially traumatic events or witnessing of events. Although the population study indicated lower rates of exposure to traumatic events, compared with our military personnel, individuals experienced ~2.7 events, which is comparable to the findings for the military personnel in our study. However, it is important to note that individuals in our study were younger than the

population in general, which means that a greater proportion of individuals experienced potentially traumatic events at a younger age.

Positive Military Experiences

Military personnel reported a variety of positive appraisals of the military, the mission, their unit, and overall mission support (Table III). More specifically, the vast majority of personnel (93%; *n* = 285) reported that their friends and family members were proud of their military service, with the majority reporting respect for the officers in their unit (81%; *n* = 254) and trust for their fellow military medical personnel (68%; *n* = 210).

Predeployment PTSD and Emotionality

Predeployment PTSD was examined as a continuous severity score, indexed by the PCL-M. The mean predeployment PTSD score was 22.97 (SD, 7.24). This PCL-M mean is comparable to the PCL-M mean reported by peacekeepers in Kosovo before deployment (mean, 25.76; SD, 13.46).¹⁴ Furthermore, as indexed by the Positive and Negative Affectivity Schedule in this sample, reports of positive emotionality (mean, 36.29; SD, 6.98) were significantly higher than reports of negative emotionality (mean, 17.06; SD, 5.75; *t* = 34.18; *p* < 0.01).

Predictors of PTSD Symptoms and Affect

In the next set of analyses, we examined predictors of predeployment PTSD symptoms, positive affect, and negative affect. We conducted three hierarchical regression analyses, entering risk variables (stressors and previous traumatic events) in the first block. Resilience variables (positive military experiences and trait resilience) were entered in the second block, to determine whether they accounted for an additional percentage of the variance in each outcome variable. Correlations among variables in the regression models are shown in Table IV.

Predictors of Predeployment PTSD Symptoms

In the hierarchical regression predicting PTSD symptoms before deployment (Table V), the specified risk factors ac-

TABLE IV. Correlations among Variables in Regression Models

Variable	Correlation						
	1	2	3	4	5	6	7
1. LEC	—						
2. Predeployment stressors	0.23 ^a	—					
3. Positive military experiences	-0.02	-0.18 ^a	—				
4. Resilience	0.08	-0.24 ^a	0.34 ^a	—			
5. PTSD	0.34 ^a	0.34 ^a	-0.25 ^a	-0.22 ^a	—		
6. Negative affect	0.15 ^b	0.39 ^a	-0.13 ^b	-0.32 ^a	0.43 ^a	—	
7. Positive affect	0.04	-0.13 ^b	0.46 ^a	0.62 ^a	-0.13 ^b	-0.17 ^a	—

^a*p* < 0.01, two-tailed test.

^b*p* < 0.05, two-tailed test.

TABLE V. Hierarchical Regression of Predeployment Factors Predicting PTSD Symptoms

Variable	β	t	R^2
Step 1			0.17 ^a
LEC	0.28 ^a	4.05	
Predeployment stressors	0.24 ^a	3.47	
Step 2			0.20 ^a
LEC	0.30 ^a	4.05	
Predeployment stressors	0.20 ^a	2.75	
Positive military experiences	-0.15 ^b	-2.05	
Resilience	-0.06	-0.83	

Model statistics for the stress symptoms index equation were as follows: $F_{(4,178)} = 11.14, p < 0.01$.

^a $p < 0.01$.

^b $p < 0.05$.

counted for the most variance in PTSD symptoms. The final model accounted for 20% of the variance, with potentially traumatic events ($\beta = 0.30; p < 0.01$), predeployment stressors ($\beta = 0.20; p < 0.01$), and positive military experiences ($\beta = -0.15; p < 0.05$) each predicting a significant proportion of the variance.

Predictors of Predeployment Positive Affect

In the hierarchical regression predicting positive emotionality before deployment (Table VI), the specified resilience factors accounted for the most variance in positive affect. The final model accounted for 44% of the variance, with positive military experiences ($\beta = 0.26; p < 0.01$) and trait resilience ($\beta = 0.53; p < 0.01$) each predicting a significant proportion of the variance. Neither of the risk factors was significantly associated with positive affect.

Predictors of Predeployment Negative Affect

In the hierarchical regression predicting negative affect before deployment (Table VII), the specified risk and resilience factors were each significant contributors to the overall regression equation. The final model accounted for 16% of the variance, with potentially traumatic events ($\beta = 0.14; p <$

TABLE VI. Hierarchical Regression of Predeployment Factors Predicting Positive Affect

Variable	β	t	R^2
Step 1			0.04 ^a
LEC	0.11	1.46	
Predeployment stressors	-0.20 ^b	-2.68	
Step 2			0.44 ^b
LEC	0.01	0.18	
Predeployment stressors	0.01	0.22	
Positive military experiences	0.26 ^b	4.34	
Resilience	0.53 ^b	8.52	

Model statistics for the positive affect index equation were as follows: $F_{(4,177)} = 34.36, p < 0.01$.

^a $p < 0.05$.

^b $p < 0.01$.

TABLE VII. Hierarchical Regression of Predeployment Factors Predicting Negative Affect

Variable	β	t	R^2
Step 1			0.12 ^a
LEC	0.11	1.46	
Predeployment stressors	0.30 ^a	4.18	
Step 2			0.16 ^a
LEC	0.14 ^b	1.99	
Predeployment stressors	0.24 ^a	3.21	
Positive military experiences	-0.01	-0.18	
Resilience	-0.21 ^a	-2.83	

Model statistics for the negative affect index equation were as follows: $F_{(4,176)} = 8.55, p < 0.01$.

^a $p < 0.01$.

^b $p < 0.05$.

0.05), predeployment stressors ($\beta = 0.24; p < 0.01$), and trait resilience ($\beta = -0.21; p < 0.01$) each predicting a significant proportion of the variance.

DISCUSSION

We examined risk and resilience variables among military medical personnel preparing for deployment to Iraq. Although rates of predeployment PTSD symptoms were relatively low and positive affect was greater than negative affect, military medical personnel reported a host of predeployment stressors, which might place them at risk for mental health complications. If military medical personnel are worried about a variety of stressors at home, then it becomes increasingly more complicated for them to remain focused on their military duties during their deployment. Predeployment stressors may create a high baseline of tension, resulting in a ripple effect of stress for military personnel serving in deployed locations.

Similar to rates reported by Bolton et al.¹² and Slusarcick et al.,¹⁶ potentially traumatic events before deployment were widely reported by military medical personnel, and there is evidence that preexisting trauma may place individuals at greater risk for later mental health complications, such as PTSD.^{30,31} With similar definitions of potentially traumatic events (i.e., excluding learning about the traumatic events of others), nearly 74% of U.S. adults in the general community have been exposed to at least one PTSD-qualifying traumatic event,²⁹ which is lower than the rates reported in our study. It is significant that, before deployment, a greater number of military medical personnel reported potentially traumatic events, compared with the population at large, although they were younger than individuals surveyed in epidemiological studies.

We also found that predeployment PTSD symptoms were most strongly associated with risk factors (i.e., predeployment stressors and lifetime trauma), over and above resilience factors. It is possible that, in the context of preparations for deployment, nagging stressors and a history of trauma simply outweigh the benefits derived from a resilient personality in

predicting PTSD symptoms. Risk factors being the most robust predictors of PTSD symptoms before deployment should also be considered within a dose-response framework, given that cumulative stressors and trauma often have long-lasting effects, sometimes affecting individuals many years later.³² Another possibility is that individuals who experience adversity and high levels of stress before deployment are primed for the development of subsequent mental health symptoms, given past history, predeployment stressors, and immediate PTSD symptoms.

Screening for these stressors before deployment and implementing interventions to help military personnel manage anxieties before deployment may ameliorate the long-term mental health impact. This is especially important for potentially high-risk groups such as military medical personnel, who may be intensely involved with and exposed to traumatic injury, death, and dying, above and beyond exposure to war zone stressors. Screening efforts should be implemented with caution and with awareness of their limitations.³³ There have been several guidelines suggested for screening of military personnel,³⁴ including the assertion that the benefits of screening should outweigh the harms (e.g., the stigma arising from being “unfit” for service and the cost of screening programs), especially given the importance of morale and trust in the war zone. Education should focus on indicating that stress before deployment is the norm rather than a liability and that most individuals manage effectively if proper steps are taken to reduce stressors before departure. Interventions also should focus on teaching stress reduction and coping skills related to the transition to the war zone, including communication skills aimed at closure with respect to stressful situations at home. As always, screening tools and education/intervention programs should be empirically tested and validated before implementation on a larger scale.

We also found that resilience factors (i.e., trait resilience and positive military experiences) were most strongly associated with positive affect before deployment, which is consistent with previous findings concerning positive emotions.³⁵ Resilience can be defined as response flexibility in the face of ever-changing situational demands, including the ability to recover from negative and stressful experiences and find positive meaning in seemingly adverse situations. Individuals exhibiting high trait resilience often experience positive emotions even in the throes of stressful events and compounded adversity.³⁶ More specifically, resilient military personnel may experience positive emotions despite numerous reported predeployment stressors, and this personality trait, in addition to positive military experiences, creates a milieu in which military personnel are able to maintain well-being amid serious stressors. As highlighted by Fredrickson and Losada,³⁶ although positive affect may be temporary, the accumulated resources that amass as a result of positive feelings are robust. Furthermore, these resources function as cumulative assets that can be drawn upon in times of need, to manage future stressors and adverse situations.

Positive military experiences before deployment also played an important role in predicting positive affect, with the establishment of trust, support, pride, and belonging being an important foundation that helps military members thrive and feel part of a larger mission and purpose. These positive military experiences are also likely related to fostering strong cohesion and morale, which are associated with fewer post-deployment PTSD symptoms and overall well-being.^{37,38} Establishing this foundation before deployment is critical, given the multitude of war zone stressors that these military medical personnel may experience. If personnel do not feel support, trust, guidance, and feelings of belonging to a larger team, then thriving in this challenging environment will be difficult. Although it is unclear whether trait resilience can be increased, positive military experiences certainly represent a variable that can fluctuate; fostering this strong foundation before deployment may indirectly attenuate adverse mental health reactions after deployment.

Negative affect was associated with a combination of risk and resilience factors, with trait resilience being inversely related to negative affect. The mechanism through which individuals experienced negative affect seems to share a common pathway with PTSD symptoms and positive affect. Although PTSD symptoms and negative affect before deployment might be synonymous, we found that this was not the case, theoretical overlap notwithstanding. We conceptualize the relationship between PTSD symptoms and negative affect as concentric circles, each with its own independent predictors. Another important point to highlight with respect to negative affect is that the existence of negative affect before deployment should not be viewed as maladaptive. In fact, a small dose of negative affect in the midst of preparations for deployment is a healthy response. Some have highlighted that it is important to pay attention to positive:negative affect ratios in trying to understand overall well-being.³⁹ Indeed, we found that, overall, positive affect was significantly greater than negative affect among military medical personnel.

There are several limitations in this study that should be noted. First, given that this was a convenience sample, Air Force medical personnel who were surveyed might not be representative of all military personnel deployed to Iraq or even specifically of military medical personnel. Military personnel deployed to Iraq represent a diverse group, in terms of their branch of service, rank, duties, and demographic characteristics, which is important to consider when interpreting these results. Our sample contained a large proportion of officers (41%; $n = 135$), which is fairly typical of medical military personnel, because of the large number of doctors, nurses, and allied health professionals in these units, but is not typical of the military in general. Our sample also included a large proportion of women (42%; $n = 78$), approximately twice that of women in the Air Force (20%).⁴⁰ Second, there are a number of variables that may be important to capture in the future. For example, a direct measure of cohesion and morale would help depict some of the underlying

sentiments of connectedness that may explain additional variance in a complicated picture. Other personality measures would also likely help to make these results more complete.

There are several important implications of the current study. A better understanding of the factors related to resilience in military medical personnel should allow for improved educational, training, and clinical programs to increase resilience or hardiness before military deployments. Certain resilience variables, such as temperament and cognitive ability, are influenced by genetic factors and thus may be difficult to alter via intervention. Even here, however, we may be able to glean important clues that can assist with programs designed to foster resilience. For example, research that elucidates the coping styles of especially resilient individuals may suggest ways of teaching these styles to others, thereby bolstering their resilience. Moreover, a focus on the individual as the locus of resilience must not lead us to overlook interventions performed at the group level that can positively affect the resilience of group members.⁴¹ Interventions that heighten group cohesion, boost morale, and increase the quality of leadership should buffer personnel against deployment stress. Trusted leadership and strong unit cohesion can be systemic protective factors that lead to increased group resilience in deployed military medical personnel. This highlights the importance of teaching the concepts of leadership and unit cohesion, which are included in most senior military officer professional education courses.

The identification of individual and environmental risk factors among military medical personnel also may help improve programs to decrease the potential negative impact of deployment. Because of the high costs of education and training for many military medical personnel, the discharge of one military medic for a deployment-related mental health disorder could easily cost >\$250,000, in terms of medical disability, medical care, and costs to train a replacement.

Although multiple deployments may heighten the risk for psychological problems, they may also improve resilience, based on increased knowledge and experience of deployed personnel. For example, one prospective study of British troops deployed to Iraq revealed that mental health significantly improved after the troops returned from their successful mission.⁴² These data suggest that well-trained soldiers with high morale who successfully master a stressful deployment may experience improved mental health and possibly increased resilience and self-efficacy. Additional prospective longitudinal research is needed to evaluate the factors of risk and resilience as they relate to military medical deployments.

Overall, military medical personnel deployed to Iraq exhibited low levels of PTSD symptoms and high levels of positive affect before deployment. Premilitary exposure to trauma and current stressors should be included as part of any comprehensive model considering factors that impinge on military personnel before deployment. Trait resilience seemed to protect against overwhelming negative affect and also predicted reports of positive affect among these individ-

uals. Future studies should aim to understand the important role predeployment factors play as military members prepare to deploy, as well as their impact on postdeployment mental health. Although the emphasis has understandably been on mental health responses following deployment, by failing to consider predeployment factors we are at risk of missing critical factors that could help explain the overall well-being of military personnel.

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Posttraumatic Growth Among Military Medical Personnel

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A growing body of literature documents growth and positive life changes resulting from exposure to traumatic incidents (e.g., Cordova, Cunningham, Carlson, & Andrykowski, 2001; Linley & Joseph, 2004). Military medical personnel deployed to active war zones routinely provide care to wounded and severely injured service members while simultaneously being exposed to war zone related threats. Very little information is known about the positive impact on military medical personnel of working in a high-threat area and evaluating and treating a large number of combat casualties with gruesome injuries.

Tedeschi and Calhoun (1996) have empirically demonstrated five categories of posttraumatic growth: appreciation of life, relating to others, new possibilities, personal strength, and spiritual change. However, the nature and antecedents of posttraumatic growth are unclear. Previous research examining the impact of exposure to potential traumatic experiences on growth has yielded mixed results: Some research has found evidence of a linear relationship between combat exposure and positive developmental outcomes (Aldwin, Levenson, & Spiro, 1994), while other research suggests that combat exposure leads to growth for only a subset of individuals, and that those exposed to the highest levels of distressing events may not experience positive growth (Card, 1983). Also unclear is whether external resources (e.g., unit cohesion, social support, military grade) and background characteristics (e.g., age, gender, ethnicity, marital status, education, income, and predeployment military status) relate to posttraumatic growth (PTG).

In the present study, we examined levels of PTG reported by military medical personnel deployed as part of Operation Iraqi Freedom and identified deployment-related and demographic predictors of PTG. At 6-months post deployment, 160 military medical personnel completed a 21-item rationally derived measure of Military healthcare exposure (MHE) and the Posttraumatic Growth Inventory (PGI; Tedeschi & Calhoun, 1996). The sample included 69 males and 70 females, 29.2% of whom were non-white.

Correlational analyses revealed that both unit cohesion and length of time in the military were significantly related to PGI ($r = 1.69, p < .05$; $r = -.15, p < .05$). A series of hierarchical regression analyses were used to test for quadratic moderation for each of the PGI subscales and for the total score. Controlling for unit cohesion and length of time in service, we found a positive, linear relationship between Military healthcare exposure and posttraumatic growth ($b = 1.57, p < .001$). Consistent with research by Aldwin (1994), there was no evidence of a curvilinear interaction between MHE and PGI for any of the subscales or the total score. The limitations and implications of these findings are discussed.

Risk and Resiliency in Medical Personnel Exposed to Disaster Trauma

Invited Address for the 2nd Annual Continental Divide
Disaster Behavior Health Conference, Colorado Springs, CO

Alan L. Peterson, PhD

This presentation will review risk and resiliency in medical personnel exposed to disaster trauma. It will first review the types of disaster trauma exposure that occurs in health care workers during natural disasters, terrorist attacks, mortuary duty, and military combat. Data from a large prospective study of over 1000 military medical personnel deployed to work at a combat trauma hospital in Iraq will be reviewed. This study involves the completion of a comprehensive survey of factors related to risk and resilience during five assessment points: pre-deployment, mid-deployment, and at 1-, 6-, and 12-months follow-up periods after returning from the deployment. Factors related to risk of psychological health problems such as posttraumatic stress disorder will be reviewed as well as factors that are related to resiliency. The impact of cultural factors in the provision of health care after disasters will be discussed and data will be presented on the impact of working with Iraqi patients on U.S. military medical personnel. Potential programs to enhance resiliency in health care workers will also be reviewed.

2009 Study Publications and Presentations

- Cedillos, E. M., Krantz, L., Hatch, J., Baker, M., & Isler, W. (2009, November). *Predictors of resiliency among military medical personnel*. Poster session presented at the annual meeting for the International Society for Traumatic Stress Studies, Atlanta, GA.
- Cedillos, E. M., Luethcke, C., Benson, T. A., Conoscenti, L. M., Baker, M., Isler, W., ... Dickstein, B. D. (2009, November). *Military medical personnel deployment experiences: Preliminary focus group findings*. Poster session presented at the annual meeting for the Association for Behavioral and Cognitive Therapies, New York, NY.
- Krantz, L., Cedillos, E. M., Dickstein, B., Litz, T. T., & Peterson, A. L. (2009, November). *Perceived barriers to mental health care in military medical personnel*. Poster session presented at the annual meeting of the International Society for Traumatic Stress Studies, Atlanta, GA.
- McLean, C. P., Benson, T., Litz, B. T., Peterson, A. L., Baker, M. T., & Isler, W. C. (2009, November). *Gender differences in posttraumatic growth*. Poster session presented at the annual meeting of the Association for Behavioral and Cognitive Therapies, New York, NY.

Predictors of Resiliency Among Military Medical Personnel

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Military medical personnel deployed in support of Operation Iraqi Freedom (OIF) are placed in stressful situations and asked to perform their duties under intense circumstances. Some personnel may feel that they are unprepared for situations encounter. The purpose of this study is to identify resiliency factors for posttraumatic stress disorder (PTSD) and its symptoms. The Attitudes and Beliefs questionnaire and the Posttraumatic Stress Disorder Checklist-Military version (PCL-M) were given to 106 Air Force medical personnel who deployed to the Air Force Theatre Hospital in Balad, Iraq. Analysis revealed significant negative correlations between the changes in Attitudes and Beliefs total scores as well as Belief in the Mission and Confidence in Preparedness subsections. This suggests that cognitive changes in medical personnel may be predictive of stress related symptoms. Future research should explore this relationship and whether these attitudes and beliefs serve as resiliency factors against the development of stress related symptoms.

Military Medical Personnel Deployment Experiences: Preliminary Focus Group Findings

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Military medical personnel deployed in service of Operation Iraqi Freedom (OIF) are asked to provide health care in dangerous locations and under extreme circumstances. Medical personnel are responsible for working with combat casualties and human remains, including providing direct medical care to combat casualties in a hostile area, body handling and identification, as well as their usual job responsibilities. Furthermore, they are subject to the same risks as combat personnel, particular risks from explosive devices. Additionally, medical personnel must cope with long, stressful hours and separation from family and supportive networks back home. It is unclear what types of training programs and/or military services may help aid personnel with these deployment-related stressors.

The present study presents preliminary findings from initial focus groups conducted with Air Force medical personnel regarding their deployment experiences. These focus groups, conducted with service members after deployment, are designed to provide feedback to improve preparedness training, increase resiliency, and maximize growth potential during deployment.

Transcript notes from the initial six focus groups conducted with a total of 14 participants from large medical center that had previously deployed to Theater Trauma Hospital in Iraq were examined for common themes. Participation in the focus groups was voluntary, no compensation was given, and anonymity was assured. The groups were digitally recorded and were about one hour in length. Participants were asked questions aimed at their pre-, mid-, and post-deployment experiences and included questions regarding strategies for dealing with stressful situations, adequacy of training, and suggestions for improvement. Meeting notes were examined by two evaluators who identified common themes among participants. Themes that were identified as common by both evaluators include, but are not limited to: feelings regarding pre-deployment mandatory training content, benefits regarding peer support and interaction, military support for family members, strategies for coping with deployment stress, and suggestions for adapting to post-deployment environment. It is anticipated that feedback from these focus groups will provide a broad range of information regarding unique stressors faced by military medical personnel across the deployment cycle.

The views expressed in this article are those of the authors and are not the official policy of the Department of Defense or the United States Air Force.

Perceived Barriers to Mental Health Care in Military Medical Personnel

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Military medical personnel face direct and indirect exposure to violence in the warzone, yet predictors of Posttraumatic Stress Disorder (PTSD) and subsequent help-seeking behaviors remain understudied among deployed care-providers. Given previous findings that U.S. combat personnel commonly report barriers to mental health care (Hoge et al., 2004), we examined if and how similar concerns manifest among healthcare workers deployed to Iraq.

Medical personnel stationed at Wilford Hall Medical Center and MacDill AFB Clinic completed a series of questionnaires following deployment to Joint Base Balad, Iraq. PTSD symptom severity was measured using the PCL-M, and perceived barriers to care were assessed using a rationally derived measure similar to that administered by Hoge et al. Overall, 49.6% of participants endorsed at least 1 barrier to care, and there was a low to moderate positive correlation between the number of barriers endorsed and overall score on the PCL-M ($r = .26, p < .01$).

These results suggest that healthcare workers are not immune to barriers to care. In addition, healthcare workers exposed to high impact combat and operational stress were twice as likely to report concerns about stigmatization and other barriers to care. The types of barriers endorsed by participants and the implications of these findings will be discussed.

ABCT poster submission

Title: Gender Differences in Posttraumatic Growth

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Abstract:

Men and women respond differently to stress and trauma. Although partially explained by the severity and type of trauma exposure incurred, women are more prone to developing PTSD than men (e.g., Breslau et al., 1991; Tolin & Foa, 2006) but they also report more posttraumatic growth (PTG) (e.g., Bellizzi, 2004; Sheikh & Marotta, 2005; Tedeschi & Calhoun, 1996). In terms of adaptation to military stressors, demographic variables (e.g. age, education) and deployment-related variables (e.g. combat exposure, unit support) have been found to predict PTG (e.g., Maguen, Vogt, King, King, & Litz, 2006), but little is known about how these factors relate to PTG across genders among service members. Psychological growth is arguably particularly likely among service members who provide care in theatre or have other helper roles (e.g., training, building). However, care-providers are also at risk for exposure to various combat and operational stressors. We examined PTG in 174 Air Force medical personnel (90 men, 84 women) who deployed to Iraq. At 6-months post deployment, participants completed the Posttraumatic Growth Inventory (PGI; Tedeschi & Calhoun, 1996), Military Healthcare Exposure (MHE; a 21-item rationally derived measure), the General Military Experience Scale (Litz et al., 1997), the Combat Experiences Survey (Hoge et al., 2004), and the Current Stressors/Adversities Checklist (Litz, King, King, Orsillo, & Freidman, 1997). The PGI had excellent internal consistency ($\alpha = .96$). Scores ranged from 0 to 105 ($M=37.90$; $SD=27.04$). Women reported significantly higher levels of PTG ($M = 43.37$, $SD = 28.49$) than men ($M = 30.34$, $SD = 25.94$; $F(1,135) = 7.85$, $p < .01$). However, after controlling for demographic and deployment-related variables, the MHE was the only significant predictor ($B = .28$, $p < .05$) of PTG [$R^2 = .16$, $F(6,81) = 3.19$, $p < .01$]. Consistent with previous research, women reported significantly higher levels of PTG than men. However, gender was not a predictor of growth, after accounting for demographic and deployment experiences. It appears that men and women are equally likely to grow after being challenged with helper roles and deployment stressors.

2010 Study Publications and Presentations

Dickstein, B. D., McLean, C. P., Mintz, J., Conoscenti, L., Steenkamp, M. M., Benson, T. A., ... Litz, B. T. (2010). Unit cohesion and PTSD symptom severity in Air Force medical personnel. *Military Medicine*, 175, 482-486.

MILITARY MEDICINE, 175, 7:482, 2010

Unit Cohesion and PTSD Symptom Severity in Air Force Medical Personnel

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ABSTRACT Research suggests that military unit cohesion may protect against the development of post-traumatic stress disorder (PTSD). However, equivocal findings have led researchers to hypothesize a potential curvilinear interaction between unit cohesion and warzone stress. This hypothesis states that the protective effects of cohesion increase as warzone stress exposure intensifies from low to moderate levels, but at high levels of warzone stress exposure, cohesion loses its protective effects and is potentially detrimental. To test this theory, we conducted a test for curvilinear moderation using a sample of 705 Air Force medical personnel deployed as part of Operation Iraqi Freedom. Results did not support the curvilinear interaction hypothesis, although evidence of cohesion's protective effects was found, suggesting that unit cohesion protects against PTSD regardless of level of stress exposure.

INTRODUCTION

In the military, unit cohesion and support is fundamental to mission success and morale.¹ High levels of unit cohesion are associated with greater well-being, greater job satisfaction, superior unit performance, and lower incidence of disciplinary problems.² Given the importance of social supports in adaptation to trauma,³ unit cohesion is likely to serve as a protective factor that moderates the relationship between warzone stress exposure and the development of post-traumatic stress disorder (PTSD). To date, few studies have directly investigated this question. Among those that have, equivocal results have been reported.

Using data from a sample of female healthcare providers studied as part of the National Vietnam Veterans Readjustment Survey (NVVRS), McTeague et al.⁴ found an inverse relationship between unit cohesion and PTSD symptom severity (greater cohesion related to fewer PTSD symptoms). However, among male combat veterans who participated in the NVVRS, Fontana et al.⁵ found that unit cohesion had no direct relationship with PTSD symptomatology.

In an effort to account for these discrepant findings, Brailey et al.⁶ hypothesized a curvilinear interaction between unit cohesion and warzone stress exposure. The curvilinear interaction hypothesis states that unit cohesion protects against the development of PTSD and that this protective effect increases as stress exposure mounts from a low to moderate

level. However, at high levels of stress exposure, it is posited that cohesion not only loses its protective effect, but becomes detrimental (i.e., promotes the development of PTSD). This may explain why McTeague et al.⁴ found that cohesion and PTSD were inversely related whereas Fontana et al.⁵ found no relationship. That is, the combat veterans in the Fontana study were likely exposed to higher levels of stress exposure than the female healthcare providers examined by McTeague.

The notion that unit cohesion becomes a liability at high levels of stress exposure is consistent with the results of a secondary analysis by Fontana et al.⁵ using the same sample of male combat veterans from the NVVRS. When the effects of unit cohesion were examined at different levels of stress exposure, results showed that although high cohesion predicted less PTSD among those reporting low warzone stress, higher levels of cohesion predicted more psychopathology among those reporting high levels of stress.

Why good unit cohesion might increase the risk for PTSD in high stress conditions is not clear. Brailey and colleagues⁶ speculated that the protective effects of cohesion are largely attributable to an instilled sense of group efficacy (i.e., trust and confidence in the unit). During low to moderate levels of stress exposure, Brailey et al. argue that service members are able to meet the demands of the situation, thereby reinforcing their sense of group efficacy. However, at high levels of stress exposure, situational demands become insurmountable and problem-solving abilities are compromised. The sharp diminution of group efficacy may leave service members with a strong sense of disillusionment, increasing their risk for PTSD. Another explanation of how high unit cohesion may increase the risk for PTSD relates to the devastating effect of losing a close comrade (in highly exposed groups). Milgram and Hobfoll⁷ argued that service members with highly cohesive units will experience a greater sense of loss and survivor guilt than those from low cohesion units.

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Brailey et al.⁶ did not find evidence of a curvilinear interaction between unit cohesion and stress; however, the participants in this study were soldiers with no history of warzone deployment (stress exposure ratings were based on soldiers' previous life events). Thus, the authors suggest that the average rates of stress exposure were not high enough to detect a curvilinear interaction. Study samples with a large breadth and magnitude of warzone stress exposure are required to adequately test a curvilinear relationship.

To examine how unit cohesion and stress exposure relate to PTSD, we used data from Air Force medical personnel deployed to Iraq as part of Operation Iraqi Freedom (OIF). Medical personnel members serving within active warzones are known to face the dual burden of treating severely injured service members and being personally subjected to life threat.^{8,9} Given the magnitude of warzone stress often endured by this population, we expected to find evidence of the curvilinear interaction hypothesis posited by Brailey et al.

METHODS

Procedure

Data for this study were collected as part of a larger, ongoing longitudinal study funded by the United States Air Force Surgeon General's Operational Medicine Research Program (FA7014-07-C-0036). Medical personnel serving as part of the 332nd Expeditionary Medical Group voluntarily completed surveys while deployed at Joint Base Balad, Iraq in the period between December 2004 and December 2008. Participants' mean number of days deployed at the time of assessment was 80.2. Informed consent was obtained from participants before deployment.

Participants

A total of 705 U.S. Air Force medical personnel completed surveys while actively deployed as part of OIF. The sample included an almost equal number of men (48.4%) and women (51.6%), and participants were predominately white (69.1%), married (60.9%), between the ages of 25 and 29 years (19.3%), held a rank between E-4 and E-6 (41.3%), and had at least some college experience (92.7%).

Missing Data

Of the 705 medical personnel who completed surveys, 171 (24.3%) were missing data on at least one variable of interest. To account for this, we employed a full information maximum likelihood (FIML) missing data algorithm when conducting regression analyses. FIML assumes that data are "missing at random" and is considered a state-of-the-art missing data technique.^{10,11}

Measures

PTSD Checklist Military Version

A modified version of the PTSD Checklist (PCL),¹² the PCL-Military Version (PCL-M)¹³ was used to measure each of the

17 PTSD symptoms listed in the DSM-IV¹⁴ using a 5-point Likert scale. The PCL-M has strong psychometric properties,^{15,16} and showed good internal reliability in the present sample ($\alpha = 0.93$).

Unit Cohesion Scale

Military unit cohesion was examined using a 5-item, rationally derived measure containing items similar to those used by Brailey et al.⁶ Participants responded to items using a 5-point scale ranging from "not at all" to "extremely." Items were: "to what extent do you feel you belong in your present unit," "to what extent is your unit like a family to you," "do you respect the officers in your unit," "do you trust the airmen in your unit," and "how good are the available role models and leaders in your unit." The internal reliability for the current sample was adequate ($\alpha = 0.82$).

Military Healthcare Stressor Scale

The Military Healthcare Stress Scale is a 21-item measure that was developed for this study to assess typical stressors associated with healthcare practice in the combat environment. Items were derived from focus groups containing military members who had previously deployed to Iraq and served on the Air Force Critical Care Aeromedical Team. Participants rated the degree to which they were emotionally impacted by exposure to patients with severe injuries using a 5-point scale ranging from "did not happen" to "extreme impact." Items included: "exposure to patients who were about to die," "exposure to patients who lost a leg," and "exposure to patients with severe burns." The measure demonstrated good internal reliability ($\alpha = 0.96$).

Combat Experiences Scale (CES)

Exposure to events more commonly experienced by combat personnel (e.g., "being shot at," "shooting or directing fire at the enemy," and "being attacked or ambushed.") was assessed using a 21-item, rationally derived measure that includes many items drawn from the Peacekeeping Incidents and Experiences Scale.¹⁷ The CES asks participants to rate the degree to which events emotionally impacted them using a 6-point response format ranging from "does not apply" to "extreme impact." The internal reliability for the current sample was good ($\alpha = 0.89$).

Data Analyses

To measure the level of stress exposure endured by the present sample, descriptive analyses were obtained for PTSD, healthcare-related stress exposure, and combat-related stress exposure. Potential demographic group differences in cohesion were then examined. *T*-tests were used to test for differences as a function of gender (male versus female) and race (whites versus nonwhites), and multiple regression was employed to test cohesion's relationship with age, education level, and military rank.

Hierarchical regression analyses were used to test the primary study hypothesis. Total PCL-M score was used as the

dependent variable. Our analyses were based on the recommendations of Aiken and West¹⁸ and are consistent with the statistical methods used previously by trauma researchers examining curvilinear moderation.^{6,19} In step 1, healthcare-related stress exposure, combat-related stress exposure, and unit cohesion were entered as independent variables. To test for linear interaction effects, product terms for both warzone exposure scales and cohesion (healthcare-related stress \times cohesion and combat-related stress \times cohesion) were then entered in step 2. In step 3, curvilinear moderation was examined by squaring each of the exposure scales and including these in the analysis both by themselves, as well as in product terms with unit cohesion (healthcare-related stress² \times cohesion and combat-related stress² \times cohesion). All independent variables were grand mean centered before being entered into the analyses and product terms.

Because members of the 332nd Expeditionary Force were deployed in cohorts, we used the "intercepts only" multilevel method described by Hox²⁰ to test for possible nesting effects on all study variables, with cohort entered as a level 2 variable. No significant nesting effects were observed.

RESULTS

Stress Severity

The mean PCL-M score reported by participants was 26.76 (SD = 11.06). On average, service members reported being moderately or severely emotionally impacted by 2.50 combat-related events (SD = 2.71) and 5.09 healthcare-related events (SD = 6.38). The items most frequently rated as having a moderate or severe impact were "seeing children or mothers who were victims of war" (46.9%; healthcare scale) and "seeing dead or seriously injured Americans" (51.4%; healthcare scale).

Unit Cohesion

Unit cohesion had a significant inverse relationship with PTSD symptoms ($r = -0.30, p < 0.01$). Unit cohesion did not differ by race ($t = 0.29, d.f. = 692, p = 0.29$), military rank ($B = -0.03, SE B = 0.24, p = 0.90$), age ($B = 0.03, SE B = 0.11, p = 0.80$), or education level ($B = -0.01, SE B = 0.20, p = 0.96$). However, unit cohesion did differ between gender ($t = 3.03, d.f. = 492, p < 0.01$); greater unit cohesion was reported by men ($M = 12.80; SD = 4.08$) than by women ($M = 11.67; SD = 4.23$).

Hierarchical Regression

As shown in Table I, each step of the regression analysis produced a significant model. In step 1, higher levels of both healthcare- and combat-related stress were associated with increased PTSD symptom severity. Unit cohesion was found to have a significant inverse relationship with PTSD. In step 2, the linear moderation effect was significant for healthcare-related stress, but not combat-related stress. In step 3, no evidence was found of curvilinear moderation (the quadratic

TABLE I. Summary of Hierarchical Regression Analysis for Unit Cohesion, Healthcare-Related Stress, and Combat-Related Stress Predicting Current PTSD Symptom Severity

Variable	R ²	ΔR^2	B	SE B	β
Step 1	0.33**	0.33			
Healthcare-Related Stress			0.25	0.02	0.41**
Combat-Related Stress			0.12	0.03	0.14**
Unit Cohesion			-0.66	0.09	-0.25**
Step 2	0.36**	0.03			
Healthcare-Related Stress			0.24	0.02	0.39**
Combat-Related Stress			0.11	0.03	0.14**
Unit Cohesion			-0.61	0.09	-0.23**
+ Healthcare-Related Stress \times Unit Cohesion			-0.03	0.01	-0.20**
+ Combat-Related Stress \times Unit Cohesion			0.01	0.01	0.07
Step 3	0.43**	0.07			
Healthcare-Related Stress			0.22	0.02	0.36**
Combat-Related Stress			0.10	0.03	0.12**
Unit Cohesion			-0.53	0.10	-0.20**
Healthcare-Related Stress \times Unit Cohesion			-0.02	0.01	-0.11*
Combat-Related Stress \times Unit Cohesion			0.01	0.01	0.06
+ Healthcare-Related Stress ²			0.01	0.00	0.24**
+ Combat-Related Stress ²			0.00	0.00	0.10*
+ Healthcare-Related Stress ² \times Unit Cohesion			0.00	0.00	-0.07
+ Combat-Related Stress ² \times Unit Cohesion			0.00	0.00	0.06

N = 705; * $p < 0.01$; ** $p < 0.001$; ², squared.

product terms were nonsignificant); however, the quadratic main effects (healthcare-related stress², combat-related stress²) were significant (see Fig. 1).

Cohort Effects

Covariance parameter estimates were nonsignificant across all variables. Intraclass correlations indicated that cohort assignment accounted for less than 1% of the variance in PCL-M, cohesion, healthcare-related stress, and combat-related stress scores. Taken together, these findings indicate that cohort assignment was not significantly associated with any of the variables of interest in this study.

DISCUSSION

The purpose of this study was to examine how unit cohesion affects the relationship between warzone stress exposure and PTSD symptoms in military medical personnel. Specifically, we tested the curvilinear interaction hypothesis, which states that unit cohesion can promote the development of PTSD under high stress conditions. As expected, both healthcare-related stress exposure (i.e., treating severely injured victims of war) and combat-related stress exposure (i.e., experiencing personal life threat) were significantly related to PTSD symptom severity. Interestingly, both forms of stress exposure were found to relate to PTSD in a curvilinear fashion (Fig. 1). Service members exposed to a mild amount of warzone stress

endorsed fewer PTSD symptoms than those reporting no stress exposure. This suggests that some exposure to warzone stress may help to alleviate anticipatory anxiety among military medical personnel, possibly by providing individuals with an increased sense of self-efficacy. Alternatively, this finding can be seen as evidence for a stress inoculation effect,²¹ in which adaptive forms of coping are reinforced through rehearsal and application.

Contrary to our expectations, we found no evidence to support the curvilinear interaction hypothesis. We did, however, find a significant linear interaction between military unit cohesion and warzone stress exposure, such that greater cohesion was associated with lower levels of PTSD symptom severity (Fig. 2). This finding suggests that unit cohesion has a protective effect against the development of PTSD; it does not

increase the risk for PTSD, even at high levels of stress exposure. It is important to note that the magnitude of warzone stress endured by the average participant may have been insufficient for detecting a curvilinear effect. Similarly, the length of deployment at the time of assessment (80.2 days on average) may have precluded service members from experiencing a broad range of stressors. To date, the best evidence in support of the curvilinear interaction hypothesis comes from a sample of Vietnam combat veterans,⁵ which suggests that the situational demands and mission stressors associated with ground combat may be most likely to interact with cohesion in a curvilinear fashion.

To help identify potential predictors of unit cohesion, we examined differences in cohesion across a variety of demographic variables. Little is known about which factors might predict unit cohesion, and identifying these factors may ultimately inform efforts to enhance cohesion among service members. Consistent with the results of a study of Army soldiers,²² unit cohesion did not differ across racial groups. Furthermore, there were no group differences in cohesion as a function of age, education level, or military rank. We did find that men endorsed greater cohesion than women, although this difference was small. Taken together, these findings suggest that unit cohesion does not meaningfully relate to demographic group status. Future research aiming to identify predictors of cohesion may want to focus on other, non-demographic factors, such as unit members' previous life events.²³

There are several limitations to our study that should be noted. First, data were cross-sectional and obtained while participants were actively deployed. Although this leaves the data less prone to retrospective report bias,²⁴ it also precludes the examination of long-term outcomes associated with cohesion. Second, we relied on self-report using rationally derived assessment scales. As pointed out by Siebold,²⁵ this not only raises psychometric concerns, but prevents researchers from agreeing upon a precise definition of the construct and a standard for how to assess it. Third, some researchers have argued that subsequent to the loss of a close comrade, high cohesion may exacerbate one's feelings of loss and survivor guilt.⁷ Casualty rates within the 332nd Expeditionary Medical Group were not assessed in the present study. Accordingly, we were unable to test this theory. Finally, although most medical personnel members reported experiencing multiple stressful events having a strong emotional impact, it is possible that the magnitude and breadth of warzone stressors endured by this population does not sufficiently test the limits of the hypothesized curvilinear model.

Our findings provide further evidence that unit cohesion serves as a protective buffer against PTSD symptom development, regardless of level of stress exposure. Future research examining cohesion should sample military populations that have experienced high levels of stress exposure, including combat-related loss (i.e., ground combat troops). Research using prospective, longitudinal designs is needed to

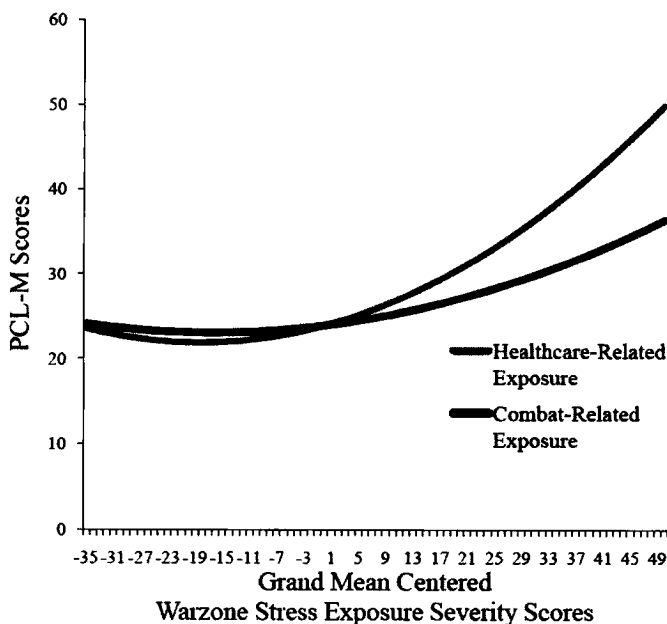


FIGURE 1. Curvilinear relationship between combat- and healthcare-related stress exposure and PTSD symptom severity.

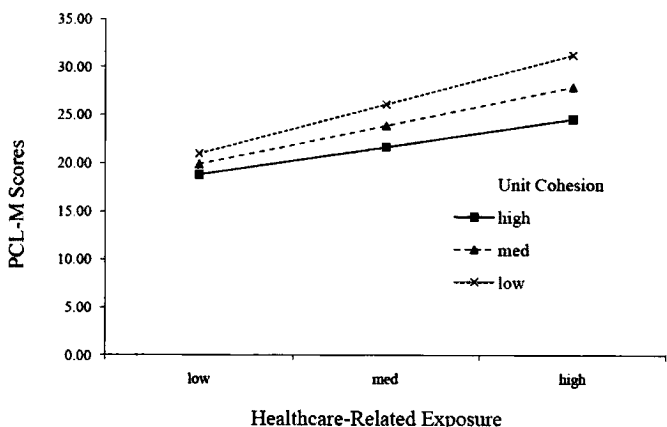


FIGURE 2. Linear interaction between unit cohesion and healthcare-related stress in predicting PTSD symptom severity.

draw causal conclusions about the relationship between unit cohesion and PTSD, as well as to identify possible variables mediating this effect. Given that cohesion is a modifiable construct, these data would inform efforts aimed at promoting cohesion among military units.

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2011 Study Publications and Presentations

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Factors of Combat Experiences and Associations with Psychological Symptoms Among
Deployed Military Medical Personnel

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Abstract

Research on the relationship between combat exposure and psychological morbidity often considers “combat” as a unitary construct without regard to the potential for subtypes of combat experiences. In this study, we considered the possibility that different subtypes of combat experiences might differentially relate to different forms of psychological and behavioral adaptation among 1,007 military medical providers halfway through their deployments to Iraq. Utilizing exploratory factor analysis with oblique rotation, we identified three distinct factors of combat experiences among deployed medical providers: Outside the Wire events comprised of patrolling in off-base areas among the local population, Aftermath events comprised of exposure to the consequences of violence and combat, and Witness events comprised of direct observation or experience of violent or injury-causing events. All factors were significantly correlated with higher levels of PTSD symptoms, depression symptoms, and negative mood, but were uncorrelated with positive mood. Only Outside the Wire events correlated with functional impairment. PTSD and depression symptoms were most strongly correlated with Aftermath events. Results suggest that different subtypes of combat experiences might be differentially related to various forms of psychopathology among deployed medical providers.

Keywords: military, deployment, PTSD, depression, exploratory factor analysis

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Deployed Military Medical Personnel

Most research concerning associations among deployment experiences and psychological morbidity has focused on military personnel engaged primarily in combatant roles (Peterson, Wong, Haynes, Bush, & Schillerstrom, in press). Accordingly, most work on deployment stressors treats exposure as a unitary construct with content focused on events marked by hostile or aggressive events (e.g., discharging weapons, witnessing explosions, being under attack; Breslau & Davis, 1987; Bryan, Cukrowicz, West, & Morrow, 2010; Castro & McGurk, 2007). In this framework, it is typical to find a dose-response relationship between combat exposure and mental health outcomes (e.g., Hoge, et al., 2004). However, the predictive relationship between unitary combat exposure scales and outcome is typically moderate at best. Because many researchers have failed to examine the depth and breadth of potentially traumatizing and stressful combat and operational experiences that service members face, especially in long-lasting guerilla wars of insurgency, considerable explanatory variance in outcome is left unexplained.

The idea that different subtypes of combat might differentially relate to psychological outcomes is not new. Fontana, Rosenheck, and Brett (1992) distinguished among several subtypes of combat experiences among Vietnam veterans, finding that these subtypes were differentially related to different forms of psychological disturbance (e.g., posttraumatic stress disorder [PTSD], depression, and suicidal behavior). For example, events in which veterans were unable to prevent the deaths of others were more strongly associated with suicidal behaviors and intrusive thoughts than were events in which veterans initiated aggression towards others. King, King, Gudanowski, and Vreven (1995) disaggregated war-zone exposure in Vietnam into

subconstructs—namely traditional combat, atrocities-abusive violence, perceived threat, and malevolent environment—and found differential patterns of relationships predicting PTSD.

One military occupational subgroup that might have deployment experiences distinct from those of traditional combatants includes medical professionals deployed far forward into combat zones who provide immediate medical care to injured service members (Maguen et al., 2008). Recent data have shown that deployed military personnel serving as noncombatants are nonetheless exposed to combat-related trauma, and this exposure is directly related to the development of symptoms of PTSD and depression (Peterson, Wong, Haynes, Bush, & Schillerstrom, in press). In addition to experiencing combat stressors (e.g., mortar attacks), military medical providers encounter medical stressors, such as caring for severely injured and dying service personnel, that may contribute to psychological morbidity, especially PTSD and depression (Burden, Jeffery, & Leach, 2005; Kolkow, Spira, Morse, & Grieger, 2007; Peoples, Gerlinger, Budinich, & Burlingame, 2005). A recent survey of military medical providers (Kolkow, et al., 2007) found that exposure to direct combat and perceived threats of personal harm were associated with a significant increase in the likelihood for probable PTSD but not for depression. Exposure to seriously injured or dead individuals was unrelated to either PTSD or depression, however, suggesting that different types of deployment experiences might be differentially related to distinct symptom clusters among military medical professionals. Kolkow et al.'s study is limited, however, by the inclusion of medical providers who had not deployed, which limits the generalizability of their findings.

The aim of this study was to empirically identify distinct subtypes of emotionally distressing combat experiences among military medical personnel currently deployed to a

combat zone, and to determine if these subtypes differentially related to measures of psychological health.

Methods

Participants and Procedures

Participants included 1,038 military medical professionals deployed to a combat support hospital located in Iraq. Gender was 50.6% male and 49.4% female. Age distribution was 15.8% 18-24 years, 18.8% 25-29 years, 17.1% 30-35 years, 15.4% 35-39 years, 12.6% 40-44 years, 11.5% 45-49 years, 5.5% 50-54 years, 2.1% 55- 59 years, 0.3% 60-64 years, 0.1% 65+ years, and 1.3% unknown. Racial distribution was 66.0% Caucasian, 11.5% African-American, 10.0% Hispanic/Latino, 4.7% Asian/Pacific Islander, 5.6% other, and 2.2% unknown. Rank distribution was 5.6% junior enlisted (E1-E3), 42.4% middle enlisted (E4-E6), 9.2% senior enlisted (E7-E9), 19.0% junior officer (O1-O3), 23.2% senior officer (O4-O6), and 0.6% unknown. On average, participants had been in Iraq for 83.0 ± 35.3 days at the time of survey completion. Participant demographics are summarized in Table 1.

Surveys were distributed to medical personnel approximately halfway through their deployment during unit formations, during which time study procedures were explained. Although surveys were distributed during formations to ensure all personnel had the opportunity to participate, survey completion was strictly voluntary. Surveys were returned anonymously to collection boxes distributed around the hospital and collected after the predetermined deadline. The anonymous surveys were then mailed back to the U.S. for entry into a secured database. The study was approved by Wilford Hall Medical Center's Institutional Review Board and reviewed by the U.S. Army's Joint Combat Casualty Research Team.

Measures

Combat experiences. The Combat Experiences Scale (CES) is a 22-item checklist of a range of combat-related experiences (e.g., being attacked or ambushed, shooting or directing fire at the enemy, seeing dead or seriously injured Americans, handling or uncovering dead bodies or body parts, etc.). Respondents are asked to indicate which events they have experienced at any time during the current deployment, and the emotional impact of each experience. If an event was not experienced, participants selected 0 (“does not apply” or “did not experience”). If an event was experienced, participants rated its emotional impact on a 4-point Likert scale ranging from 1 (“no impact”) to 4 (“extreme impact”). The CES used in the current study included items used previously in military-related research (Adler, Dolan, Bienvenu, & Castro, 2000; Bryan, et al., 2010; Hoge, et al., 2004; Mental Health Advisory Team (MHAT) V, 2008).

PTSD symptoms. The PTSD Checklist-Military Version (PCL-M; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report inventory that measures the severity of each DSM-IV PTSD symptom ranging on a scale from 1 (“not at all”) to 5 (“extremely”). The PCL-M is widely used as a clinical tool in the Department of Defense and the Department of Veterans Affairs, and has been used extensively in military-related research on PTSD among Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans (Terhakopian, Sinaii, Engel, Schnurr, & Hoge, 2008). Weathers and colleagues (1993) found that a cutoff score of 50 has 60% sensitivity and 99% specificity in a military sample, and is widely used as the optimal cutoff score for a likely PTSD diagnosis.

Depression symptoms. The 9-item depression scale of the Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001) was used to assess the frequency of depression symptoms on a scale from 0 (“not at all”) to 3 (“nearly every day”). The PHQ-9 is widely used in medical settings and is based directly on the DSM-IV criteria for major depressive disorder. A

cutoff score of 10 has very good sensitivity (.74 to .85) and specificity (.91 to .99) for a diagnosis of major depression obtained from various structured clinical interviews including the Composite International Diagnostic Interview (Arroll, et al., 2010) and Mini International Neuropsychiatric Interview (Adewuya, Ola, & Afolabi, 2006). It also correlates highly with other measures of depression such as the Beck Depression Inventory-Second Edition (Adewuya, et al., 2006).

Mood state. The Positive and Negative Affect Scale (PANAS; Watson & Clark, 1994) is a widely used measure of positive and negative emotional states. The survey consists of 20 descriptive terms that respondents rate on a scale of 1 (“very slightly or not at all”) to 5 (“extremely”), which load onto two factors: positive affect and negative affect. Positive affect reflects the extent to which a person feels enthusiastic, active, and alert, with high positive affect indicating a state of high energy, concentration, and pleasurable engagement, and low positive affect indicating a state of lethargy and sadness. In contrast, negative affect reflects subjective distress and displeasure, with low negative affect indicating a state of calmness and high negative affect indicating a state of discomfort and aversive mood states. For this study, the PANAS was administered using the “moment” temporal directions (i.e., respondents were requested to indicate how they feel *right now*), which has demonstrated good test-retest reliability ($r = .54$ for positive affect, and $r = .45$ for negative affect), indicating that even momentary mood ratings reflect general affective levels that do not considerably fluctuate (Watson, Clark, & Tellegen, 1988).

Functional impairment. The 3-item Role-Emotional scale of the widely-used SF-36 Version 2 (Ware, et al., 2007) was used to measure functional impairment secondary to emotional distress. Participants were asked to indicate how frequently they had experienced the following problems with work or other regular daily activities in the past month as a result of any

emotional problems: (1) cut down on the amount of time spent on work or other activities; (2) accomplished less than desired; and (3) accomplished work or other activities less carefully than usual. Each item was rated on a 5-point scale ranging from 1 (none of the time) to 5 (all of the time). Internal consistency estimates are good ($\alpha = .82$), and the scale has been found to be strongly associated with a wide range of psychological and physical health issues (Ware, Kosinski, & Keller, 1994).

Data Analytic Approach

Of the 1038 participants, only the 1007 (97.0% of the total sample) who completed all items of the Combat Experiences Scale (CES) were used for the current study's analyses. Exploratory factor analysis (EFA) was utilized to identify different types of combat experiences as measured by the CES, consistent with the best practices recommendations of Costello & Osborne (2008). Lorenzo-Seva and Ferrando's (2006) FACTOR software was used for all EFAs. Parallel analysis using marginally bootstrapped samples (Lattin, Carroll, & Green, 2003) was utilized to guide decisions regarding the optimal number of factors to be retained for rotation. Unweighted least squares method for factor extraction was chosen due to nonnormal distribution of CES items. A series of oblique rotations to allow for correlated factors were utilized and compared to one another using Lorenzo-Seva's (2003) Loading Simplicity Index (LSI); the rotated solution that demonstrated the simplest structure was ultimately retained. The Kaiser-Meyer-Olkin (KMO) value was .886 and the Bartlett's statistic was significant ($p < .001$), indicating the data was adequate for factor analysis.

To determine the relationship of psychological symptoms with each type of combat experience, we calculated Pearson correlations with 95% confidence intervals. The disattenuation procedures recommended by Osborne (2003) were utilized to correct all

calculated correlation coefficients. Disattenuation of coefficients provides the “true” shared variance of the variables if reliabilities were perfect for both, but it does not change the statistical significance of findings¹. Comparisons of disattenuated correlation coefficients were accomplished using the procedures detailed by Steiger (1980). The Holm-Bonferroni method (Holm, 1979) for multiple comparisons was utilized to control for error when determining the significance of correlation comparisons.

Results

Descriptive statistics

Means and standard deviations for all psychological variables are presented in Table 2. Mean PTSD symptoms and depressive symptoms were somewhat elevated among deployed medical personnel. Depression and PTSD symptoms were very highly correlated with each other in the positive direction. In addition, both of these variables were positively correlated with negative affect and functional impairment, and they negatively correlated with positive affect. Greater levels of functional impairment were significantly associated with higher levels of PTSD symptoms, depressive symptoms, and negative affect, and lower levels of positive affect.

What are the factors of combat experiences among deployed medical personnel?

Parallel analysis of CES items indicated that three factors should be extracted. Comparisons of the three-factor solution with a two-factor and four-factor solution confirmed that the three-factor model had best data fit, with a root mean square of residuals (RMSR) equal to .0385. All items in this initial EFA loaded above .30 on one factor, with only one item (item 5) crossloading onto two factors. We dropped this item and conducted a new EFA, which again indicated that a three-factor solution was optimal, with an RMSR = .0388. In this second EFA,

¹ In the current study, standard correlation coefficients are denoted by the conventional abbreviation *r*. Disattenuated correlation coefficients are denoted by this abbreviation with an asterisk (*r*^{*}).

however, several items did not load onto any of the three factors with a coefficient greater than .30 (items 1, 9, and 12). Because both models fit the data equally well, we decided to keep the initial EFA with all items retained, including the crossloading item 5. The final factor solution for this EFA is presented in Table 3. The first factor, named “Outside the Wire” (OTW), was comprised of activities and events that occur within the context of patrols and missions conducted off-base and within the local population. The second factor, named “Aftermath,” was comprised of events that are typically the consequence or result of injury and/or violence. The third factor, named “Witness,” comprised of events in which injury or violence was directly witnessed or experienced by the individual. The three factors demonstrated small to moderate intercorrelations, supporting their overlapping nature yet relative independence from one another: OTW/Aftermath, $r = .280$; OTW/Witness, $r = .555$; Aftermath/Witness, $r = .355$. Aftermath events were the most frequently endorsed events, with 93.8% of the sample reporting experiencing at least one Aftermath event, followed by 57.4% experiencing at least one Witness event, and only 22.7% experiencing at least one OTW event.

What are the relationships among different combat factors and psychological symptoms?

Means, standard deviations, Pearson correlations’ and corrected correlations among combat factors and symptom measures were next calculated, and are presented in Table 4. Correlations tended to be small to moderate in magnitude, with higher ratings of impactful combat events being associated with higher levels of PTSD symptoms, depression symptoms, functional impairment, and negative affect. In general, combat experiences were most significantly correlated with PTSD symptoms, followed by depression and negative affect, were only weakly associated with functional impairment, and were uncorrelated with positive affect. Aftermath events tended to demonstrate the relative strongest correlations with psychological

symptoms. Comparison of the disattenuated correlation coefficients confirmed this trend. Specifically, Aftermath events were more strongly correlated with PTSD and depression symptoms than OTW (PTSD: $z = 6.13, p < .001$; depression: $z = 5.63, p < .001$) and Witness (PTSD: $z = 4.08, p < .001$; depression: $z = 5.15, p < .001$) events, but were more weakly associated with functional impairment than OTW ($z = -3.06, p = .002$) events. Disattenuated correlation coefficients with 95% confidence intervals are graphically displayed in Figure 1.

Discussion

The primary aims of the current study were to first identify different subtypes of combat experiences among deployed military medical personnel and then to identify the relative magnitude of each identified type of combat with various indicators of psychological distress and impairment. Regarding the experience of various combat events, exploratory factor analysis (EFA) suggested three primary factors of combat experiences endorsed by medical personnel in the war-zone. The first factor, named Outside the Wire (OTW), was characterized by events typically associated with patrolling or conducting missions off-base within the local population (e.g., witnessing hostility between warring factions, removal of unexploded ordnance, patrolling areas, disarming civilians, shooting at the enemy, etc.). The second factor, named Aftermath, was characterized by direct exposure to the consequences or results of injury and/or violence (e.g., seeing physical devastation, handling or uncovering dead bodies or body parts, smelling the stench of decomposing bodies, having contact with traumatized civilians, etc.). The third factor, named Witness, was characterized by events in which the respondent directly observed or witnessed injury or violence as it occurred (e.g., being in an accident, being attacked or ambushed, being shot at, etc.).

Among deployed medical personnel, Aftermath events were associated with the greatest levels of PTSD and depression symptoms. This pattern of findings might suggest that exposure to aftereffects of violence and combat, to include injury, death, and trauma, may be particularly central to the development of psychological distress among deployed medical personnel relative to other threatening and potentially traumatic combat experiences including directly witnessing violence and injury, being attacked, and engaging in combat. Given the context of the deployed medical setting, one possible interpretation of these results is that Aftermath events may be associated with helplessness stemming from the inability to save patients' lives or prevent severe injury, which could trigger dysphoria and grief reactions that overlap with depressive symptoms (e.g., sadness, sleep disturbance, lowered energy, appetite changes). Another possibility is that higher levels of exposure to severe injury and death could contribute to emotional burnout or compassion fatigue (Stewart, 2009), both of which can also manifest in ways that overlap with depression (e.g., anhedonia, social withdrawal, decreased energy, decreased motivation, hopelessness).

This latter possibility seems especially relevant given the nature of deployed medical personnel's primary mission to provide direct medical care to injured individuals at military hospitals. Among deployed military personnel, Aftermath events are much more likely to be experienced than OTW or Witness events because military medical personnel are much less likely to patrol local areas or participate in military combatant actions (e.g., OTW events), and are therefore less likely to be repeatedly and directly exposed to combat and/or violence as it occurs (i.e., Witness events). They are, in contrast, much more likely to be exposed to the consequences of these actions (i.e., Aftermath events) with higher frequency. This is supported by our finding that 93.8% of the sample experienced at least one Aftermath event, but much

fewer experienced OTW (22.7%) and Witness (57.4%) events. In contrast to medical personnel, traditional combatants are more likely to have greater exposure to OTW and Witness events relative to Aftermath events since their primary duties are directly engaged in combat and patrol operations as opposed to medical care. This could explain why these types of events have traditionally shown strong associations with psychopathology among combatants (Breslau & Davis, 1987; Castro & McGurk, 2007; Hoge, et al., 2004). In a similar vein, repeated exposure to injury and death could therefore account for Aftermath's relatively stronger relationship with psychopathology among deployed medical personnel. Further research is needed to better understand this relationship.

One particularly interesting and unexpected finding was that Aftermath experiences were not correlated with functional impairment although they were rated as the most emotionally impactful and were most strongly linked with PTSD and depression symptoms, whereas the generally less emotionally upsetting OTW events were correlated with functional impairment. Although surprising, a similar pattern has been reported by others. Specifically, Jones and colleagues (2008) found that among British veterans of OIF, medical personnel with greater exposure to Aftermath-type experiences due to the provision of care to severely wounded personnel reported much lower levels of functional impairment postdeployment as compared to medical personnel who did not provide care for wounded personnel. The authors suggested that one possible explanation for this finding is that medical professionals with limited exposure to severely injured personnel were unable to fulfill their perceived role as caregivers, which might have increased their distress and contributed to functional impairment. Another possibility is that because Aftermath events fall within the professional anticipated scope of military medical personnel's duties, daily functioning remains relatively intact despite the stress associated with

these job-related experiences. Unfortunately our data cannot definitively explain this finding, although it is encouraging that the most emotionally distressing events for deployed medical personnel do not appear to be related to functional impairment, especially given the high frequency with which medical providers are exposed to Aftermath events while deployed (93.7% of the current sample endorsed exposure to at least one Aftermath item). If replicated, this finding could point to a form of “resilience” among military medical personnel that might otherwise be missed if emotional distress and functional impairment are not measured as separate domains.

The study is not without limitations. First, the sample consisted of only medical personnel with a reasonably restricted range of formal combat experiences, which limits generalizability to other military samples. Similarly, different combat experiences among different military professions could be experienced in different ways, such that correlations with psychopathological measures might differ in magnitude. Replications of the current study among more diverse military samples would be useful to further support our findings. Our study is also limited by the lack of measurement of the *frequency* of each combat event. The amount of exposure over time to potentially traumatic or aversive combat experiences such as death or violence could be another dimension of combat exposure that is differentially related to psychopathology. For example, exposure to a greater number of injuries and more death could potentially have a more useful or meaningful correlation with psychopathology than the method of measuring combat exposure used in this study (i.e., yes/no exposure to a variety of combat experiences). Finally, another notable limitation of the current study is utilization of self-report measures and an absence of psychological diagnoses. It is possible, for instance, that different psychological disorders could differentially affect how various combat events are experienced.

Overall, the general pattern of findings supports the perspective that different subtypes of combat experiences might be differentially related to various forms of psychopathology, especially among military medical personnel. This has important implications for clinical work and research with military populations. Specifically, it might be valuable to consider a variety of combat and operational experiences when working with military personnel because different deployment experiences might have differential impact on psychological outcomes.

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Table 1

Sample demographics

	<i>n</i>	<i>%</i>
Gender		
Male	396	38.2
Female	386	37.2
Missing	256	24.7
Age		
18-24	164	15.8
25-29	195	18.8
30-34	177	17.1
35-39	160	15.4
40-44	129	12.4
45-49	118	11.4
50-54	56	5.4
55-59	22	2.1
60-64	3	0.3
65+	1	0.1
Missing	13	1.3
Rank		
E1-E3	58	5.6
E4-E6	440	42.4
E7-E9	96	9.2
O1-O3	197	19.0
O4-O6	241	23.2
Missing	6	0.6
Race		
White	685	66.0
Black	119	11.5
Hispanic	104	10.0
Asian/Pacific	49	4.7
Other	58	5.6
Missing	23	2.2

Table 2

Means, Standard Deviations, Intercorrelations, and Corrected Intercorrelations for all Variables

		1	2	3	4	5
		Raw correlations				
1	PCL-M	1.000				
2	PHQ9	0.730*	1.000			
3	Functional Impairment	0.177*	0.157*	1.000		
4	Positive Affect	-0.267*	-0.366*	-0.126*	1.000	
5	Negative Affect	0.595*	0.558*	0.140*	-0.222*	1.000
		1	2	3	4	5
		Disattenuated (corrected) correlations				
1	PCL-M	1.000				
2	PHQ9	0.813*	1.000			
3	Functional Impairment	0.190*	0.175*	1.000		
4	Positive Affect	-0.289*	-0.410*	-0.136*	1.000	
5	Negative Affect	0.668*	0.648*	0.157*	-0.251*	1.000
	<i>M</i>	26.50	3.77	5.99	33.99	17.43
	<i>SD</i>	11.05	4.38	3.87	8.63	6.24

Note: * $p < .01$ level; PCL-M = Posttraumatic Stress Disorder Checklist-Military Version; PHQ-9 = Patient Health Questionnaire Depression Subscale.

Table 3

Final Factor Solution for the Exploratory Factor Analysis of the Combat Experiences Scale

Item	Factor Loadings			
	OTW	Aftermath	Witness	
1 Being in an accident	.121	.009	<u>.352</u>	
2 Being attacked or ambushed	-.023	.043	<u>.475</u>	
3 Seeing physical devastation	-.113	<u>.547</u>	.230	
4 Being shot at	-.040	.000	<u>.657</u>	
5 Being taken hostage	<u>.357</u>	-.119	<u>.452</u>	
6 Seeing dead bodies or body parts	-.014	<u>.758</u>	.007	
7 Handling or uncovering dead bodies or body parts	.086	<u>.709</u>	-.015	
8 Smelling the stench of decomposing bodies	.142	<u>.484</u>	.071	
9 Witnessing an accident which resulted in serious injury or death	.107	.133	<u>.307</u>	
10 Witnessing hostility between the former warring factions	<u>.309</u>	.098	.262	
11 Seeing dead or seriously injured Americans	-.094	<u>.700</u>	.040	
12 Knowing someone seriously injured or killed	.091	.091	<u>.316</u>	
13 Having to aid in the removal of unexploded ordinances (UXOs)	<u>.527</u>	.031	.099	
14 Patrolling areas (or riding in areas) where there were land mines	<u>.656</u>	-.049	.163	
15 Having hostile reactions from civilians you were trying to help	.229	<u>.406</u>	-.057	
16 Disarming civilians	<u>.661</u>	.065	-.005	
17 Having contact with traumatized civilians	.084	<u>.653</u>	-.084	
18 Witnessing hostility over property or boundary disputes	<u>.667</u>	.101	-.083	
19 Having to exercise restraint while patrolling	<u>.790</u>	.023	-.077	
20 Shooting or directing fire at the enemy	<u>.566</u>	-.043	.183	
21 Seeing children or mothers who were victims of war	-.004	<u>.668</u>	-.053	
22 Needing to police or manage civilians in chaotic or unpredictable conditions	<u>.328</u>	.176	.052	
	Variance	3.262	3.324	1.663
	Reliability estimate	.845	.858	.675

Note: OTW = Outside the Wire

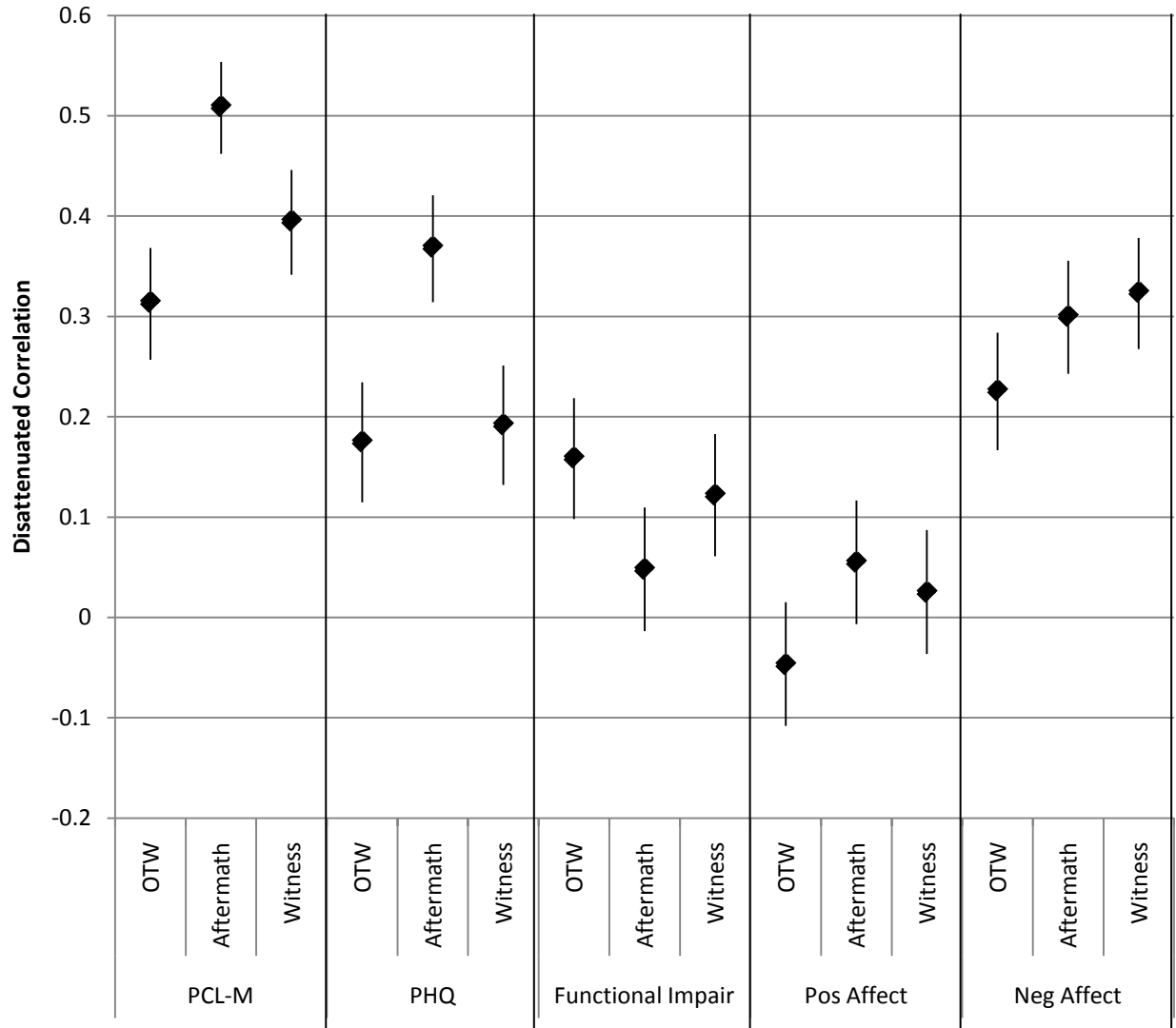
Table 2

Intercorrelations, and Corrected Intercorrelations for Psychological Variables with Factors of Combat Experiences

		Raw correlations		
		1	2	3
1	OTW	1		
2	Aftermath	0.280*	1	
3	Witness	0.555*	0.355*	1
4	PCL-M	0.278*	0.455*	0.313*
5	PHQ9	0.150*	0.318*	0.147*
6	Functional Impairment	0.141*	0.043	0.097
7	Positive Affect	-0.041	0.049	0.020
8	Negative Affect	0.192*	0.257*	0.246*
		Disattenuated (corrected) correlations		
		1	2	3
1	OTW	1		
2	Aftermath	0.329*	1	
3	Witness	0.735*	0.466*	1
4	PCL-M	0.314*	0.509*	0.395*
5	PHQ-9	0.175*	0.369*	0.192*
6	Functional Impairment	0.159*	0.048	0.122
7	Positive Affect	-0.047	0.055	0.025
8	Negative Affect	0.226*	0.300*	0.324*
	<i>M</i>	0.80	10.41	2.29
	<i>SD</i>	2.46	6.63	3.13

Note: * $p < .01$ level; OTW = Outside the Wire; PCL-M = Posttraumatic Stress Disorder Checklist-Military Version; PHQ-9 = Patient Health Questionnaire Depression Subscale.

Figure 1. Disattenuated correlation coefficients with 95% confidence intervals for the Hostility and Death factors of the Combat Experiences Scale with measures of psychopathology. OTW = Outside the Wire; PCL-M = PTSD Checklist-Military Version; PHQ = Patient Health Questionnaire; Pos Affect = Positive Affect; Neg Affect = Negative Affect.



APPA Poster

Project Title: Perceptions of Mental Healthcare and Willingness to Seek Treatment among Military Medical Personnel

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Introduction: The stigma faced by service members with psychiatric disorders has been well acknowledged (e.g., Hoge et al., 2004) and has led to efforts aimed at redressing this problem and promoting mental health service utilization. Recent findings suggest that perceptions of mental healthcare have improved among service members since the beginning of Operation Iraqi Freedom (Warner, Appenzeller, Mullen, Warner, & Griger, 2008); however, it remains unclear whether service members are becoming more willing to seek mental health treatment. Accordingly, we examined trends in service members' willingness to seek care.

Methods: Self-report data were collected from 378 Air Force medical personnel as part of an ongoing, longitudinal study. Assessments were completed approximately one-month after participants returned from Iraq. Measures included two face valid questionnaires, created specifically for this study, assessing willingness to seek treatment and alcohol consumption. In addition, participants completed the *PHQ – 9 Depression Scale* and the *PTSD Checklist (PCL)*. Internal consistency for each of these scales was found to be adequate (Cronbach alpha was not calculated for alcohol consumption, as this measure merely asks about the number of drinks consumed in the past month). The effect of time on service members' willingness to seek treatment was examined by comparing participants assessed between 2005-06 to those assessed between 2007-09. To rule out possible confounds, cohorts were compared on demographic variables, PTSD and depression symptomatology, and alcohol use.

Results: The sample was split about evenly with regards to gender and was varied with regards to rank, time in the military, age, education, and race. Chi-square analysis revealed that participants in the second cohort (2007-09) reported greater willingness to seek care. No differences were found between cohorts on demographic variables, alcohol use, PTSD, or depression.

Conclusion: It appears that efforts to reduce stigma are working; however, a salient minority of participants did not report a willingness to seek treatment. Thus, continued work is needed to address stigma among service members.

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Attitudes and Beliefs of U.S. Military Personnel about Providing Health Care
for Iraqi Patients in Operation Iraqi Freedom

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KEYWORDS

Military, Health Care, Medical, Operation Iraqi Freedom

ABSTRACT

As a part of Operation Iraqi Freedom and Operation New Dawn, U.S. military medical personnel have provided health care for Iraqi National Guard, civilians, and security detainees. However, little is known about the impact of this work. We surveyed U.S. military medical personnel ($N = 563$) concerning their level of comfort in caring for Iraqi patients and beliefs about providing health care. The results indicated that most medical personnel felt comfortable treating Iraqi National Guard (64%), civilian (59%), and security detainee (46%) patients, although a salient minority were uncomfortable (19%, 26%, and 37%, respectively) in these roles. Similar results were obtained regarding beliefs about using U.S. personnel to provide health care to Iraqi patients. Almost half of the participants (47%) did not believe they were adequately trained to care for or interact with Iraqi patients. The results suggest that medical personnel may benefit from enhanced predeployment cultural education and training.

INTRODUCTION

The traditional role of U.S. military medical personnel has been to provide health care for American service members in garrison and during military deployments. However, those deployed in support of Operation Iraqi Freedom, and now Operation New Dawn, have often devoted much of their time and resources to treating Iraqi civilians and combatants. This occurred as the U.S. military responded to a moral obligation to provide medical care to civilians and address a large humanitarian need created by war. Before the Persian Gulf War began in 1991, health care in Iraq was fairly extensive, comprising an intricate system of primary, secondary, and tertiary hospitals connected with communication and referral networks, and ample transport services and ambulances (HCG, 2003). However, years of sanctions by the United Nations and wars resulted in a deterioration of the Iraqi health care system (UNICEF, 2010; WHO, 2007; UN 2010). Although health care needs have increased, the capacity of the Iraqi health care system has decreased. For example, 20,000 of the 34,000 doctors registered in Iraq in 1990 have left the country, and only 30,000 out of the 80,000 beds needed for Iraqi patients are available in public hospitals (ICRC, 2008). Hospitals and primary health care facilities are outdated, lack medications and other basic medical supplies, and do not have enough emergency and operating rooms to care for the many patients generated by mass casualties (ICRC, 2008).

The resources required to meet the medical needs of the Iraqi people have placed a significant burden on the U.S. military medical care system (Murray, 2005). For example, one study (Stout et al., 2007) reported that over half of the hospitalized burn patients at the 28th Combat Support Hospital, which specialized in burn care, were Iraqi civilians or enemy combatants, whereas remaining patients were U.S. and coalition forces. Furthermore, the Iraqi

patients stayed for an average of 10 days (ranging from 1-53 days), even though the facility was intended for short-term care (1-3 days) or stabilization of critical conditions until patients could be aeromedically evacuated (Stout et al., 2007). Although American service members with severe medical conditions are often evacuated to state-of-the-art facilities out of theater, there are few such hospitals available for most Iraqi patients (Murray, 2005).

These circumstances have required U.S. military medical personnel deployed to Iraq to have extensive contact with Iraqi patients. It is important to understand how these circumstances affect these service members and the performance of their duties. Anecdotally, some U.S. military medical personnel have reported struggles with conflicting personal beliefs about treating Iraqi patients, some of whom are insurgents who might have killed or injured members of the U.S. coalition forces who are being treated at the same hospital (Boivin, 2005). Other anecdotal reports have described discomfort among military personnel while interacting with Iraqis due to vast cultural differences (Wong, 2004). These kinds of internal conflicts could affect care behaviors and morale and act as a source of stress and strain for health care providers. Unfortunately, most published reports on the attitudes and beliefs of U.S. military medical personnel regarding the treatment of Iraqi patients are based on informal personal testimony (e.g., Boivin, 2005).

In the present study, we surveyed 563 U.S. military medical personnel about their attitudes toward Iraqi patients and beliefs about their role in providing health care for Iraqi patients in the deployed setting. We additionally asked participants to assess the impact of predeployment training on their attitudes and beliefs toward Iraqi patients. In contrast to previous informal anecdotal testimonies, we also systematically collected data about deployment experiences, including reactions to working with Iraqi patients, through a free-response item.

METHODS

Procedure

Data were collected as part of a longitudinal study funded by the U.S. Air Force Surgeon General's Operational Medicine Research Program (FA7014-07-C-0036) investigating psychological risk and resilience in U.S. medical military personnel across the deployment cycle. Air Force medical personnel serving in Iraq between 2004 and 2009 voluntarily completed surveys approximately halfway into their deployment to a U.S. military hospital in Iraq. The purpose of the study was described to participants, and they were asked to volunteer to complete an anonymous survey. Completed surveys were returned in opaque, sealed envelopes to the associate investigators at the hospital. The study was reviewed and approved by the Institutional Review Board at Wilford Hall Medical Center, the Air Force Personnel Survey Program, and the U.S. Army's Joint Combat Casualty Research Team.

Participants

A total of 821 U.S. Air Force medical personnel completed and returned surveys. Out of these individuals, 25.1% ($n = 206$) did not complete any of the survey items measuring attitudes and beliefs about Iraqi patients, and 6.3% ($n = 52$) exhibited possible biased responding by leaving select questions blank. These individuals were therefore excluded from the analysis. All participants who fully completed the survey ($N = 563$) were included in the analysis.

The sample included 387 Caucasian (68.7%), 54 African American (9.6%), and 45 Hispanic (8%) participants. There was an almost equal distribution of men (35.7%) and women (37.1%). Some of the participants (27.2%) did not report their gender, primarily because this question was inconspicuously located on the form, making it easy to overlook. This was corrected on subsequent surveys after investigators became aware of the problem. Age range

was also diverse, including 91 participants (16.2%) between the ages of 18 and 24, 108 between 25 and 29 (19.2%), 100 between 30 and 34 (17.8%), 86 between 35 and 39 (15.3%), 68 between 40 and 44 (12.1%), 65 between 45 and 49 (11.5%), and 37 who were 50 or older (6.6%).

Additionally, the sample consisted of personnel from a range of enlisted (51.4%) and officer (42.8%) ranks. For enlisted personnel, 34 participants (6.0%) were between E-1 and E-3, 235 (41.7%) between E-4 and E-6, and 51 (9.1%) between E-7 and E-9. For officers, 115 (20.4%) were junior officers (O-1 to O-3) and 126 (22.4%) were field grade officers (O-4 to O-6). Totals and percentages did not always add up to the total number of participants due to some missing data.

Measures

Attitudes and Beliefs about Iraqi Patients Questionnaire. No pre-existing measure had been developed to address our central questions about attitudes and beliefs about caring for and interacting with Iraqi patients. Therefore, we had to rationally derive our own. The item content was developed from interviews with and feedback from U.S. military medical personnel working at a combat support hospital in Iraq. Many military medical personnel indicated that they were not adequately prepared to work with Iraqi patients and that, prior to deployment, they thought they would be working primarily with patients from the U.S. military and coalition forces. The interviews highlighted areas of concern pertained to predeployment training related to working with Iraqi patients, level of comfort in working with Iraqi patients, and the use of U.S. military medical personnel to treat Iraqi patients. One of the greatest areas of concern was the assessment and treatment of patients during mass casualty events. Although every person interviewed indicated a clear understanding of the Geneva Convention guidelines outlining the equal treatment of all patients in a military battle zone, many indicated they had experienced

significant distress during mass casualties. For example, some described difficulties in prioritizing and providing life-saving treatments for a combination of severely injured U.S. military personnel, Iraqi women and children, and insurgents, all seen as part of the same mass casualty event. Similar difficulties were described related to the provision of care to a variety of different patients during inpatient hospitalizations.

As a result of these interviews, we created a 9-item Attitudes and Beliefs about Iraqi Patients Questionnaire with responses ranging from 0 (strongly disagree) to 4 (strongly agree; see Table 1). One question assessed whether military medical personnel felt they were adequately prepared and trained to care for and interact with Iraqi patients prior to their deployment. Three questions evaluated level of comfort in the role of caring for and interacting with Iraqi National Guard, Iraqi civilian, and Iraqi security internee patients. Three additional questions evaluated the belief that U.S. military personnel should be used to evaluate and treat patients from these same three categories. One item evaluated the belief that U.S. military medical personnel should treat all patient categories equally (e.g., U.S. military, Iraqi National Guard, Iraqi civilians, Iraqi security internees, etc.) during a mass casualty event. The final item evaluated the belief that all patients should be given equal priority for assessment and treatment during inpatient hospitalizations. It is important to note that the responses to all of these items describe the personal beliefs of military medical personnel, not their actions. The questions were designed to detect possible internal conflicts some military medical personnel cope with while carrying out their duties.

Free Response Item. At the end of the survey, participants had the opportunity to comment on any topic related to their deployment experience. This response item specifically states: “Please write any additional written comments you may have about your medical

deployment experience in the space provided below.” Free responses were used for this paper to provide insight into questionnaire responses.

Data Analysis

The data analysis was conducted using SPSS version 18 (SPSS, Inc., Chicago, IL). Each item of the Attitudes and Beliefs about Iraqi Patients Questionnaire was analyzed separately, because items on the questionnaire were intended to measure multiple concepts rather than a single overarching concept. Frequency analyses were conducted for each item of the questionnaire. In the descriptive analyses reported in the results section, the 5-point range of item responses was collapsed into two categories including those who agreed (Somewhat Agree and Strongly Agree) or disagreed (Somewhat Disagree and Strongly Disagree).

RESULTS

Comfort in Role of Caring for and Interacting with Iraqi Patients

The frequency of responses on the Attitudes and Beliefs about Iraqi Patients Questionnaire are included in Table 1. Most deployed U.S. military medical personnel did not feel uncomfortable or uneasy in their role caring for or interacting with Iraqi patients. Military personnel were most comfortable working with Iraqi National Guard patients (63.5%), followed by Iraqi civilians (58.6%) and Iraqi security internees (46.2%). However, a salient minority of military medical personnel were uncomfortable in these roles related to all three Iraqi patient categories. Participants indicated that they were most uncomfortable in caring for or interacting with Iraqi security detainee patients (37.3%), followed by Iraqi civilian patients (26.1%) and Iraqi National Guard patients (19.2%).

Use of U.S. Military Medical Personnel to Evaluate and Treat Iraqi Patients

Most participants also agreed that deployed U.S. military medical personnel should be used to evaluate and treat Iraqi patients. The largest percentage agreed that U.S. personnel should be used to treat Iraqi National Guard patients (61.3%), followed by Iraqi civilians (47.8%) and Iraqi security detainees (37.3%). About one third of the military medical personnel did not believe that they should be used to treat Iraqi security detainees (31.3%) or Iraqi civilians (27.7%). A smaller percentage (17.8%) disagreed that they should provide care to Iraqi National Guard patients.

Prioritization of Assessment and Treatment during Mass Casualty Events

The questionnaire also surveyed personal beliefs about providing equal priority to a variety of patient categories during mass casualty events involving U.S. service members, Iraqi National Guard, Iraqi civilians, and Iraqi security internees. The majority of U.S. military medical personnel agreed that all patients should be equally prioritized during mass casualties (55.3%). However, about one third of participants (32.5%) expressed some level of disagreement that all of the groups should receive equal priority. It should be noted that there was no evidence that differential priority was actually given to any patient based on anything other than their medical status.

Prioritization of Assessment and Treatment During Inpatient Hospitalization

Personal beliefs were also assessed about providing equal priority to all patients during inpatient hospitalization. The majority of participants (58.8%) agreed that all patients should be equally prioritized during inpatient hospitalizations. A minority of participants (29.3%) expressed some level of disagreement that all of the groups should receive equal priority during inpatient hospitalization.

Predeployment Preparation and Training

The results indicated that almost half of the participants (46.7%) did not believe they had received adequate predeployment training to care for or interact with Iraqi patients. A smaller percentage of participants (38.9%) indicated that they had received adequate training. Somers' *d* analysis was used to quantify the degree of satisfaction with predeployment training (item 1 on the Attitudes and Beliefs about Iraqi Patients Questionnaire) and to predict attitudes and beliefs about treating Iraqi patients (items 2-9 on the questionnaire). There was a small but statistically significant relationship between satisfaction with predeployment training and all other items except item 6, the belief that U.S. military medical personnel should be used to evaluate and treat Iraqi National Guard patients (see Table 2). The direction of the relationship suggests that individuals who are more satisfied with predeployment training for working with Iraqi patients are more comfortable caring for and interacting with Iraqi patients. In addition, those more satisfied with their predeployment training had personal beliefs that were more in accord with their duty to treat Iraqi patients.

Free Response Items

To further explore attitudes and beliefs toward Iraqi patients, we evaluated free responses to the survey. Sixty-seven (11.9%) of the 563 participants provided free responses. Of the 67 participants who wrote free responses, 15 (22.4%) provided comments related to interacting with Iraqi patients. Some responses suggested that discomfort experienced while treating Iraqi patients may partly stem from cultural and language barriers. For example, one participant wrote, "Pre-deployment training should have included more about the population we were going to be treating—i.e. Iraqis ... 60+% ... so that we could have had the opportunity to learn more about the culture and language before we deployed." Other participants reported frustration related to coping with negative attitudes of Iraqi patients towards Americans. One participant wrote,

“...the Iraqi people who get our help don’t appreciate our help and think we are weak for doing it.” The same participant added, “you become bitter,” in part because “your cliental [sic] doesn’t want you here for the most part.” Another similarly responded that “despite what may be happening in the war zone, many of the Iraqi civilians/patients do not appreciate what we as America do for them.” This lack of positive regard within the caregiver and patient interaction may contribute to the discomfort of U.S. military medical personnel in their interactions with some groups of Iraqi patients.

In contrast, other participants expressed deep concern for their Iraqi patients and satisfaction with their role in providing health care for them. One wrote, “I have taken care of many Iraqis, but see them as human beings with devastating injuries.... We have seen quite a few children – infants, some of whose parents could not initially be found – that I found distressing. Overall my experience has been very positive – but I do look forward to going home.” Another wrote, “I’m proud that I deployed and hope I made an impact in someone’s life. I enjoyed working with the Iraqis, however ... I don’t know how I could have prepared myself for this emotionally.” A third participant remarked, “I’ve really enjoyed my time here in Iraq and find my work to be very rewarding. War’s devastation to the innocent, the women and children, is hardest for my heart.” Other participants additionally remarked on their general satisfaction with the role they served during deployment, though many of these responses did not specifically address interaction with Iraqi patients. For example, one participant wrote, “This deployment has been the best thing in my career thus far. I have truly been blessed with a mission like this and have felt that this was my purpose in life at this time.... I will be going back to my family and my duty station with a sense that I, (we as a team), have accomplished something here and did it well.”

DISCUSSION

Since the start of Operation Iraqi Freedom, tens of thousands of U.S. military medical personnel have deployed to Iraq to provide medical support for U.S. and coalition forces. In addition, considerable medical care has been provided to Iraqi patients. To better understand the potential impact of this work, we surveyed 563 deployed U.S. military medical personnel about their attitudes and beliefs regarding working with Iraqi patients. Most participants endorsed comfort with treating Iraqi National Guard, civilian, and security detainee patients, and most agreed with the policy to use the U.S. military to provide health care to Iraqis. In addition, free-response items indicated that working with Iraqi patients was often incredibly rewarding and fulfilling. However, a sizeable proportion expressed discomfort in working with Iraqi patients and did not believe that U.S. military medical personnel should be used to evaluate and treat Iraqi patients. These findings were most evident when working with Iraqi security detainees. About one third of the participants reported difficulties with the policy to provide equivalent medical care to all patient categories during mass casualty events and inpatient hospitalizations.

The free responses to the survey provided some insight into the challenges of working with Iraqi patients. Participants indicated that a primary challenge in assessing and treating Iraqi patients was related to cultural and language barriers. Most U.S. military hospitals in Iraq have contracted with local Iraqi interpreters to assist with bedside medical translation and to improve cultural competencies. However, these services are often limited, and many interpreters place their own lives and those of their family at risk by supporting the U.S. military.

The study and advancement of foreign languages and cultural competency is actively promoted by the U.S. military (McFarland, 2005; Watson, 2010), and cultural awareness classes are part of predeployment training for many military service members (Salmoni, 2006).

However, access to this training is limited for many medical personnel, and there are inevitable gaps in cultural sensitivity, knowledge, and comfort (Connable, 2009). This is in part due to the vast cultural and language divide that exist across different deployment locations.

British military medical providers who cared for Iraqis during Operation Telic provided anecdotal reports of similar difficulties with Iraqi language and culture (Hobart, 2005). They expressed particular concern about the language barrier because the interpreters lacked medical training and, as such, possibly obscured communication between the provider and the patient. Furthermore, cultural differences in areas such as illness behavior and religion can create challenges and tension for health care providers. With regard to illness behaviors, for example, British military medical providers in Operation Telic remarked that some Iraqi patients expressed symptoms that were more extreme than their actual ailment warranted (Hobart, 2005). Based on the results of the present study and from previous anecdotal reports, it seems likely that differences in culture and language contribute to the discomfort experienced by many military medical providers.

At times, equally prioritizing care for all patient demographic categories can be distressing for deployed military medical personnel. This is particularly true when critical medical resources are expended on enemy insurgents at the potential expense of the health or lives of U.S. service members and coalition forces. Though equally prioritizing patients based on medical status is clearly the ethical course of action, directly facing the reality of this situation in the military battlefield can be emotionally difficult. At times, health care personnel are required to neglect wounded American service members to provide treatment for enemy prisoners of war, some of whom may have injured or killed American service members and may attempt to do so in the future.

This study has several noteworthy limitations. First, the generalizability of our findings is limited because approximately 31% of participants did not complete any questions from the Attitudes and Beliefs about Iraqi Patients Questionnaire or only completed select questions. It is possible that these individuals did not feel comfortable expressing discomfort or disagreement with regard to their duties, even in an anonymous survey. Additionally, the analysis of free-response items was only descriptive; we did not undertake a formal content analysis of these responses. Furthermore, information gleaned from the free responses may be biased because very few of the participants ($n = 15$) wrote free responses relevant to their experience providing health care for Iraqi patients.

The results of the present study suggest that predeployment training has a positive impact on attitudes and beliefs about treating Iraqi patients. Enhanced predeployment education and training with an emphasis on medical cultural competencies in working with Iraqi patients and preparation to cope with potential discrepancies between personal beliefs and required actions may help decrease distress and increase psychological resiliency in deployed U.S. military medical personnel. Given our limited knowledge about the relationships between U.S. military medical providers and their Iraqi patients in deployed settings, additional research is warranted. We recommend that enhanced training in delivering culturally competent medical services be developed and evaluated for deploying U.S. military medical personnel.

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Table 1. Frequency of Responses to Items on the Attitudes and Beliefs about Iraqi Patients Questionnaire. ($N = 563$)

Question	Strongly Disagree	Somewhat Disagree	Unsure	Somewhat Agree	Strongly Agree
	(0) <i>n</i> (%)	(1) <i>n</i> (%)	(2) <i>n</i> (%)	(3) <i>n</i> (%)	(4) <i>n</i> (%)
I felt well prepared and trained to care for or interact with Iraqi patients prior to my deployment	112 (19.9)	151 (26.8)	81 (14.4)	166 (29.5)	53 (9.4)
I felt uncomfortable or uneasy in my role caring for or interacting with Iraqi civilian patients.	150 (26.6)	180 (32.0)	86 (15.3)	126 (22.4)	21 (3.7)
I felt uncomfortable or uneasy in my role caring for or interacting with Iraqi National Guard patients.	172 (30.6)	185 (32.9)	98 (17.4)	88 (15.6)	20 (3.6)
I felt uncomfortable or uneasy in my role caring for or interacting with Iraqi Security Internees (Enemy Prisoner of War).	115 (20.4)	145 (25.8)	93 (16.5)	139 (24.7)	71 (12.6)
I believe that U.S. military medical personnel should be used to evaluate and treat Iraqi civilian patients	54 (9.6)	102 (18.1)	138 (24.5)	173 (30.7)	96 (17.1)
I believe that U.S. military medical personnel should be used to evaluate and treat Iraqi National Guard patients	31 (5.5)	69 (12.3)	118 (21.0)	227 (40.3)	118 (21.0)
I believe that U.S. military medical personnel should be used to evaluate and treat Iraqi Security Internees (Enemy Prisoner of War).	81 (14.4)	95 (16.9)	134 (23.8)	165 (29.3)	88 (15.6)
I believe that during a mass casualty, all patients (e.g., U.S. military, Iraqi civilians, Iraqi National Guard, Iraqi Security Internees, etc.) should be given equal priority for assessment and treatment based on their medical status.	99 (17.6)	84 (14.9)	69 (12.3)	131 (23.3)	180 (32.0)
I believe that during inpatient hospitalization, all patients (e.g., U.S. military, Iraqi civilians, Iraqi National Guard, Iraqi Security Internees, etc.) should be given equal priority for assessment and treatment based on their medical status.	72 (12.8)	93 (16.5)	67 (11.9)	147 (26.1)	184 (32.7)

Table 2. Correlation of Item 1, Satisfaction with Predeployment Training for Caring for and Interacting with Iraqi patients, with Items 2-9, Attitudes and Beliefs About Iraqi Patients

Questionnaire. ($N = 563$)

Question	Correlation with Item 1, Predeployment Training Satisfaction:	
	Somers' <i>d</i> Value	<i>p</i> -Value
I felt well prepared and trained to care for or interact with Iraqi patients prior to my deployment.		
I felt uncomfortable or uneasy in my role caring for or interacting with Iraqi civilian patients.	-.19	$p < .001$
I felt uncomfortable or uneasy in my role caring for or interacting with Iraqi National Guard patients.	-.20	$p < .001$
I felt uncomfortable or uneasy in my role caring for or interacting with Iraqi Security Internees (Enemy Prisoner of War).	-.21	$p < .001$
I believe that U.S. military medical personnel should be used to evaluate and treat Iraqi civilian patients	.09	$p = .016$
I believe that U.S. military medical personnel should be used to evaluate and treat Iraqi National Guard patients	.07	$p = .066$
I believe that U.S. military medical personnel should be used to evaluate and treat Iraqi Security Internees (Enemy Prisoner of War).	.13	$p < .001$
I believe that during a mass casualty, all patients (e.g., U.S. military, Iraqi civilians, Iraqi National Guard, Iraqi Security Internees, etc.) should be given equal priority for assessment and treatment based on their medical status.	.15	$p < .001$
I believe that during inpatient hospitalization, all patients (e.g., U.S. military, Iraqi civilians, Iraqi National Guard, Iraqi Security Internees, etc.) should be given equal priority for assessment and treatment based on their medical status.	.14	$p < .001$

Impact of Combat, Healthcare, and Family and Personal Stressors on Symptoms of PTSD and
Depression in Military Medical Personnel During Deployment to Iraq

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Abstract

Military medical personnel often experience a mixture of healthcare and professional stressors and potentially traumatic, combat-related experiences during deployment to war zones. This puts them at risk for posttraumatic stress disorder and comorbid problems, such as depression. Like all service members, medical personnel also have to manage stressors related to their personal lives during deployment, such as separation from family members, personal and family health problems, and financial difficulties, which also may negatively impact mental health. We surveyed 704 military medical personnel during their deployment to Iraq to evaluate the association between these 3 classes of stressors (combat, healthcare, and personal/family stressors) and symptoms of posttraumatic stress disorder (PTSD) and depression. Symptoms of posttraumatic stress disorder and depression significantly correlated with each predictor (combat, healthcare, and personal/family stressors). However, combat exposure did not predict PTSD or depression symptoms after controlling for personal/family stressors and healthcare stressors.

Keywords: posttraumatic stress, depression, healthcare, combat, family and personal stress

Impact of Combat, Healthcare, and Family and Personal Stressors on Symptoms of PTSD and Depression in Military Medical Personnel During Deployment to Iraq

Many military personnel deployed in service of Operations Iraqi Freedom (OIF), New Dawn (OND), and Enduring Freedom (OEF) are exposed to combat, increasing their risk for developing posttraumatic stress disorder (PTSD) and depression. In a survey of combatants who had deployed to Iraq and Afghanistan, 58–95% reported being attacked or ambushed, and 84–92% reported receiving incoming artillery, rocket, or mortar fire (Hoge et al., 2004). More frequent combat exposure was associated with higher rates of PTSD, and approximately 6% of service members deployed to OEF and 12–13% of those deployed to OIF met strict criteria for PTSD¹ (Hoge et al., 2004). Additionally, about 7–8% of combatants who returned from deployment to OIF or OEF met strict criteria for depression² (Hoge et al., 2004). Another survey indicated a positive linear relationship between combat exposure and PTSD and depression for Soldiers, and a positive linear relationship between combat exposure and PTSD (but not depression) for Marines (Office of the Surgeon, Multinational Force–Iraq and Office of the Surgeon General, U.S. Army Medical Command, 2006). This survey focused primarily on Soldier and Marine combat teams but included military support units as well. Additional surveys conducted in military personnel with various specialties found that 7.6% of those deployed to OEF or OIF and exposed to combat met strict criteria for new-onset PTSD, as opposed to 1.4%

¹The strict criteria for PTSD used by Hoge and colleagues (2004) is the same as that used by other studies cited in this manuscript (Kolkow, Spira, Morse, & Grieger, 2007; Smith et al., 2008), requiring participants to endorse at least one intrusion, three avoidance, and two hyperarousal symptoms with at least a moderate level of severity on the PTSD Checklist (Weathers, Litz, Herman, Huska, & Keane, 1993), and to obtain a total score of ≥ 50 .

²Strict criteria for depression included meeting DSM-IV criteria for major depression based on the Patient Health Questionnaire (PHQ; Kroenke, Spitzer, & Williams, 2001), and endorsing impairment in home, work, or interpersonal functioning at a level of “very difficult” on the PHQ (Hoge et al., 2004).

who were deployed but did not report combat exposure (Smith et al., 2008). These surveys demonstrate that exposure to combat events is high among OEF and OIF personnel, and frequency of exposure is directly related to risk for PTSD and depression.

Military healthcare providers deployed to war zones are also at an elevated risk for stress-related mental and psychological health problems (Armed Forces Health Surveillance Center, 2010; Kolkow, Spira, Morse, & Grieger, 2007; Martin, 2007; Smith et al., 2008). Some research suggests that military healthcare specialists face a risk for new-onset PTSD that is comparable to that of combatants. The Millennium Cohort Study indicated that 2.9% of military healthcare personnel met strict criteria for new-onset PTSD after deployment (controlling for pre-deployment trauma), as compared with 2.4% of combatants (Smith et al., 2008). Using less specific and more sensitive diagnostic criteria (endorsement of two of the four PTSD screening questions on the Postdeployment Health Assessment), another study identified possible PTSD among 10.5% of deployed combatants compared to 13.9% of healthcare specialists (Martin, 2007).

The risk for deployment-related psychopathology in healthcare personnel may, in part, be due to the higher risk for exposure to combat-related events (e.g., life threat) in modern warfare. For example, due to the increased emphasis on smaller and faster military units, military healthcare teams are becoming increasingly mobile (Gawande, 2004). Small teams of healthcare providers, such as Forward Surgical Teams, follow directly behind combat troops and set up temporary medical facilities in the combat zone (Gawande, 2004). These advances in military healthcare practice allow wounded troops to receive medical attention sooner, but they also position military healthcare providers close to combat where they may be exposed to threats such as incoming fire and rocket-propelled grenades.

Moreover, noncombatant military medical personnel may be at increased risk for stress-related problems compared to combat troops because the latter receive intensive training for combat—they expect that these events will occur, and they have the opportunity to return fire (Peterson, Wong, Haynes, Bush, & Schillerstrom, 2010). In contrast, the training of medical personnel has an entirely different emphasis, and few expect repeated exposure to mortal danger. In addition, medical personnel are unauthorized to fight unless their patients or assets are under direct attack.

In addition to combat exposure, deployed healthcare specialists must cope with stressors related to providing medical care in a combat zone, such as exposure to grotesque wounds and severe burns, as well as handling dead bodies and body parts. Though the evidence clearly suggests that combat stressors contribute to elevated distress and risk for psychological health problems, research findings regarding the contribution of healthcare stressors are mixed. Kolkow and colleagues (2007) found that exposure to combat-related events, such as frequently being in direct combat or being fired on by enemy forces, as well as frequent perception of personal danger, increased the risk of PTSD (but not depression) in military healthcare providers. Conversely, exposure to healthcare-related stressors (including exposure to wounded or dead friendly forces, enemy forces, or civilians) was unrelated to an increased risk for PTSD or depression (Kolkow et al., 2007). Similarly, Koren et al. (2009) reported that Israeli hospital workers in a war zone were not at elevated risk for PTSD despite their frequent exposure to casualties.

However, these findings are at odds with other studies that have found that healthcare stressors such as witnessing injury and death can create risk for PTSD. For example, Vietnam veteran nurses with PTSD have been found to have heightened physiological responses to scripts

describing a traumatic military nursing event they witnessed (Carson et al., 2000). Furthermore, moderate to severe levels of anxiety can develop in hospital nurses (Kerasiotis & Motta, 2004), suggesting that the day-to-day medical traumas take a toll on nurses' mental health. Higher levels of PTSD symptoms (McCarroll, Ursano, & Fullerton, 1995) and short-term dysphoria (Jones, 1985) have developed in military personnel who have been exposed to human remains. Research among rescue workers, whose first-response experience after disasters resembles that of medical personnel in a war zone, further supports the idea that working with trauma survivors can increase risk of PTSD. One study of rescue workers after a plane crash revealed that workers who assisted survivors were nearly 3 times more likely to develop PTSD in comparison with workers who did not assist survivors (Fullerton, Ursano & Wang, 2004). Altogether, the literature provides an unclear picture of the impact of healthcare stressors on mental health.

Preliminary evidence suggests that stressors related to personal and family life might also affect the mental health of deployed medical personnel. Though service members are geographically separated from family-related stressors during deployment, many communicate regularly with family and friends back home through phone calls or the Internet. Although communication with family and friends may boost morale, it can also be stressful. For example, surveys of peacekeeping troops shortly after telephone communication became widely available in the deployed setting indicated that, although the majority of Soldiers reported that calls home boosted their morale, a salient minority reported that telephone calls home were associated with negative experiences or negative affect (Applewhite & Segal, 1990). Communicating with the home front may be stressful in several ways. For example, families may continue to rely on service members to make important household decisions (Applewhite & Segal, 1990; Ender, 1995). Service members may additionally learn of family crises that they cannot resolve because

of their absence, or they might receive bad news from home in an uncontrolled or unsupportive setting (Applewhite & Segal, 1990).

Consistent with these ideas, preliminary evidence suggests that personal and family stress negatively affect mental health in deployed service members. Data collected from U.S. Army personnel after returning from Iraq indicate that concerns about deployment-related life and family disruptions are associated with more symptoms of PTSD and depression, a higher number of physical symptoms, and worse overall mental, physical, and cognitive functioning (Vogt, Proctor, King, King, & Vasterling, 2008). A separate report described results of a hierarchical linear regression analysis on these data, investigating a variety of factors contributing to change in PTSD symptoms from pre- to postdeployment (Vasterling et al., 2010). Analyses revealed that concerns about life and family during deployment, combined with postdeployment life events, explained 7% of the variance in PTSD symptoms among active duty personnel, and 22% in National Guard members, after the authors controlled for demographics and predeployment PTSD symptoms (Vasterling et al., 2010).

Data collected before deployment in Air Force medical personnel and in National Guard members corroborate the important contribution of family and personal stress. Maguen et al. (2008) found that personal and family stressors³ were related to PTSD symptoms and negative affect in Air Force medical personnel before deployment. Similarly, another study found that National Guard members' predeployment concerns about the disruption of life and family were associated with PTSD and depression symptoms before deployment, with a stronger relationship for women than men (Carter-Visscher et al., 2010). Though data collected both before (Maugen

³ Maguen et al. (2008) referred to personal and family stressors before deployment as "predeployment stressors." Our study surveys the same stressors during deployment, but labels them as "personal and family stressors."

et al., 2008; Carter-Visscher et al., 2010) and after (Vogt et al., 2008; Vasterling et al., 2010) deployment seem to indicate the importance of family and personal stressors, the effect of these stressors during deployment has not been documented. Given the frequency of communication with family and friends throughout deployment, events related to personal and family life might be important contributors to stress during deployment, potentially reducing resilience toward mental health problems that may develop during deployment, such as depression and PTSD.

If personal and family stress poses an additional risk factor for mental health problems, then mental health providers working to prevent and treat psychological health problems in the deployed setting may be able to use this information in treatment planning and therapy. Information about the impact of personal and family stressors during deployment might also provide justification for improvement in services offered to deployed service members, such as family support and assistance. It may additionally be useful to understand how personal and family stress affects deployed medical personnel in particular, since they are already at increased risk due to combat and healthcare stressors. We surveyed deployed Air Force medical personnel for their exposure to stressors related to personal and family life, and we examined the association between personal and family stressors and symptoms of PTSD and depression. To compare the contribution of personal and family stressors with previously researched stressors in deployed medical personnel, we also investigated the relative contribution of personal and family stressors, combat exposure, and healthcare stressors to symptoms of PTSD and depression through multiple regression.

Methods

Procedures

Data were collected as a part of a larger, ongoing study of psychological risk and resilience in deployed military medical personnel (Maguen et al., 2008; Dickstein et al., 2010). Surveys were distributed during deployment at an Air Force hospital in Iraq between 2004 and 2010. The purpose and voluntary nature of the study were explained to participants in a group setting. Participants completed the written surveys anonymously and returned them in opaque, sealed envelopes. The study was reviewed and approved by the Institutional Review Board at Wilford Hall Medical Center.

Participants

A total of 704 U.S. Air Force medical personnel completed the survey during active deployment. Participants completed the survey an average of 81.94 days ($SD = 32.98$) into deployment. The majority of participants were male, between 18 and 29 years old, married, Caucasian, had some college education, had a military ranking between E-4 and E-6, and had been in the military for 10 years or less (see Table 1).

Measures

Combat Stressors. The Combat Experiences Scale (CES) is a rationally derived 22-item scale based on the Peacekeeping Incidents and Experiences Scale (Adler, Dolan, Bienvenu, & Castro, 2000). Participants indicate the occurrence and impact of combat-related events such as “being shot at” and “being attacked or ambushed.” Responses range from 1 to 6 on a Likert scale. Participants who did not experience the event select 1 (*does not apply*) or 2 (*did not experience*), whereas participants who did experience the combat stressor rate its emotional impact on a scale from 3 (*no impact*) to 6 (*extreme impact*).

Healthcare Stressors. The Military Healthcare Stressor Scale (MHSS) is a 21-item scale measuring the occurrence and impact of healthcare-related stressors experienced by

medical personnel in the deployed setting. The MHSS was developed based on information gathered during focus groups including military medical personnel who had deployed to Iraq and who worked on the Air Force Critical Care Aeromedical Transport Team. Likert scale responses range from 1 to 5. Participants who did not experience the stressor select 1 (*did not happen*), whereas participants who did experience the stressor rate its impact on a scale ranging from 2 (*no impact*) to 5 (*extreme impact*).

Personal and Family Stressors. The 13-item questionnaire about personal and family stressors was rationally derived and modified from a questionnaire used in a study of peacekeepers in Somalia (Litz, King, King, Orsillo, & Friedman, 1997) and Kosovo (Maguen, Litz, Wang, & Cook, 2004). The questionnaire asks participants whether personal issues (such as health or financial problems) and family-related issues (such as lack of family support and family responsibilities) have been concerning them, and if so, to what extent. Items also include deployment related stressors, such as separation from family members and friends. For each potential stressor, participants respond 0 (*does not apply*) or rate the level of their concern about issues on a Likert scale from 1 (*very low*) to 5 (*very high*). Previous research using this scale demonstrated that it has acceptable internal consistency ($\alpha = .76$; Maguen et al., 2008).

PTSD Symptoms. The Posttraumatic Stress Disorder Checklist-Military Version (PCL-M) is a brief, self-report scale used to assess symptoms of PTSD (Weathers, Litz, Herman, Huska, & Keane, 1993). Participants rate the extent to which each of 17 PTSD symptoms have been bothering them during the past month on a scale from 1 (*not at all*) to 5 (*extremely*). The PCL correlates with other gold-standard measures of PTSD such as the Clinician-Administered PTSD Scale, and it has excellent test-retest reliability and internal consistency (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Weathers et al., 1993).

Depression Symptoms. The Patient Health Questionnaire-9 (PHQ-9) evaluates frequency over the past two weeks of each of the nine major depressive disorder symptoms in the DSM-IV on a scale from 0 (*not at all*) to 3 (*nearly every day*; Kroenke, Spitzer, & Williams, 2001). The scale has excellent internal consistency and test-retest reliability, and its overall validity has been well established by multiple studies (Kroenke et al., 2001).

Data Analysis Plan

After we adjusted for combat and medical stress, we used multiple linear regression analysis to test the hypotheses that personal and family stress predicts severity of PTSD and depression symptoms. The PCL-M score served as a measure of PTSD symptoms, and the PHQ-9 score served as a measure of depression symptoms. We fit separate models to predict each of these two dependent variables. The independent variables in each model included personal stressors, combat stressors, and medical stressors plus their interactions. We centered all independent variables on their grand mean. Ordinary least squares regression produced skewed and heteroscedastic residuals. Therefore, we used a robust linear regression analysis. We first identified and removed multivariate outliers with a minimum generalized variance algorithm and then estimated the regression parameters using skipped regression analysis with a Thiel-Sen estimator (Wilcox, 2005; R Development Core Team, 2009). We used a percentile bootstrap method to estimate 95% confidence intervals and rejected all null hypotheses at the two-sided $p < .05$ significance level.

Results

Preliminary Analysis

To characterize our participants, we first calculated unadjusted means for each measure, and compared PTSD and depression symptoms reported by our sample to clinical cutoffs. Our

sample had a mean score of 20.61 ($SD = 8.26$; range 0–55) on the Personal and Family Stressor Scale, a mean of 51.71 ($SD = 17.82$; range 21–102) on the Military Healthcare Stressor Scale, and a mean of 48.08 ($SD = 13.74$; range 22–96) on the Combat Experiences Scale. The sample had a mean score of 26.10 ($SD = 10.58$; range 17–77) on the PCL-M, which is well below the established clinical cutoff score of 44 (Blanchard et al., 1996) to 50 (Hoge et al., 2004; Weathers et al., 1993) for possible PTSD. The sample had a mean score of 3.66 ($SD = 4.21$; range 0–26) on the PHQ-9. Total scores less than 5 on the PHQ-9 are almost always indicative of the absence of a depressive disorder (Kroenke et al., 2001).

In Table 2 we report the number of participants who endorsed moderate to high concern for each item on the Personal and Family Stressor Scale. Table 3 reports the intercorrelation matrix for all variables in this analysis. Because not all variables were normally distributed, we report Spearman's rank-order correlations.

Multiple Regression Analysis

Table 4 displays the regression analysis of PTSD symptoms. Because all independent variables are mean centered, the regression parameters reflect the expected change in PTSD symptoms for each unit of change in the predictor when all other predictors in the model are held at their mean level. None of the interaction terms in the model was statistically significant. Personal/family stressors and medical stressors were directly associated with PTSD symptoms; however, combat stressors did not significantly predict PTSD symptoms after we adjusted for the other variables.

Table 5 displays the regression analysis of depression symptoms. As in the PTSD regression analysis, all independent variables were mean centered. None of the interaction terms was statistically significant. As for PTSD symptoms, personal/family and medical stressors were

directly associated with symptoms of depression, but combat stressors did not significantly predict symptoms of depression after adjusting for the other predictors.

Discussion

We found that personal and family stressors, as well as healthcare stressors, conferred risk for the onset or worsening of symptoms of PTSD and depression in military medical personnel during deployment. These findings are inconsistent with previous reports that exposure to higher levels of healthcare-related stressors did not increase risk for PTSD in hospital staff in a war zone in Israel (Koren et al., 2009) or in American medical personnel deployed to Iraq and Afghanistan (Kolkow et al., 2007). Different methods of evaluation may partly explain discrepant findings. Koren et al. did not evaluate individual subjects, but rather classified hospital workers into high or low levels of exposure based on their specialty (e.g., oncology was classified as low exposure whereas the emergency room was classified as high exposure). Kolkow et al. simply evaluated whether military healthcare personnel reported that they frequently observed or provided care for injured or dead civilians, friendly forces, or enemy forces. Whereas Kolkow et al. and Koren et al. simply dichotomized participants into high and low exposure groups, we assessed individual differences on scales that directly measure the relevant variables. Our results add to the mounting evidence (Carson et al., 2000; Jones, 1985; Kerasiotis & Motta, 2004; McCarroll et al., 1995) that exposure to healthcare related stressors has a negative impact on mental health.

Though combat exposure significantly correlated with self-reported symptoms of depression and PTSD, it was not a significant predictor of PTSD or depression symptom severity after adjusting for exposure to personal/family stressors and healthcare stressors. These results suggest that healthcare and personal/family stressors are uniquely implicated in the etiology and

maintenance of mental health symptoms in deployed medical personnel. These findings are consistent with research on service members stressed by deployment-related life and family disruptions among National Guard personnel before deployment (Carter-Visscher et al., 2010) and Army personnel after deployment (Vogt et al., 2008; Vasterling et al., 2010). In combination with these previous findings, our research suggests that providing predeployment training or services to assist in coping with personal and family stressors during deployment might improve psychological resilience among deployed military personnel.

Our study has several limitations. For example, our results cannot be generalized to nonmedical personnel. Additionally, the cross-sectional study design prevents us from determining causality. Though logic suggests that stressors might lead to onset of symptoms of PTSD and depression, participants experiencing symptoms of depression and/or PTSD may exaggerate their self-reports of personal and family, healthcare, and combat related stressors due to a negatively biased point of view. Also, stressors and psychological symptoms were entirely self-reported. Despite its limitations, this study provides important new information regarding the key role of healthcare stressors, as well as personal and family stressors, as predictors of psychological health in deployed military medical personnel.

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Table 1

Sample Demographics (N = 704)

Demographic	Number (%)
<i>Gender</i>	
Male	286 (40.6%)
Female	244 (34.7%)
<i>Age (years)</i>	
18-29	249 (35.7%)
30-39	231 (33.1%)
40-49	166 (23.8%)
50-59	48 (6.9%)
60-64	3 (0.4%)
<i>Marital Status</i>	
Married	424 (60.2%)
Single	153 (21.7%)
Divorced	73 (10.4%)
Engaged	36 (5.1%)
Separated	10 (1.4%)
Other	2 (0.3%)
<i>Race/Ethnicity</i>	
White or Caucasian	480 (68.2%)
Black or African American	71 (10.1%)
Hispanic or Latino	65 (9.2%)
Asian or Pacific Islander	34 (4.8%)
Other	41 (5.8%)

Highest Education

GED or High School Diploma	47 (6.8%)
Some College	201 (28.6%)
Associates Degree	101 (14.3%)
4-year College Degree	145 (20.6%)
Masters Degree	121 (17.2%)
Doctoral Degree	79 (11.2%)

Military Rank

E-1 – E-3	37 (5.3%)
E-4 – E-6	303 (43.0%)
E-7 – E-9	62 (8.8%)
O-1 – O-3	140 (19.9%)
O-4 – O-6	159 (22.6%)

Length of Time in Military (years)

0-10	360 (51.2%)
11-20	251 (35.7%)
21-30	85 (12.1%)
30+	7 (1.0%)

Note. Due to missing responses, frequencies do not sum to the total sample size. A particularly high number of participants (24.7%; $n = 174$) did not report gender. This likely was due to the inconspicuous placement of the gender question on early versions of the survey, a problem amended in later versions.

Table 2

Mid-deployment Personal and Family Stressors (N = 704)

Item	Number (%) Endorsing Item as Medium, High, or Very High Concern
Being separated from family members and friends	486 (69.0%)
Family responsibilities	294 (41.8%)
Completion of personal business before deployment	230 (32.7%)
Health problems of family members	215 (30.5%)
Problems with co-workers	201 (28.6%)
Personal health problems	152 (21.6%)
Not having friends to talk to or do things with	133 (18.9%)
Financial problems	108 (15.3%)
Death of close friend or family member	70 (9.9%)
Being unfairly treated in my relationship	63 (8.9%)
Lack of support from my family	50 (7.1%)
Emotional or mental abuse in my relationship	27 (3.8%)
Physical abuse in my relationship	0 (0%)

Table 3

Spearman Rank-Order Correlations Among the Combat Experiences Scale (CES), Medical Healthcare Stressor Scale (MHSS), Personal and Family Stressors (FAM/P), PTSD Checklist-Military Version (PCL-M), and Patient Health Questionnaire-9 (PHQ-9) in Deployed Military Personnel (N=704)

Variable	Correlation				
	1	2	3	4	5
1. CES	—	.54	.26	.35	.21
2. MHSS		—	.29	.49	.39
3. FAM/P			—	.44	.43
4. PCL-M				—	.71
5. PHQ-9					—

Note. All correlations are significant ($p < .05$).

Table 4

Results of Linear Regression Analysis of PTSD Symptoms

Predictor Variable	Regression Parameter	Standard Error	95% Confidence Interval		<i>p</i>
			Lower Limit	Upper Limit	
Constant	22.563	0.400	21.805	23.348	<.000001
Combat	0.039	0.031	-0.034	0.085	.341
Personal	0.272	0.069	0.145	0.413	<.000001
Medical	0.106	0.026	0.053	0.153	<.000001
Personal x Combat	0.006	0.006	-0.010	0.016	.651
Personal x Medical	0.006	0.005	-0.005	0.015	.274
Combat x Medical	0.005	0.002	-0.001	0.007	.097
Family x Combat x Medical	0.001	0.0004	-0.0004	0.001	.364

Note. Thiel-Senn statistic for the model = 77.607, $p < .000001$.

Table 5

Results of Linear Regression Analysis of Depression Symptoms

Predictor Variable	Regression Parameter	Standard Error	95% Confidence Interval		<i>p</i>
			Lower Limit	Upper Limit	
Constant	11.378	0.207	11.048	11.888	<.000001
Combat	0.013	0.013	-0.014	0.037	.412
Personal	0.120	0.002	0.053	0.170	.002
Medical	0.047	0.011	0.021	0.066	.002
Personal x Combat	-0.001	0.002	-0.005	0.004	.766
Personal x Medical	0.003	0.002	-0.002	0.006	.376
Combat x Medical	0.001	0.001	-0.0003	0.003	.155
Family x Combat x Medical	-0.0001	0.0002	-0.0003	0.0003	.850

Note. Thiel-Senn statistic for the model = 60.946, *p* = .002

Psychological Trauma: Theory, Research, Practice, and Policy

Posttraumatic Growth and Posttraumatic Stress Among Military Medical Personnel

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Posttraumatic Growth and Posttraumatic Stress Among Military Medical Personnel

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Military medical personnel deployed to war zones are dually burdened with stressors related to providing healthcare and combat and operational experiences. To better understand how different types and levels of stress exposure relate to positive and negative mental health outcomes among military medical personnel, the associations between combat and healthcare stress exposure and posttraumatic growth and posttraumatic stress disorder (PTSD) were examined among 253 Air Force medical personnel recently redeployed from Iraq. Both types of stress exposure were uniquely associated with increased PTSD symptomatology. However, combat exposure was linearly associated with PTSD, suggesting a dose-response relationship, whereas the relationship between healthcare stress and PTSD was curvilinear. Both forms of stress exposure showed an inverted U-shaped relationship with posttraumatic growth.

Keywords: military, posttraumatic growth, PTSD, medical personnel

Military medical personnel deployed to war zones provide care to wounded and severely injured service members, and they are also directly exposed to various war zone-related threats. The duties of military medical personnel include providing direct med-

ical care to combat casualties in hostile areas (e.g., providing field transfusions and field-expedient anesthesia while under fire), removing human remains from combat zones during life-threatening circumstances, being assigned to grave registration, and assisting with the handling and identification of deceased bodies (Peoples, Gerlinger, Budinich, & Burlingame, 2005; Peterson, Nicolas, McGraw, Englert, & Blackman, 2002). In addition to the pressure and stress of treating wounded military personnel and civilians, medical personnel are also at risk of personal injury from attacks with small arms fire, mortars, rockets, and improvised explosive devices. Thus, these individuals are potentially dually burdened by the risk of combat stress exposure as well as exposure to high magnitude stressors related to their duties as a medical service provider (e.g., bearing witness to the trauma and suffering of those they treat).

To date, very little is known about the possible negative or positive psychological effects of these types of experiences on military medical personnel. Most research on service members has focused on examining the effects of combat stress among combat troops. These studies have found evidence of a dose-response relationship between combat exposure and psychological distress, with higher levels of exposure predicting worse mental health outcomes (e.g., McCarroll, Fullerton, Ursano, & Hermsen, 1996; McCarroll, Ursano, Fullerton, Liu, & Lundy, 2002). For example, soldiers and Marines serving in Iraq exposed to high levels of combat stress (e.g., attacks or ambushes, getting shot at, seeing

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dead bodies or human remains) were most likely to develop a psychiatric disorder, including major depression, generalized anxiety, and most notably, posttraumatic stress disorder (PTSD; Hoge et al., 2004).

Military medical personnel deployed to war zones work within high-threat areas, evaluating and treating a large number of combat casualties that involve gruesome forms of injury. This type of occupational stress, termed “healthcare stress,” involves bearing witness to the grotesque aftermath of battle while providing care to fellow service members with life threatening injuries. Healthcare stress has been associated with the expression of chronic PTSD symptoms among healthcare providers (Burden, Jeffery, & Leach, 2005; McCarroll et al., 2002; McTeague, McNally, & Litz, 2004; Paul, 1985). Thus, we would expect that military personnel exposed to both healthcare and combat stress would be at risk for various forms of psychological distress, especially PTSD.

Although exposure to potentially traumatic events is a defining risk factor for the development of PTSD (e.g., Kulka et al., 1990), growing evidence suggests that stress exposure can also lead to positive psychological change (e.g., Cordova, Cunningham, Carlson, & Andrykowski, 2001; Linley & Joseph, 2004; McMillen, Smith, & Fisher, 1997; Tedeschi & Calhoun, 1996). Exposure to military stress and trauma can also be a maturing and growth experience for some service members. Posttraumatic Growth (PTG) is defined as the subjective experience of positive psychological change reported by individuals as a result of their struggle with trauma (Tedeschi & Calhoun, 2004). PTG can entail self-improvement, better interpersonal relationships, and a newfound appreciation for life after stressful or traumatic experiences (Tedeschi & Calhoun, 1996). Some studies suggest that in the wake of some potentially traumatic events, PTG may be a more likely outcome than psychopathology (Quarantelli, 1985; Tedeschi, 1999). In one study, 77% of soldiers deployed to Bosnia reported positive psychological changes as a consequence of their deployment, whereas 63% reported a negative consequence, and 47% reported both positive and negative consequences (Newby et al., 2005).

Several studies have found that higher levels of stress exposure are associated with higher levels of PTG (Aldwin, Levenson, & Spiro, 1994; Davis, Nolen-Hoeksema, & Larson, 1998; McMillen, Smith, & Fisher, 1997). Although these findings seem to suggest that greater stress exposure yields greater PTG in a direct, linear fashion, it is improbable that psychological growth continues indefinitely and that growth is greatest at extreme levels of stress exposure. A study of former refugees and displaced people in Sarajevo found a quadratic (inverted U) relationship between PTG and trauma exposure (Powell, Rosner, Butollo, Tedeschi, & Calhoun, 2003). PTG was highest among refugees when levels of trauma exposure were relatively moderate; however, PTG decreased as the level of trauma exposure continued to mount. A curvilinear relationship between stress exposure and PTG is consistent with research by Card (1983), who found that those with the highest reported levels of combat exposure in Vietnam combat veterans were the least likely to report growth. Thus, in contrast to the dose-dependent relationship between stress exposure and PTSD, high levels of trauma exposure may make growth less likely.

Although military medical personnel may endure many extremely aversive events, there is good reason to assume that providing healthcare services is highly rewarding and can safeguard against stress reactions. Despite dangerous and demanding

circumstances, healthcare providers may benefit from having a context and assuming a role that “provides a reassuring structure and sense of purpose in a landscape of uncertainties and disruption of social ties” (Calderón-Abbo, Kronenberg, Many, & Ososfsky, 2008, p. 211). The importance of taking an active role is highlighted by Hobfoll, Canetti-Nisim, Galea, Johnson, and Palmieri’s (2007) notion of action-based growth. Hobfoll and colleagues suggest that the benefits associated with PTG are critically dependent upon translating meaning-making cognitions to action. It follows then that roles that require individuals to take active, concrete steps toward problem solving may promote PTG by supporting individuals’ sense of control and validating feelings of autonomy and competency. In this way, actively providing care for fellow service members in acute pain and suffering could lead to increased distress while simultaneously promoting PTG.

To date, no research has examined how the unique experiences of deployed military medical personnel relate to PTSD and PTG. The present study examined the relationship between different types of stress exposure and positive and negative mental health outcomes among military medical personnel redeployed from Iraq. Specifically we tested whether these relationships were linear (dose-response) or quadratic (U-shaped). It was hypothesized that both types of stress exposure would be positively related to PTSD and PTG but that PTG would decrease at the highest levels of reported stress exposure.

Method

Participants

Participants were 253 Air Force medical personnel (40.7% were men, 37.5% were women, and 21.7% did not indicate their gender) who were recently redeployed from Iraq as part of Operation Iraqi Freedom. Participants were predominately Caucasian (70.4%), married (67.2%), and had obtained an associate’s degree or higher (69.6%). Participants varied in age: 12.6% were 18–24 years old, 17% were 25–29, 17.4% were 30–34, 24.1% were 35–49, 17% were 40–44, and 11.9% were ≥ 45 . Participants represented a range of military rank: 5.5% were E1–E3 (enlisted), 23.3% were E4–E6 (junior noncommissioned officers), 3.4% were E7–E9 (senior noncommissioned officers), 12.3% were O1–O3 (company grade officers), and 9.7% were O4–O6 (field grade officers). The length of time in the military also varied: 0–5 years: 40.2%; 6–10 years: 22%; 11–15 years: 15.1%; 16–20 years: 14.8%; 21–25 years: 5.8%; 25–30: 1.8%.

Measures

Posttraumatic growth. The Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) is a 21-item scale designed to assess personal growth after a range of stressful experiences. Items are rated on a scale from 0 (*I did not experience this change as a result of my crisis*) to 5 (*I experienced this change to a very great degree as a result of my crisis*). Numerous studies have demonstrated a five-factor structure for the PTGI in nonmilitary samples (e.g., Linley, Andrews, & Joseph, 2007; Morris, Shakespeare-Finch, Rieck, & Newbery, 2005; Taku, Cann, Calhoun, & Tedeschi, 2008). These factors are as follows: appreciation of life (e.g., “My priorities about what is important in life”), relating to others

(e.g., “Knowing that I can count on people in times of trouble”), new possibilities (e.g., “I established a new path for my life”), personal strength (e.g., “Knowing I can handle difficulties”), and spiritual change (e.g., “A better understanding of spiritual matters”). The PTGI showed excellent internal consistency in the current sample ($\alpha = .96$).

PTSD symptoms. The PTSD Checklist, Military Version (PCL-M; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report inventory that assesses the severity of PTSD symptoms. The PCL-M uses a five-point Likert scale ranging from 1 (*not at all*) to 5 (*extremely*) to evaluate the severity of each *Diagnostic and Statistical Manual (DSM-IV*; American Psychiatric Association, 1994) symptom of PTSD, including reexperiencing symptoms, avoidance and emotional numbing symptoms, and hyperarousal symptoms. The PCL-M has strong psychometric properties (e.g., Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Bliese et al., 2008; Weathers et al., 1993) and showed excellent internal reliability in the current sample ($\alpha = .96$).

Healthcare stress exposure. The Military Healthcare Stressor Scale (MHSS) is a 21-item measure of exposure to typical stressors associated with healthcare practice in the combat environment. Items were rationally derived from focus groups with medical military members who were previously deployed to Iraq and individuals who served on the Air Force Critical Care Aeromedical Transport team. The scale includes items such as “Exposure to patients with gaping wounds,” “Exposure to patients that I didn’t have a clue how to help,” and “Exposure to patients with severe burns.” Items are rated on a scale from 0 (*No Impact*) to 4 (*Extreme Impact*), with the additional response option of *Did not happen*. The measure demonstrated excellent internal reliability ($\alpha = .95$).

Combat stress exposure. The Combat Experiences Scale (CES) is a list of 22 stressful experiences that may have occurred during the deployment. Items were modified from previous scales (Castro, Bienvenu, Huffmann, & Adler, 2000). Items assess events that nonmedical, combat personnel often experience but which may be experienced by some medical personnel. The scale includes items such as “Being shot at,” “Being attacked or ambushed,” and “Shooting or directing fire at the enemy.” Items are rated on a scale from 0 (*No Impact*) to 4 (*Extreme Impact*), with additional response options of *Does not apply* and *Did not experience*. The CES showed excellent internal reliability in the current sample ($\alpha = .92$).

Personal stress. The Current Stressors/Adversities Checklist (CSAC; Litz, King, King, Orsillo, & Friedman, 1997) is designed to measure the extent to which respondents are currently troubled or concerned by common life stressors such as “Financial problems” and “Being separated from family and friends.” Each of the 13 items is rated on a five-point scale from 1 (*Very Low*) to 5 (*Very High*), with *Does Not Apply* as an additional response option. The items were rationally derived and modified from the Litz et al. (1997) study of peacekeepers from Somalia ($\alpha = .84$) and the Maguen et al. (2004) study of peacekeepers from Kosovo ($\alpha = .87$). Among the larger study sample of military medical personnel, the CSAC has demonstrated good reliability ($\alpha = .76$) and good convergent and discriminate validity with measures of PTSD risk and resilience at predeployment (Maguen et al., 2008).

Positive military experiences. The General Military Experience Scale (GMES) is designed to assess thoughts and appraisals

of a current military experience (e.g., “To what extent is your unit like a family to you?”, “How much do you feel the nation supports the military these days?”, and “How proud do you feel your family and friends are of your military service?”). This nine-item scale includes a five-point response format with anchors ranging from *not at all* to *extremely*. The GMES was modified from the Positive Military Experiences Scale (Litz et al., 1997), which has demonstrated excellent internal reliability ($\alpha = .81$, Litz et al., 1997; $\alpha = .87$, Maguen et al., 2004). The modifications altered the wording of a subset of items to make the scale more relevant to the current conflict (e.g., “Do you believe Americans appreciate the importance of military duty in the post 9/11 world?”). The GMES has shown excellent internal reliability among the larger study sample of military medical personnel ($\alpha = .83$) and good convergent and discriminate validity with measures of PTSD risk and resilience at predeployment (Maguen et al., 2008). The internal reliability for the current study sample was good ($\alpha = .78$).

Procedure

Data for this study were collected as part of a larger, ongoing longitudinal study funded by the United States Air Force Surgeon General’s Operational Medicine Research Program. For the larger study, participants are medical personnel deploying from a large medical center to serve as part of the expeditionary medical group in Iraq between September 2004 and December 2009. Participants were invited to voluntarily complete surveys on five occasions: (1) predeployment; (2) two months after the start of the deployment, (3) one month after returning from a four-month deployment, (4) six months after return from the deployment, and (5) again at the 12-month point after returning from the deployment. Data from the third time point (one month postdeployment from Iraq) were used for the current study. Potential participants were contacted by e-mail prior to mailing the postdeployment surveys. The e-mail notified participants that the survey had been sent to them in the mail and invited those individuals who were no longer stationed at a large medical center to request that a survey be sent to them by providing their mailing address. The completed surveys were then returned in a self-addressed envelope to the research staff. Participants’ mean number of days deployed at the time of assessment was 80.4. After informed consent, participants completed surveys in a standardized group setting. The institutional review boards at the large medical center and at the VA Boston Healthcare System approved all procedures and materials.

Statistical Analyses

Hierarchical regression analyses were used to examine the relationships between combat stress exposure and symptoms of PTSD, combat stress exposure and PTG, healthcare stress exposure and symptoms of PTSD, and healthcare stress exposure and PTG. To control for the possible influence of positive military experiences and current personal stressors on the relationship between stress exposure and the criterion, scores on the GMES and CSAC were entered in the first step of all regression analyses. For each of the four regression models, the independent measures were entered in two hierarchical steps: First, the linear predictor (CES or MHSS) and control variables (GMES and CSAC) were entered; and second, the quadratic predictor (CES or MHSS) was included in the analysis.

Results

Table 1 shows the mean, standard deviation, and range for all study measures. Nearly one quarter of the sample (23%) fell above a clinical cut off score of 32 on the PCL-M (Bliese et al., 2008). Mean scores on the PTGI were low given the range of possible scores. Mean scores on the CES and the MHSS showed slight positive skewing (<1.5). Table 2 shows the results of the regression analyses for combat stress exposure on PTSD (Model 1) and on PTG (Model 2). In Model 1, the first multiple regression analysis with CES-linear predicting PTSD was significant, and CES-linear had a significant positive regression weight. The addition of CES-quadratic in step 2 did not produce a significant increase in R^2 , and CES-quadratic did not contribute to the full model.

Model 2 shows the results of the regression analyses for PTG on combat stress exposure. In step 1, the first multiple regression analysis with CES-linear predicting PTG was significant, and CES-linear had a significant positive regression weight. The addition of CES-quadratic in step 2 produced a significant increase in R^2 , with CES-quadratic showing a significant positive relationship to the criterion.

The relationships between combat stress exposure and the outcome variables are depicted in Figure 1. Graphs were created by plotting the regression equation across different levels of each independent variable. As shown, PTSD symptoms were linearly related to CES scores such that combat stress exposure was positively associated with greater PTSD symptoms. PTG, in contrast, had a positive linear and a negative quadratic relationship with CES scores; PTG increased as scores on the CES rose from low to moderate and began to decline as scores continued to increase.

Table 3 shows the results of the analyses examining the relationship between healthcare stress exposure and the outcome variables. As shown, the addition of the MHSS-quadratic component significantly increased the level of variance explained by Models 3 and 4. Healthcare stress exposure was found to have a significant positive relationship with PTSD, and a significant negative relationship with PTG.

Figure 1 also depicts the relationships between healthcare stress exposure and the outcome variables. Symptoms of PTSD had a positive linear and a positive quadratic relationship with healthcare stress exposure, whereas PTG had a positive linear and a negative quadratic relationship.

Table 1
Means, Standard Deviations, and Ranges on All Study Measures

Measure	<i>n</i>	<i>M</i>	<i>SD</i>	Range	
				Potential	Actual
PCL-M	253	27.04	11.77	17–75	17–75
PTGI	203	38.56	25.64	0–105	0–105
CES	208	9.84	7.45	0–88	0–44
MHSS	243	23.16	15.77	0–84	0–63
GMES	249	22.02	5.60	0–45	9–36
CSAC	242	16.76	8.53	0–65	0–44

Note. PCL-M = PTSD Checklist, Military Version; PTGI = Posttraumatic Growth Inventory; CES = Combat Experiences Scale; MHSS = Military Healthcare Stressor Scale; GMES = General Military Experience Scale; CSAC = Current Stressors/Adversities Checklist.

Table 2
Summary of Regression Analyses for Combat Stress Exposure

	<i>B</i>	<i>SE B</i>	<i>F</i>	<i>R</i> ²	ΔR^2
Model 1: PTSD					
Step 1			53.21***	.48	.48***
CES-linear	.89***	.09			
GMES	-.16	.12			
CSAC	.34***	.08			
Step 2			39.87***	.48	.00
CES-linear	.95***	.12			
GMES	-.16	.12			
CSAC	.37***	.08			
+CES-quadratic	-.00	.00			
Model 2: PTG					
Step 1			4.42**	.10	.10**
CES-linear	1.12**	.33			
GMES	.72	.44			
CSAC	.10	.28			
Step 2			5.77***	.16	.06**
CES-linear	1.78***	.39			
GMES	.76	.42			
CSAC	.09	.27			
+CES quadratic	-.08**	.03			

Note. MHSS = Military Healthcare Stressor Scale; CES = Combat Experiences Scale; GMES = General Military Experience Scale; CSAC = Current Stressors/Adversities Checklist.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

This study examined how combat and healthcare stress relates to PTSD and PTG among recently returning OIF/OEF military medical personnel. As expected, higher levels of both combat and healthcare stress were associated with higher levels of PTSD symptoms. The results also showed that both combat and healthcare stress were associated with higher levels of reported PTG. This finding is consistent with past research and underscores the notion that growth and emotional distress are not mutually exclusive. For example, a recent meta-analysis of 87 cross-sectional studies covering a broad range of stressful events indicated that although “benefit finding” (as measured by the PTGI and other similar scales) was associated with lower depression and greater positive well-being, it was also associated with greater intrusive and avoidant thoughts about the stressor (Helgeson, Reynolds, & Tomich, 2006). Recent studies of Israeli ex-POWs (Solomon & Dekel, 2007) and of Israelis civilians exposed to terror (Hall et al., 2010; Levine, Laufer, Hamama-Raz, Stein, & Solomon, 2008) also highlight the connection between PTG and PTSD. These studies showed that PTG increased as PTSD increased and that reported growth only diminished at high levels of PTSD. Consistent with this research, our results show that increased stress exposure is related to both PTG and PTSD, with trajectories only diverging at the highest reported levels of stress exposure.

Military medical personnel are dually burdened by combat and healthcare stress, both of which appear to put them at risk for developing PTSD. The results of this study show that healthcare stress is positively related to symptoms of PTSD and that this risk increases at higher levels of healthcare stress. In other words, the highest levels of healthcare stress were more strongly associated with PTSD symptom severity than lower reported levels of health-

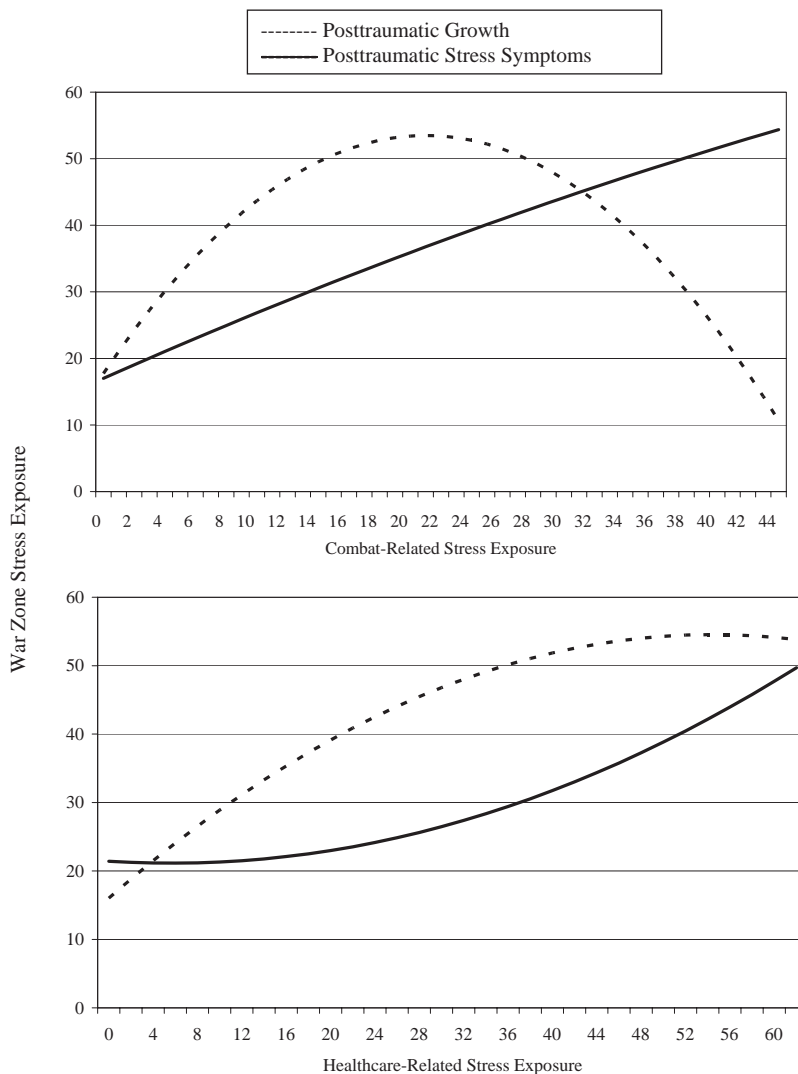


Figure 1. PTSD and PTG as a function of war zone stress exposure.

care stress exposure. Combat stress also showed a positive linear relationship with PTSD, but there was no comparable evidence of a positive curvilinear relationship. The lack of a significant curvilinear relationship between combat stress and PTSD may be attributable to the following: (1) a lack of power to detect a significant relationship; (2) an insufficient range of combat stress exposure (i.e., a curvilinear relationship may be observable in samples with higher levels of combat exposure); or (3) unique characteristics of healthcare stress such that moderate levels are more protective against PTSD relative to combat stress. Although post hoc analyses did reveal insufficient power (power < .10) to detect the small effect of the quadratic term, the latter two hypotheses should also be considered. Scores on the CES were low relative to the MHSS; a curvilinear relationship between combat stress and PTSD may be apparent in samples reporting a greater range of combat stress exposure. The interpretation that moderate levels of healthcare stress are less strongly associated with PTSD relative to combat stress is consistent with the notion that health-

care provision can reduce stress reactions by increasing a sense of mastery and control. Future research is needed to test these possibilities.

This study also examined how combat and healthcare stress relate to PTG. It was hypothesized that PTG would show a positive, inverted U-shaped relationship with PTSD, such that PTG was highest at moderate levels of both types of stress exposure. This pattern was found for both combat and healthcare stress exposure, replicating the curvilinear relationship reported by Powell and colleagues (2003). The curvature of the relationship was especially pronounced for healthcare stress exposure; PTG increased the most as levels of healthcare stress increased from mild to moderate levels. This suggests that providing healthcare in theater, while stressful, can yield positive psychological outcomes. As noted above, this may be attributable to the rewards and sense of moral purpose inherent in the role of providing care, healing, and protection. Beyond moderate levels of healthcare stress, however, the probability of growth appears to abate.

Table 3
 Summary of Regression Analyses for Healthcare
 Stress Exposure

	<i>B</i>	<i>SE B</i>	<i>F</i>	<i>R</i> ²	Adj. <i>R</i> ²	ΔR^2
Model 3: PTSD						
Step 1			52.44***	.44	.43	.44***
MHSS-linear	.39***	.04				
GMES	-.08	.12				
CSAC	.41***	.08				
Step 2			48.62***	.50	.49	.05***
MHSS-linear	.33***	.04				
GMES	-.06	.11				
CSAC	.40***	.08				
+MHSS-quadratic	.01***	.00				
Model 4: PTG						
Step 1			13.04***	.22	.20	.22***
MHSS-linear	.74***	.13				
GMES	1.06**	.37				
CSAC	.18	.25				
Step 2			10.98***	.24	.22	.02*
MHSS-linear	.79***	.13				
GMES	1.03**	.37				
CSAC	.17	.24				
+MHSS quadratic	-.01*	.00				

Note. MHSS = Military Healthcare Stressor Scale; CES = Combat Experiences Scale; GMES = General Military Experience Scale; CSAC = Current Stressors/Adversities Checklist.

* $p < .05$. ** $p < .01$. *** $p < .001$.

There are a number of limitations in this study that should be noted. First, the data were cross-sectional, precluding inferences about the direction of the relationships found and making it difficult to rule out various third variables. Although the data were drawn from a larger, longitudinal study, unresolved problems with the data matching methods have reduced our ability to examine longitudinal data. Second, although the CES and MHSS are face valid, they await external validation and the correspondence between scores on these scales and the constructs they are designed to assess is unknown. Related to this concern, the mean scores on the CES were low relative to the possible range of the measure, and there were few participants reporting combat stress exposure at levels associated with decreased PTG. Thus, it will be important to replicate the curvilinear relationship between the combat stress and PTG in other military populations who may be exposed to higher levels of combat stress. Third, combat and healthcare exposure was reported retrospectively and may have been influenced by coping processes and other events that occurred subsequently. Recall bias is a potential threat for all self-report measures, and the shared method variance may have artificially inflated the relationships across measures. Self-reported PTG may be particularly vulnerable to “downward temporal comparisons” (Stasko & Ickovics, 2007) when trauma victims are motivated to worsen their perception of their past self to see improvement in their current life situation (McFarland & Alvaro, 2000). Related to this, it is important to note that self-perceived PTG and actual PTG may differ in important ways. Although there is evidence that self-reported PTG can be moderately corroborated by trauma survivors’ partners (Weiss, 2002), PTG has not been reliably linked to measures of psychological adjustment. Thus, it is difficult to know how meaningful reported PTG is to the lives of those reporting these changes

(for a critical review of the PTG construct, see Zoellner & Maercker, 2006). Finally, our sample included only Air Force medical personnel; thus, the results may not generalize to other service members.

Many questions remain for future research to address. For example, what are the demographic, ecological, and psychological factors (e.g., coping processes) that moderate and mediate the stress–PTSD and the stress–PTG relationships? In light of Hobfoll’s theory of action-based growth, we might hypothesize that the active and healing role of military medical personnel is critical to their ability to experience genuine growth. Future research examining how different military roles and duties relate to PTG and long-term functioning would provide a more developed test of the hypothesis that action-based growth leads to positive outcomes (Hobfoll et al., 2007). It could be that military role moderates the relationships between stress and mental health functioning; alternatively, military role might represent a proxy for cognitive factors such as perceived autonomy and self-efficacy that mediate these relationships. Distinguishing between moderator and mediator effects and developing a better understanding of how these factors interact may inform strategies for minimizing negative stress-related reactions and fostering psychological growth and genuine positive adaptation.

This is the first study, to our knowledge, documenting the mental health effects associated with the unique role of OIF/OEF military medical personnel. The results suggest that combat and healthcare stressors and demands are associated with negative psychological outcomes (i.e., PTSD symptoms) at high levels of exposure. The results also showed that positive mental health outcomes (i.e., PTG) can result from these stressors, but only up to a certain point. It may be that exposure to high levels of stress makes growth impossible for some.

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Does the Repressor Coping Style Predict Lower Posttraumatic Stress Symptoms?

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ABSTRACT We tested whether a continuous measure of repressor coping style predicted lower posttraumatic stress disorder (PTSD) symptoms in 122 health care professionals serving in Operation Iraqi Freedom. Zero-order correlational analyses indicated that predeployment repressor coping scores negatively predicted postdeployment PTSD symptoms, $r_s = -0.29$, $p = 0.001$, whereas predeployment Connor-Davidson Resilience Scale (CD-RISC) scores did not predict postdeployment PTSD symptoms, $r_s = -0.13$, $p = 0.14$. However, predeployment trait anxiety was chiefly responsible for the association between repressor coping and PTSD symptom severity, $r_s = 0.38$, $p = 0.001$. Four percent of the subjects qualified for a probable PTSD diagnosis. Although service members with relatively higher PTSD scores had lower repressor coping scores than did the other subjects, their level of predeployment anxiety was chiefly responsible for this relationship. Knowing someone's predeployment level of trait anxiety permits better prediction of PTSD symptoms among trauma-exposed service members than does knowing his or her level of repressive coping.

INTRODUCTION

Most people exposed to traumatic events do not develop posttraumatic stress disorder (PTSD),¹ revealing that victims vary in their vulnerability for developing the disorder. Accordingly, researchers have sought to identify variables that heighten risk for PTSD among those suffering from trauma.² More recently, they have inverted the traditional emphasis on risk, seeking instead to identify resilience variables that buffer people against PTSD.³⁻⁵ Resilience programs may bolster stress-buffering traits, helping individuals acquire skills to recover from exposure to serious stressors.⁶

Variables that foster resilience are not necessarily the mirror image of risk factors. For example, lower scores on intelligence tests prospectively predict severity of PTSD symptoms among veterans even after researchers have adjusted statistically for the severity of combat exposure.⁷ Yet the mean IQ score of veterans without PTSD lies within the above average range, whereas it lies within the normal range for those with PTSD.⁷ Likewise, children with above average IQ scores are less likely to develop PTSD following subsequent trauma exposure compared to children whose scores were in the normal or low range.⁸ Yet risk for PTSD among traumatized chil-

dren of low intelligence is not greater than among those of average intelligence. These studies imply that above average intelligence is a resilience variable rather than below average intelligence being a risk factor.

Another variable potentially relevant to resilience is the repressor coping style.^{9,10} Repressors are people who report low levels of anxiety, but who score high on a measure of social desirability (i.e., defensiveness about acknowledging emotional distress).¹¹ Although repressors report little distress when encountering stressors, they sometimes exhibit physiological activation.¹² Results such as these might seem to suggest that repressors minimize their true level of anxiety. Yet research does not support this interpretation.^{13,14} Not only do repressors differ from highly anxious people, they also differ from low anxious people who do not exhibit high levels of defensiveness. For example, highly anxious people, including those with PTSD,¹⁵ exhibit delayed color naming of threatening words on the emotional Stroop test,¹⁶ suggestive of an attentional bias for threat that exacerbates their propensity to experience distress. However, not only do repressors exhibit less Stroop interference for idiographic threat words than highly anxious people do, they also exhibit less Stroop interference for these words than nondefensive, low-anxiety people do.¹⁴ If repressors were actually anxious people who downplay their distress, they would exhibit at least as much Stroop interference for threat words as do highly anxious people.

In fact, repressors seem to have exceptional control over their attention in the presence of threat, a process that may foster resilience in the face of trauma. Consistent with this possibility, the repressor coping style is associated with less distress among people who lost loved ones to suicide.¹⁰ Ginzburg et al.⁹ found that repressors are less likely than other people to develop PTSD after suffering a heart attack. Bonanno et al.¹⁷ found that conjugally bereaved individuals who

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exhibited low self-reported distress and high physiological arousal had a mild grief course through 25 months post-loss. Taken together, these results suggest that repressive coping may buffer people against developing psychopathology following exposure to extremely stressful events.

In this study, we investigated possible predictors of resilience among health care professionals who had served in a combat support hospital in Iraq. Although professionals who treat seriously wounded and dying combatants encounter gruesome situations,¹⁸ the potential risk for PTSD in this population is not as clear as it is in service members with greater risk for direct personal life threat.^{19,20} Nevertheless, we assessed exposure to both military health care stressors and combat-related stressors.

We tested whether Mendolia's Index of Self-Regulation²¹ (ISE), a dimensional measure of the repressor coping style, prospectively predicts PTSD symptoms in deployed military health care professionals. We hypothesized that higher predeployment ISE scores would predict lower PTSD scores postdeployment. We also tested whether the CD-RISC,²² a measure of attitudes for coping with adversity, prospectively predicts PTSD symptoms. Consistent with previous research on veterans of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom⁵ (OIF), we hypothesized that higher predeployment scores on this measure would predict lower PTSD symptom severity postdeployment. Finally, we compared subjects with a probable postdeployment diagnosis of PTSD on the putative resilience measures.

METHOD

Administrative Approval

Before initiating our study, the institutional review board of Wilford Hall Medical Center at Lackland Air Force Base reviewed and approved the protocol and materials. The study was also reviewed and approved by the Air Force Personnel Survey Program and the U.S. Army's Joint Combat Casualty Research Team. Subjects provided a unique identifier so that we could link their surveys over time without the subjects revealing their identity to us.

Subjects

The subjects were 122 U.S. Air Force medical personnel who served in support of OIF at a large combat support hospital in Iraq and who volunteered to participate in a prospective longitudinal study of risk and resilience.²³ To help maintain anonymity, we collected some demographic information on subjects (e.g., age, rank) in ranges rather than specific item responses.

Of subjects who completed the demographic portion of the questionnaire, most were married (67.2%, $n = 82$). Unfortunately, many subjects did not indicate their sex, apparently because of the inconspicuous location of this item on the questionnaire, rendering it easy to overlook. Our best estimate is that about 50% were male. The ethnic composition of the study sample was Caucasian (73.8%, $n = 90$),

African-American (6.6%, $n = 8$), Latino (11.5%, $n = 14$), Asian-American (3.3%, $n = 4$), and others (2.5%, $n = 3$).

Subjects ranged widely in age. The percentages for different age groups were 18 to 24 (14.8%, $n = 18$), 25 to 29 (21.3%, $n = 26$), 30 to 34 (18%, $n = 22$), 35 to 39 (17.2%, $n = 21$), 40 to 44 (15.6%, $n = 19$), and 45 years or older (12.3%, $n = 15$). A slight majority were officers (54.9%, $n = 67$), whereas the rest were enlisted personnel (43.5%, $n = 53$).

Testing Procedures

Subjects completed predeployment questionnaires during their processing through Lackland Air Force Base before departure for Iraq. They completed postdeployment questionnaires approximately 5 months later, 1 month after returning to the United States. We mailed the postdeployment questionnaires to the subjects' military work address, and they returned them to us via interdepartmental mail. The study group comprised a series of cohorts that deployed to Iraq every 4 months beginning in September 2004 until January 2009. During this interval, cohorts departed for Iraq every 4 months.

One of the investigators explained the study to the medical personnel at the predeployment session and asked them to complete a voluntary survey comprising the demographic questions and several questionnaires. The cover sheet provided instructions, informed subjects that their participation was voluntary, and emphasized the confidentiality of their responses. Subjects completed predeployment questionnaires in an auditorium. An investigator was present to provide instructions, answer questions, and ask if subjects would allow us to recontact them to ask them to complete mid-deployment and postdeployment surveys. Completion of the predeployment surveys took about 45 minutes. Health care personnel inserted surveys, whether completed or not, into envelopes such that the investigators were unaware of who had participated in the study.

Questionnaires Completed at Predeployment

The predeployment survey packet contained a demographic questionnaire, the short form of the Manifest Anxiety Scale (MAS),²⁴ the short form of the Marlowe-Crowne Social Desirability Scale (SDS),²⁵ and the CD-RISC.²²

Questionnaires Completed at Postdeployment

The postdeployment survey packet contained the PTSD Checklist-Military version (PCL-M),²⁶ the Combat Exposure Scale (CES), and the Military Health care Stressor Scale (MHSS).

Description of Measures

Manifest Anxiety Scale

The original MAS²⁴ consists of 50 true/false questions drawn from the Minnesota Multiphasic Personality Inventory that tap trait anxiety. A study²⁴ of 59 undergraduates indicated a three-week test-retest reliability of $r = 0.89$, and a study²⁷ of

64 neuropsychiatric patients yielded a validity coefficient of $r = 0.60$ between MAS scores and clinician ratings of behavioral manifestations of anxiety. Psychometric scrutiny of individual questions led to the deletion of items of dubious validity,^{27,28} resulting in the 20-item short form of the MAS.²⁹ Despite its brevity, the short form has a coefficient of internal consistency indistinguishable from that of the original MAS (r_s 0.76 versus 0.82, respectively). We used the short form of the MAS.²⁹

Marlowe-Crowne SDS

The SDS consists of 33 true/false items that measure defensiveness or the tendency to present oneself in an unrealistically favorable light.²⁵ Items include "I have never intensely disliked someone" (T) and "I like to gossip at times" (F). Psychologists have developed a short form of the SDS comprising 13 optimal items identified via factor analysis.³⁰ Its Kuder-Richardson reliability ($r = 0.76$) compares favorably with the original version, and the correlation between the original and short versions³⁰ is $r = 0.93$. The six-week test-retest reliability of the short version³¹ is $r = 0.74$. We used the short form of the SDS³⁰ in this study.

Index of Self-Regulation

Typically, researchers identify repressors categorically as people who score low on the MAS and high on the SDS.^{12,32} Yet as Mendolia argued,²¹ categorical conceptualizations of the repressor coping style have limitations relative to continuous measures of this style. Following Mendolia,²¹ we calculated an ISE score for each subject by using the formula $20 - (\text{MAS} - \text{SDS})$. Higher ISE scores signify a stronger repressor coping style evinced by the tendency to report low anxiety symptoms and high social desirability scores. Mendolia used the short form of the MAS and the long form of the SDS, whereas we used the short forms of both scales. Hence, the highest score that one can get on the ISE would be 33 (i.e., $20 - [0 - 13]$), and the lowest score would be 0 (i.e., $20 - [20 - 0]$).

Connor-Davidson Resilience Scale

The CD-RISC contains 25 items tapping attitudes toward coping with adversity.²² Respondents indicate their degree of endorsement on 5-point scales ranging from 0 ("not true at all") to 4 ("true nearly all the time") of items such as "Having to cope with stress makes me stronger." Connor and Davidson²² reported a Cronbach's α of 0.89 for 577 general population subjects and a test-retest reliability of 0.87 among 24 patients with either PTSD or generalized anxiety disorder who had failed to respond favorably in a psychopharmacology clinical trial. Evidence for convergent and divergent validity includes a positive correlation with a hardiness scale ($r = 0.83$) and a negative correlation with a perceived stress scale ($r = -0.76$).

PTSD Checklist—Military Version

Our measure of PTSD symptoms was the widely used PCL-M.²⁶ Keyed to PTSD symptoms for the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders,³³ items appear on 5-point Likert scales ranging from 1 ("not at all") to

5 ("extremely"). The PCL-M has 17 items, and scores range from 17 to 85. The sensitivity and specificity of the PCL-M for detecting clinician-diagnosed PTSD ranges from 0.85 to 0.39 and from 0.73 to 0.97, respectively, depending on cutoffs and prevalence of the disorder in target population.³⁴

Combat Exposure Scale

The CES is a rationally derived, 22-item questionnaire based on the Peacekeeping Incidents and Experiences Scale.³⁵ It measures the occurrence and psychological impact of combat-related stressors such as "being attacked or ambushed" and "patrolling areas (or riding in areas) where there were landmines." Respondents mark each item on a Likert scale ranging from 1 to 6: 1 is for stressors the respondent indicated "Does not apply;" 2 is for "Did Not Experience." For experienced stressors, respondents indicate how much the event affected them ranging from 3 ("no impact at all") to 6 ("extreme impact").

Military Healthcare Stressor Scale

The MHSS is a 21-item questionnaire that measures the occurrence and impact of stressors associated with providing health care in a war zone. We developed the MHSS after consulting focus groups comprising military medical personnel who had served in Iraq and who had served on the Air Force Critical Care Aeromedical Transport Team. Items include a wide variety of medical stressors such as "exposure to a patient who cried or screamed in agony and fear," "exposure to patients with severe burns," and "exposure to patients that I didn't have a clue how to help." Respondents mark each item on a Likert scale ranging from 1 to 5: 1 is for stressors the respondent did not experience. For experienced stressors, respondents indicate how much the event affected them ranging from 2 ("no impact") to 5 ("extreme impact").

RESULTS

To test our main hypotheses, we used zero-order correlations. Because we had a priori predictions, we did not adjust p values for multiple tests.

Consistent with our hypothesis, higher predeployment ISE scores predicted lower postdeployment PCL-M scores, $r_s = -0.29$, $p = 0.001$; however, predeployment CD-RISC scores did not, $r_s = -0.13$, $p = 0.14$. However, because predeployment social desirability scores were unrelated to PTSD symptoms ($r_s = -0.02$, $p = 0.84$) and predeployment reports of trait anxiety were moderately correlated ($r_s = 0.38$, $p = 0.001$), it appears that the relationship between repressive coping and PTSD symptoms chiefly pertains to the relationship between trait anxiety and PTSD. In fact, the magnitude of positive correlation between predeployment trait anxiety and postdeployment PTSD symptoms was numerically greater than the magnitude of the negative correlation between predeployment repressor coping and PTSD symptoms. Hence, the association between repressor coping scores and PTSD symptoms appears attributable to predeployment trait anxiety.

Because the meaning of resilience presupposes exposure to a stressor, we identified subjects who reported at least one stressful event (scored at a level 4, 5, or 6, i.e., at least "A little" impact) by the mid-deployment or postdeployment CES. Unfortunately, not all subjects elected to complete the CES and the MHSS. Among the 90 subjects reporting at least one stressful event and for whom we did not have missing data, we conducted an ordinary least squares multiple regression analysis with PCL-M scores as the dependent variable and predeployment MAS scores, predeployment CD-RISC scores, predeployment social desirability scores, CES scores, and MHSS scores as the independent variables. Because the PCL-M scores were not normally distributed, we used a bootstrap method to estimate standard errors. The R (0.68) for regression was significantly different from zero, $F(5, 84) = 10.95$, $p < 0.001$, and the R^2 was 0.40 (adjusted $R^2 = 0.36$). However, in this model, only the CES, $\beta = 0.26$, $p = 0.007$, the MAS, $\beta = 0.33$, $p < 0.001$, and the MHSS, $\beta = 0.30$, $p < 0.001$, significantly predicted variance in PCL-M scores.

We next identified those subjects whose postdeployment PCL-M scores suggested probable PTSD and compared their responses on the predictor measures with subjects whose postdeployment PCL-M scores did not qualify for probable PTSD. Using conventional criteria for caseness, we classified a subject as qualifying for probable PTSD if he or she scored at least 50 on the PCL-M and endorsed sufficient B, C, and D criteria symptoms. Five subjects (4%) met these criteria, whereas 117 did not.

To compare these two groups, we used a robust test for medians (Harrell-Davis) and estimated the 95% confidence intervals with a bootstrap method. Unsurprisingly, the median PCL-M score for these five subjects was substantially higher than for the remaining subjects, $M_d = 65.2$ (95% CI = 54.5 to 75.9) versus $M_d = 22.1$ (95% CI = 20.6 to 23.7), $p < 0.00001$. Relative to the other subjects, those with probable PTSD also scored significantly higher on the measures of combat exposure, $M_d = 71.4$ (95% CI = 60.1 to 82.7) versus $M_d = 54.8$ (95% CI = 51.8 to 57.8), $p < 0.00001$, and health care stress, $M_d = 82.7$ (95% CI = 79.1 to 86.2) versus $M_d = 61.5$ (95% CI = 57.1 to 66.0), $p < 0.00001$.

On Mendolia's ISE measure of repressive coping, the probable PTSD subjects scored only slightly and nonsignificantly lower than the other subjects did, $M_d = 21.1$ (95% CI = 16.2 to 26.0) versus $M_d = 24.1$ (95% CI = 22.7 to 25.6), $p = 0.27$. As for the components of this index—the measures of anxiety and social desirability—the probable PTSD subjects, relative to the other subjects, scored higher on the former, but did not differ significantly on the latter: $M_d = 6.4$ (95% CI = 4.9 to 7.9) versus $M_d = 3.2$ (95% CI = 2.4 to 4.1), $p < 0.00001$ for trait anxiety; $M_d = 7.8$ (95% CI = 3.9 to 11.7) versus $M_d = 8.5$ (95% CI = 7.8 to 9.1), $p = 0.74$ for social desirability. Finally, the probable PTSD subjects scored indistinguishably from the other subjects on the CD-RISC: $M_d = 79.2$ (95% CI = 74.8 to 83.5) versus $M_d = 80.0$ (95% CI = 76.7 to 83.4), $p = 0.67$.

DISCUSSION

In this prospective longitudinal study, we investigated candidate predictors of resilience for health care personnel serving in support of OIF. Specifically, we tested whether higher scores on Mendolia's index of repressive coping and Connor and Davidson's measure of resilience predict lower scores on a continuous measure of PTSD symptoms. Although Mendolia's measure was significantly and negatively associated with PTSD symptoms, lower self-reported trait anxiety drove this effect. Indeed, the positive correlation between predeployment trait anxiety and postdeployment PTSD symptoms was numerically greater than the negative correlation between predeployment repressive coping and postdeployment PTSD symptoms. Hence, our data suggest that knowing a person's predeployment level of trait anxiety will enable greater prediction of subsequent PTSD than knowing a person's predeployment level of repressive coping.

These relationships persisted even after we adjusted the analysis for exposure to combat and health care stressors. Our findings are consistent with results of a study of Australian civilians whose pretrauma levels of neuroticism and symptoms of anxiety and depression significantly predicted PTSD symptoms in response to subsequent exposure to severe bushfires.³⁶

Using conventional criteria, we also identified subjects whose PCL scores indicated probable PTSD. Four percent of the subjects ($n = 5$) had scores suggestive of PTSD. Subjects with probable PTSD did not differ significantly from the remaining subjects on Mendolia's index of repressive coping or its social desirability component, but they did report predeployment trait anxiety levels that were approximately twice as high as those of the subjects without probable PTSD. Connor and Davidson's CD-RISC was unrelated to PTSD symptom severity or caseness. Indeed, the medians of the probable PTSD group and the non-PTSD group were similar (79.2 versus 80.8, respectively), and nearly identical to the mean for the general population in Connor and Davidson's original study (80.4). Hence, the CD-RISC was unhelpful in predicting resilience.

Interestingly, our findings contrast with those of Pietrzak et al.,⁵ who found that CD-RISC scores were negatively associated with both continuous and categorical measures of PTSD in OEF/OIF veterans approximately 26.9 months postdeployment. Their subjects came primarily from Army National Guard units whose direct combat exposure was likely much higher than was the combat exposure of our health care professionals. As Pietrzak et al.⁵ emphasized, their design was cross-sectional, not prospective. Unlike us, they did not administer the CD-RISC before deployment. Moreover, even their non-PTSD subjects had resilience scores that were significantly lower than that of Connor and Davidson's healthy civilian sample.

It is critical for the military to identify modifiable predictors of resilience suitable for incorporation in training and intervention programs for reducing risk for PTSD. Yet, a conceptual issue arises in resilience prediction when nonpathological outcomes are the norm, not the exception. That is, epidemiologists

tend to focus on predicting disease, not health, and predicting resilience when most people do not fall ill is akin to predicting health. Indeed, 95% of our study group did not have PTSD, despite the hazards they encountered while providing health care in a war zone. Other research groups have reported similar rates of PTSD among health care professionals serving in Iraq¹⁸ (9%) and in Israel¹⁹ (4.3%). To be sure, our subjects had less exposure to mortal danger than do service members in the combat arms, and this likely reduces the incidence of PTSD. Finally, performing their professional tasks of reducing suffering and saving lives in the war zone may itself buffer health care professionals from developing PTSD.

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