Contemp Fam Ther (2015) 37:316–328
DOI 10.1007/s10591-015-9344-8

ORIGINAL PAPER

His and Hers: The Interface of Military Couples' Biological, Psychological, and Relational Health

Lisa J. Trump[1] · Angela L. Lamson[2] · Melissa E. Lewis[3] · Amelia R. Muse[4]

Published online: 10 June 2015

Abstract Serving in the military has the capacity to influence military personnel, civilian spouses, and marriages in unique ways. The purpose of the present study was to provide dyadic insight into the interface between biological, psychological, and relational health factors for military couples. Couples were recruited through a military medical center ($N = 75$) in the United States and both partners were assessed on several measures of biopsychorelational health. Actor-partner interdependence models were used to predict marital quality and satisfaction in relation to each partner's experience with distress, symptoms of depression, and heart rate variability. Results indicated that husbands' pain predicted husbands' and wives' positive marital quality. Husbands' and wives' symptoms of depression also influenced wives' negative marital quality. Recommendations toward the need for relational assessments and routine screenings for both partners, as well as implementation of an integrated care model are discussed.

✉ Lisa J. Trump
buch0245@umn.edu

[1] Department of Family Social Science, University of Minnesota, 290 McNeal Hall, 1985 Buford Ave., Saint Paul, MN 55108, USA

[2] Department of Child Development and Family Relations, East Carolina University, 108 Rivers Building, Greenville, NC 27858, USA

[3] Department of Biobehavioral Health and Population Sciences, University of Minnesota Medical School, 1035 University Drive, Duluth, MN 55812, USA

[4] Department of Child Development and Family Relations, East Carolina University, 612 East 10th Street, Greenville, NC 27858, USA

Keywords Biopsychosocial · Integrated care · Military couples · Military marriages

Introduction

Currently there are approximately 3.6 million employees within the Department of Defense, of which 1.4 million men and women are active duty (Department of Defense [DoD] 2010). Within this population, 56 % are married (DoD 2010). Given that over half (51.5 %) of active duty personnel are 25 years of age or younger (DoD 2010), and that younger marriages are more likely to end in divorce (Hogan and Seifert 2010), this population is especially at risk for marital challenges or concerns (Karney and Crown 2007). In 2009, 3.6 % of officers and enlisted personnel sought a divorce (DoD 2010), and the probability of getting a divorce increased significantly after two or more years of active duty status (Hogan and Seifert 2010). Indeed, involvement in the military has the capacity to influence military husbands, civilian wives, and their marriages in considerable ways (e.g., physical demands, mental and behavioral health risks, as well as strength and resiliency). Thus, individual biological, psychological, and relational health factors for both partners as well as the fluid nature of the relationship itself, influence the health and stability of military marriages.

In addition to the relational sustenance needed to maintain any marriage, life in the military can be full of frequent and unexpected changes for military husbands as well as for their spouse. Many military husbands experience difficulties across biological, psychological, and relational domains of health throughout and following their careers, which commonly influence their civilian spouses' well-being, and can further exacerbate either partner's

health symptoms or diagnoses. Interestingly, researchers show that symptoms experienced by civilian wives often mirror the experiences, symptoms, or diagnoses of their military spouse (Bevans et al. 2011; Menchaca and Dehle 2005; Zwahlen et al. 2011). The strains that result from each spouse's biological and psychological experiences then have the capacity to influence the couples' relational health (Kiecolt-Glaser et al. 2003; Menchaca and Dehle 2005).

Thus, the purpose of this article is to (a) describe the theoretical model that grounded this study (i.e., the biopsychosocial model (Engel 1977, 1980), (b) offer biological, psychological, and relational health literature pertaining to military couples, (c) share results from a segment of a larger study, which specifically attended to the marital health of male service members and their spouses, and (d) offer recommendations that may benefit providers and researchers who can better serve military couples based on the outcomes from this study and expand on future research initiatives.

Theoretical Model for Military Couples

The biopsychosocial (BPS) model (Engel 1977, 1980) is the notion that one's health is multifaceted, with each domain (i.e., biological, psychological, social) informing the others. Biopsychosocial health factors are complex and interwoven within each individual, but have the capacity to influence the lives of others as well as be transmitted simultaneously between relationship partners, such that each partner's biopsychosocial health alters the other's biopsychosocial health in subtle and sometimes enduring ways.

Through the BPS model, Engel (1977, 1980) proposed that the biology of a person (e.g., genetic makeup and physiology) is connected to his or her psychological functioning (e.g., mental and behavioral health), which is also related to social relationships (e.g., relationships and social support). The spiritual component was later added to the BPS model, by some researchers, in order to consider how one's spirituality interacts with the other domains of health (Wright et al. 1996).

The biopsychosocial-spiritual model can be used to illuminate the relatedness of mind, body, spirituality, and social relationships to develop a deeper understanding of complex health diagnoses. Through this article, the biological (physiological stress and self-reported pain), psychological (depression and distress), and social (relational) aspects of health as they relate to marital quality and satisfaction will be examined. Given that marital satisfaction and marital quality were the only two "social" variables addressed within the social domain of BPSS for our analysis, and because spirituality was not incorporated into our hypotheses for this article, we will be using the term biopsychorelational (Lewis et al. 2012) as a more accurate reflection of the health domains represented in the review of literature and analysis.

Literature Review

Biological Health

The biological and physical health of military husbands can range from having few or no health concerns to experiencing significant injuries. Military husbands, especially those who have recently returned from combat, commonly experience significantly more health concerns compared to civilian populations (Fisher 2007). These health concerns have included traumatic brain injury, amputations, combat injuries, musculoskeletal issues, and other medical conditions, with acute and chronic pain reported as the most common health concern (Haskell et al. 2006; Tan et al. 2009). The health concerns among military personnel and veterans, especially those suffering from PTSD, tend to increase physiological stress, as measured by heart rate variability (HRV), which potentially constricts the self-regulation and psychological reactivity processes (Tan et al. 2009). More specifically, military personnel with PTSD, traumatic brain injuries, and significant pain are at a greater risk of having HRV outcomes that indicate an autonomic nervous system (ANS) imbalance (i.e., a significant stress response) (Tan et al. 2009). While experiences associated with military service may influence physiological stress levels for active duty partners, it may also contribute to concerns pertaining to a civilian partner's physical health (Smith et al. 2011).

Military husbands often experience various health concerns, some or all of which may be related to their roles in the military; however, civilian wives may also struggle with biological health concerns, such as headaches, significant changes in their menstrual cycle, difficulty sleeping, and changes in body weight (Dimiceli et al. 2010). Researchers have also found a significant relationship between wives' relational characteristics (e.g., attentiveness to the state of their relationship) and their physiological health status, potentially leading to additional health complications in their lives (Kiecolt-Glaser and Newton 2001). Further, wives of husbands who experience pain frequently report higher levels of tension and lower health status scores than those who do not have a spouse in pain (Miaskowski et al. 1997). Significant links have been found between partners' biological symptoms and their relational health (i.e., marital satisfaction, quality, and adjustment). For example, researchers examined the pace of healing blister wounds that were inflicted on the forearms of wives and found that healing occurred faster for couples who engaged in supportive interactions as compared to those who engaged in marital conflict (Kiecolt-

Glaser et al. 2005), demonstrating the significant and direct link between biological/physical and relational health.

Psychological Health

There are several potential ramifications to physical health in the lives of military husbands and their wives, and each encounter or experience has the capacity to alter psychological health for either or both partners. Psychological health challenges, such as depression (Warner et al. 2007), excessive alcohol use (Eaton et al. 2008; Blow et al. 2013), psychological stress (Allen et al. 2010), and amount and quality of sleep (Warner et al. 2009) are not uncommon for both partners of military couples. Researchers have given attention to the psychological health challenges and risks with male military personnel, particularly in relation to depression, anxiety, and post-traumatic stress. More than one-third of military men report some level of depressive symptoms (Warner et al. 2007). Each year, a large percentage (over 25 % of military personnel seeking primary care) of military personnel are diagnosed with either depression or anxiety; however, less than half of military personnel who receive regular primary care also receive mental health treatment (Warner et al. 2007). For those returning from deployment, approximately 40 % of military personnel meet the screening criteria for one or more mental health concerns, yet only half of those meeting criteria seek help of some kind (Gorman et al. 2011). Further, as military personnel experience the stress and potentially traumatic events of war (e.g., combat exposure), they tend to report higher overall distress in their life (McCuaig-Edge and Ivey 2012).

Civilian wives married to military personnel may also struggle with mental and/or behavioral health concerns. Civilian wives of military personnel are likely to experience depression (Eaton et al. 2008), caregiver burden (Warner et al. 2009), psychological distress (Allen et al. 2010), and family separation (McLeland et al. 2008). Approximately 20 % of civilian wives, in one study, screened positive for depression, while 8 % screened positive for major depression via both diagnostic criteria and functional impairment (Eaton et al. 2008). The presence of distress may trigger conflicts or further exacerbate fears, uncertainties, and suffering, and may hinder effective communication and feelings of closeness and sexual activity between partners (Zwahlen et al. 2011). Given the complex intertwining of physical and psychological health factors, many times civilian wives have a different, and often worse, perception of their marital functioning (e.g., confidence in the relationship, positive bonding, and satisfaction with sacrifice) than their military partner (Allen et al. 2010). When left untreated, a distressed spouse's overall health is likely compromised (Bevans et al. 2011).

Relational Health

Two popular perspectives have developed within the literature with regard to the relationships of military couples: (a) military couples tend to face more negative health outcomes than civilian couples due to the diverse experiences in the military (Riggs et al. 1998) and (b) involvement in the military develops certain strengths to manage hardships (Schumm and Hammond 1986). Some researchers have concluded that events such as being separated during deployment may make finding opportunities for positive connections more difficult and require significant work to re-integrate back into family life (Allen et al. 2010; Riggs et al. 1998). For example, deployment and subsequent reintegration have resulted in challenges to maintaining marital intimacy, feeling comfortable sharing stories, and managing the challenges due to deployment such as taking on additional responsibilities (Baptist et al. 2011). Other researchers have found that while deployment may provide challenges and adjustments for couples initially, marriages can withstand deployments without long-term decreases in marital satisfaction or quality (Schumm et al. 2000). Karney and Bradbury (1995) concluded that the implications of negative events on couples would likely depend on strengths of their relationship that can buffer the impact of the event. While these studies differ with regard to their understanding of the impact of the military on couples' marital health, they unite in their conclusion that military involvement is capable of influencing military couples' relational health.

For military personnel, their reported relationship quality was found to be strongly associated with their symptom severity, and similar patterns were seen among civilian wives, though the relationship tended to be smaller in magnitude (Riggs et al. 1998). In assessing marital satisfaction, wives tend to report higher levels than their military husbands (Renshaw et al. 2008), and for both partners, their marital satisfaction levels are likely to fluctuate during stressful experiences (e.g., separation due to deployment, presence of PTSD) (Allen et al. 2010; Andres 2014; Goff et al. 2007; Marek and D'Aniello 2014). The literature to date supports the notion that military involvement influences both partners across the biopsychorelational health spectrum.

This study was conducted in order to explore the individual biopsychorelational experiences of military husbands and their civilian wives in relation to their marital satisfaction and marital quality (i.e., the couple dyad). In an effort to assess the influence of biological and psychological health factors on marital relationships of military couples, levels of physiological stress, pain, depression, and distress in both partners were examined. In addition, these factors were examined in relation to their contribution to the couples'

marital health (i.e., marital quality and satisfaction). These variables were selected because of the growing concern and prevalence for divorce as well as the need to better understand marital satisfaction within the military and the likelihood that biopsychosocial health factors could be a strong contributor to marital quality and satisfaction (Allen et al. 2010; Asbery and Martin 2012; Ein-Dor et al. 2010; Smith et al. 2011). As such, the following research hypotheses were tested to learn more about the biopsychorelational health of military couples.

Research Hypotheses

The first hypothesis (H1) was that there would be no significant difference between the depression scores, as measured by the PHQ-9, of civilian wives and their military husbands. Based on our belief in the intersection of biological, psychological, and relational health, the second hypothesis (H2) was that pain (VAS pain scale) and HRV (SDNN as measured by HRV Live!) would predict additional variance in husbands' and wives' marital quality and marital satisfaction beyond the variance explained by depression (PHQ-9) and distress (DisT distress scale). The third hypothesis (H3) was that actor-partner effects would be significant between husbands' and wives' biological and psychological predictors and their own as well as partners' marital quality and satisfaction outcomes.

Method

These hypotheses were tested using data from a federally funded project that was developed by the second author of this article. This study was initially created to better understand the biopsychosocial-spiritual (Engel 1977, 1980; Wright et al. 1996) factors that influence military couples' marital health. The study was conducted at a military family medicine clinic for military personnel and their families in the US. This clinic acted as a primary care facility for military personnel (including mostly active duty Air Force personnel and retirees). All assessments were simultaneously gathered through self-report and physiological measures for both members of the couple.

A subset of the data was used to write this article, particularly in relation to male military service members and their civilian spouses. Female service members were a part of the larger study, but are not part of the purpose of this particular article. Furthermore, the authors of this article recognize that there are many military dyads that are not married, but should also be recognized, including couples that are in a committed relationship and cohabitate or identify as lesbian, gay, bisexual, and queer (LGBQ). Unfortunately because of the parameters of the larger study, LGBQ and cohabitating couples were not included in the data collection process.

Participants

Participants were recruited through a military family medicine clinic by family therapy and medical family therapy researchers. Participants needed to be active duty, reserve, or retired, and currently married with a partner that also consented to participate. Additionally, data were not collected while the service member was deployed. Seventy-five couples met the recruitment criteria. The completion of the informed consent and assessment took place in a private room at the family medicine clinic. Exclusion criteria were that neither partner could be actively receiving marital therapy.

Procedure

Potential participants were approached during their medical appointments and received information regarding participation in the study. Couples that met the eligibility criteria and expressed interest were contacted at a later date and scheduled an appointment to participate in the study. Consenting couples entered a private research room located away from the medical examination rooms. The military husband and his wife completed assessments simultaneously. As one person completed the self-report questionnaire, his or her partner was connected to the HRV monitor located on the other side of a desk (hidden from site from the other partner) and was directed to sit quietly and calmly. A divider was placed between the couple to maintain confidentiality. After their first assessment was completed, the partners switched and completed the other assessment.

Measures

Biological, psychological, and relational health data were collected from military husbands and their civilian wives through a variety of means. For this study, participants' heart rate variability (HRV-indicator for physiological stress), pain, depression, distress, marital quality, and marital satisfaction were assessed. All variables had been previously utilized with military personnel (Eaton et al. 2008; Green and Harris 1992; Lewis et al. 2012; Norris et al. 2005; Sayers et al. 2009), however, with the exception of marital satisfaction, none of the variables had been used to examine the health of military couples. Thus, utilization of these measures with military dyads serves as a unique contribution to the literature.

Heart Rate Variability

Heart rate variability (HRV) is used to measure physiological stress and is related to multiple health concerns, including diabetes, coronary artery disease, hypertension, and heart failure (Malik 1998; Tan et al. 2009). When individuals experience stress, their heart rate increases, whereas when individuals are feeling relaxed, their heart rate decreases, which can result in a more variable, or flexible and resilient interbeat pattern. Therefore, heart rate variability measures the balance, or imbalance, of the two branches of the autonomic nervous system: sympathetic (e.g., stress response) and parasympathetic (e.g., relaxation response). Standard deviation of the r–r heartbeat interval (SDNN), specifically, was used in this study to calculate HRV. A fingertip pulse oximeter was used to monitor the participants' autonomic nervous system response. Two five-minute periods (i.e., baseline and active) were collected from a 12-minute HRV analysis using Biocom's HRV Live! software with each partner and only the active period of the second 5 min was used for analysis.

Pain

Pain was reported by the participants using a pain scale (Visual Analog Scale [VAS]) (Aitken 1969). The VAS is a one-item scale that ranges from zero (*'no pain'*) to ten (*'excruciating pain'*). Participants reported their level of pain experienced within the past week. This scale is appropriate for this study because it is brief and a sensitive form of detecting levels of pain (Seymour et al. 1985).

Depression

Participants completed The Patient Health Questionnaire (PHQ-9; Spitzer et al. 1999), which assesses the severity of depressive symptoms. It was developed in accordance to the *Diagnostic and Statistical Manual of Mental Disorders, IV-TR* criteria for diagnosing depression (American Psychiatric Association 2000). There are nine questions that make up this measure, and the participant's total score (ranging between 0 and 27) indicates a provisional diagnosis of the severity of depressive symptoms (i.e., minimal, mild, moderate, moderately severe, or severe depression). An example of an item in this measure is: "Over the last 2 weeks, how often have you felt down, depressed, or hopeless?" The response options include *"Not at all," "Some days," "More than half the days,"* or *"Nearly every day."* This tool has been found to be both a valid and reliable measure for assessing the presence and severity of depressive symptoms (Spitzer et al. 1999). The Cronbach's alphas for this measure were .83 for husbands and .80 for wives.

Distress

The Distress Thermometer (DisT) is a one-item questionnaire used to assess participant's overall distress using a 10-point scale, ranging from zero (*'no distress'*) to ten (*'extreme distress'*). This scale, originally created by the National Comprehensive Cancer Network (NCCN), was intended to assess multiple types of distress, including: psychological, social, and spiritual (nonphysical) (Holland and Bultez 2007). The participants were assessed on the level of distress felt over the past week. This measure has been found to be valid with Cronbach's alphas ranging from .84 to .88 (Chambers et al. 2014).

Marital Quality

The Positive and Negative Quality in Marriage Scale (PANQIMS) examined the quality of marriages (Fincham and Linfield 1997). This scale asked participants to examine the degree to which certain aspects or qualities about their partners are positive (e.g., "Considering the positive qualities of your spouse, and ignoring the negative ones, evaluate how positive these qualities are.") or negative (e.g., "Considering only bad feelings you have about your marriage, and ignoring the good ones, evaluate how bad these feelings are.") using a 10-point scale ranging from zero (*'not at all'*) to ten (*'extremely'*). Example items in this measure include "good feelings about your marriage" and "negative feelings you have toward your spouse". This scale is a reliable measure of marital quality (Mattson et al. 2007). The Cronbach's alphas for positive marital quality were for .81 for husbands and .92 for wives, and .86 for negative and .91 for wives for negative marital quality.

Marital Satisfaction

The Kansas Marital Satisfaction Scale (KMSS) is a three-item scale that measures the level of satisfaction a participant feels with his or her spouse (Schumm 1983; Schumm and Hammond 1986). Responses to the three items range from *'extremely dissatisfied'* to *'extremely satisfied'* on a 7-point scale. An example item in this measure is: "How satisfied are you with your marriage?" Previous researchers have established the validity of this measure (Schumm et al. 2008) and reliability with a high degree of internal consistency (Mitchell et al. 1983). The Cronbach's alphas for this measure were .95 for husbands and .96 for wives.

Data Analysis Plan

A paired *t* test was conducted to investigate if there were significant differences between spouses for mean depression

score (H1). Hierarchical regressions were used to analyze the relationships between marital quality and marital satisfaction, as the response variables, and pain, physiological stress, depression, and distress, as explanatory variables, for both husbands and wives (H2). Theoretically speaking, the hierarchical regressions sought to understand how the biological health variables (i.e., SDNN and pain) contributed to the variance in relational health (i.e., marital quality and marital satisfaction) beyond what is explained by the psychological health variables (i.e., depression, distress). Actor-partner interdependence models (APIMS) were also conducted with husbands' and wives' biological and psychological variables as predictors and husbands' and wives' marital quality and marital satisfaction as outcomes. Due to having a smaller sample size, APIMS with all of the predictors and outcomes present at one time was not possible. Therefore, nine different APIM models were run. Evaluating actor-partner effects within the APIM framework is advantageous because it considers how one partner's exposure may influence the other partner's outcomes. These nuanced associations can be missed when looking at the data at the individual-level only. The analyses were performed with IBM SPSS 22.0 (IBM Corp. 2013) and RStudio (2012). The planned statistical power for this analysis was .80, the planned criterion level was .05, and the planned effect size was large (Cohen 1992).

Results

Prior to conducting any analyses to investigate the hypotheses, information on the demographic variables of the study sample were examined. Of the 75 couples sampled, the mean age for participants was approximately 36 years and the majority of participants was non-Hispanic white and had completed some college (Table 1). The mean length of marriage was approximately 10 years, and rank ranged from Airman First Class E-3 to Captain, with the most frequent rank being Technical Sergeant E-6. Additionally, descriptive statistics were performed to summarize the distribution of this study's research variables. Specifically, the means between husbands and wives were compared. Summary statistics of the variables revealed that for Standard Deviation of r–r heartbeat (SDNN), husbands had a higher mean score ($M = 81.95$, $SD = 60.47$) than wives ($M = 52.40$, $SD = 23.83$). Cohen's d for comparison of SDNN means was (.64), indicating a large effect size. Additionally, for both depression and distress, wives had higher mean scores ($M = 4.20$, $SD = 3.93$; $M = 3.58$, $SD = 2.44$) as compared to their husbands ($M = 2.78$, $SD = 3.84$; $M = 2.51$, $SD = 2.16$). Cohen's d for comparison of depression mean was or means were (.37) and for distress was (.46), indicating medium effect sizes.

Correlations were run to quantify the strength and direction of association for husbands (below the diagonal) and wives (above the diagonal) (Table 2). In Table 2 husband's variables were correlated (e.g., husbands' distress correlated with husbands' pain below the diagonal; wives' pain correlated with wives' distress above the diagonal). In addition to revealing significantly correlated variables for each partner independently, correlations between spouses (on the same variable) were also significant (see Table 3). In Table 3, wives' variables were correlated with husbands' variables (e.g., wives' pain correlated with husbands' pain).

Hypothesis 1 A paired t-test was conducted to investigate whether husbands and wives differ in their levels of depression. The analysis revealed a significant difference between husbands ($M = 2.49$, $SD = 3.36$) and wives ($M = 3.97$, SD = 3.40) in reported levels of depression, with wives reporting higher levels of depression. The analysis showed a significance below the .05 level (.003): $t(72) = 3.068$; $p < .01$ (two-tailed). The Cohen d statistic (.437) indicated a small-moderate effect size. This data revealed that there is a significant difference between spouses of military couples with regard to their levels of depression, failing to support the first hypothesis.

Hypothesis 2 Hierarchical regressions were used to identify the best predictor (i.e., HRV, pain, depression, or distress) of husbands' and wives' reported marital quality and marital satisfaction independently. These four variables were selected as predictor variables in the hierarchical regressions due to their significance in the preliminary bivariate correlation analysis as well as their presence within the collection of current literature as significantly influencing partners' biological, psychological, and relational health. Significant results are displayed in Table 4.

To examine the variable marital quality, positive and negative marital quality were separated to gather a more accurate picture of the effects of the exploratory variables. For husbands, the variable pain was statistically significant at $p < .05$ ($B = -.552$, $SE = .251$) in predicting their positive marital quality but not negative marital quality, with a R squared change of .077, $F(2,65) = 2.713$, $p < .05$. Every one-unit increase in pain was associated with a .552 unit decrease in positive marital quality for husbands (Model 1).

For wives, though their biological factors were not significant in predicting additional variance in positive and negative marital quality, the psychological variable of distress was statistically significant for predicting both their positive and negative marital quality (Models 2 and 3, respectively). The variable distress was found to be

Table 1 Demographic information for study participants

Indicator	Frequency (%) $N = 75$ Husband	Mean (SD) $N = 75$ Wife
Age (Average)	36.45 (10.06)	35.23 (9.97)
Race		
Non-Hispanic White	59 (78.7 %)	52 (69.3 %)
Black or African–American	6 (8.0 %)	6 (8.0 %)
Hispanic or Latino	4 (5.3 %)	7 (9.3 %)
American Indian/Alaskan Native	1 (1.3 %)	–
Asian–American	–	5 (6.7 %)
Biracial	1 (1.3 %)	–
Other	4 (5.3 %)	5 (6.7 %)
Education		
Grade 9–11	–	4 (5.3 %)
GED/HS diploma	13 (17.3 %)	19 (25.3 %)
1–3 years of college	48 (64.0 %)	35 (46.7 %)
College graduate	9 (12.0 %)	13 (17.3 %)
Graduate school	5 (6.7 %)	3 (4.0 %)

Table 2 Bivariate correlations between indicators for husbands (below the diagonal) and wives (above the diagonal) independently

	1	2	3	4	5	6	7
1. Pain	–	.190	.322**	.090	−.095	.260*	.145
2. Distress (analog)	.214	–	.523**	−.399**	−.159	.441**	−.086
3. PHQ-9	.300*	.359**	–	−.115	.011	.348**	−.128
4. KMSS	−.202	−.082	−.220	–	.468**	−.534**	−.010
5. PMQ	−.214	−.126	−.101	.632**	–	−.155	−.007
6. NMQ	−.023	.099	.199	−.675**	−.308**	–	−.035
7. HRV–SDNN	−.095	−.030	.025	−.025	−.108	−.081	–

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

Table 3 Bivariate correlations between husbands' (top) and wives' (left) indicators

	1	2	3	4	5	6	7
1. Pain	−.007	.109	.12	−.128	−.169	.113	.084
2. Distress (analog)	.028	.127	.294*	−.229*	−.053	.147	.052
3. PHQ-9	−.165	.172	.258*	−.166	−.081	.139	.094
4. KMSS	−.155	.088	−.116	.367**	.227	−.299**	.107
5. PMQ	−.294*	.153	.023	.123	.076	.107	−.151
6. NMQ	.044	.055	.318**	−.399**	−.286*	.249*	−.039
7. HRV-SDNN	−.138	−.056	−.023	−.015	−.004	.01	.153

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

significant ($B = -.871$, $SE = .424$) in predicting wives' positive marital quality with an R squared change of .067, F(2, 59) = 2.110, $p < .05$ (Model 2). Wives' distress (psychological variables: $B = 1.149$, $SE = .374$; psychological and biological variables: $B = 1.113$, $SE = .378$) was found to be significant for predicting negative marital quality with an R squared change of .017, $F(2, 57) = 6.569$, $p < .001$ (Model 3). When examining marital satisfaction as the outcome variable, distress was significant for wives (psychological variable: $B = -.929$, $SE = .218$; psychological and biological variables: $B = -.957$, $SE = .218$), with a R squared change of .028, $F(2,57) = 5.611$, $p < .001$ (Model 4). These results partially supported the second hypothesis.

Table 4 Significant regression models predicting positive marital quality, negative marital quality, and marital satisfaction separately for husbands and wives

	B (SE B) β	B (SE B) β		B (SE B) β	B (SE B) β
Model 1 Husbands-variables, husbands PMQ			*Model 2 Wives-variables, wives PMQ*		
1. Depression	−.031 (.163) −.025	.072 (.165) .058	1. Depression	.338 (.310) .162	.338 (.321) .186
2. Distress	−.114 (.237) −.062	−.048 (.234) −.026	2. Distress	−.871 (.424) −.306*	−.847 (.431) −.298
3. SDNN		−.009 (.009) −.122	3. SDNN		.014 (.038) .048
4. Pain		−.552 (.251) −.281*	4. Pain		−.286 (.420) .420
R^2	.006	.287	R^2	.067	.075
F for change in R^2	.187	2.713	F for change in R^2	2.11	.263
Model 3 Wives-variables, wives NMQ			*Model 4 Wives-variables, wives KMSS*		
1. Depression	.463 (.273) .219	.390 (.281) .184	1. Depression	.176 (.159) .147	.125 (.163) .105
2. Distress	1.149 (.374) .397**	1.113 (.378) .384**	2. Distress	−.929 (.218) −.568***	−.957 (.218) −.585***
3. SDNN		−.018 (.033) −.062	3. SDNN		−.008 (.019) −.049
4. Pain		.423 (.367) .134	4. Pain		.317 (.213) .178
R^2	.298	.316	R^2	.254	.283
F for change in R^2	12.528***	.017	F for change in R^2	10.054***	1.125

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

Hypothesis 3 Out of nine APIM models run that accounted for the following predictor (depression, distress, and pain) and outcome variables (negative marital quality, positive marital quality, and marital satisfaction), there were statistically significant results from five of the models. All models were just identified with zero degrees of freedom. Significant actor paths with unstandardized path coefficients included: (a) from wives' distress to wives' negative marital quality ($B = 1.236$, ($SE\ B = .303$), $p < .001$; Model Fit Indices $\chi 2(0) = 0$; CFI = 1.0; TLI = 1.0; RMSEA = .000 (90 % CI .000, .000); and SRMR = .000), (b) from wives' depression to wives' negative marital quality ($B = .597$, ($SE\ B = .230$), $p = .009$), (c) from wives' pain to wives' negative marital quality ($B = .840$, ($SE\ B = .369$), $p = .023$), (d) from wives' distress to wives' marital satisfaction ($B = -.706$, ($SE\ B = .185$), $p < .001$), and (e) husbands' pain and husbands' positive marital quality ($B = -.512$, ($SE\ B = .260$), $p = .049$).

In addition to several significant actor effects, there were two models that resulted in significant partner effects with unstandardized path coefficients. The first path was from husbands' depression to wives' negative marital quality ($B = .517$, ($SE\ B = .233$), $p = .027$) (Fig. 1). The second significant partner path was husbands' pain to wives' positive marital quality ($B = -1.167$, ($SE\ B = .423$), $p = .006$) (Fig. 2). When determining the effect of pain on positive marital quality, this APIM not only provides the effect of military husbands' pain on their own positive marital quality, but also calculates the influence of husbands' pain on their partners' marital quality, which more accurately represents the dynamics of the relationship. Thus, hypothesis three was supported via five of the nine APIM models.

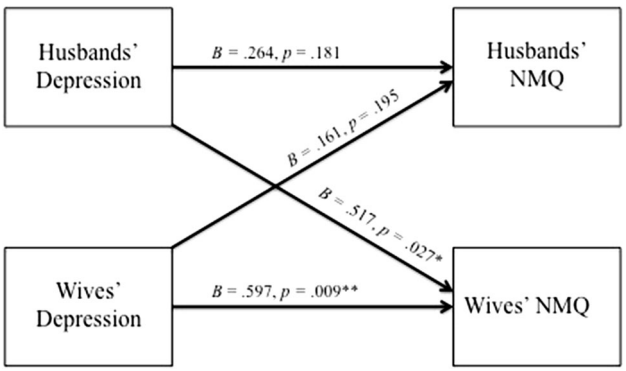

Fig. 1 Actor-partner interdependence model for depression and negative marital quality

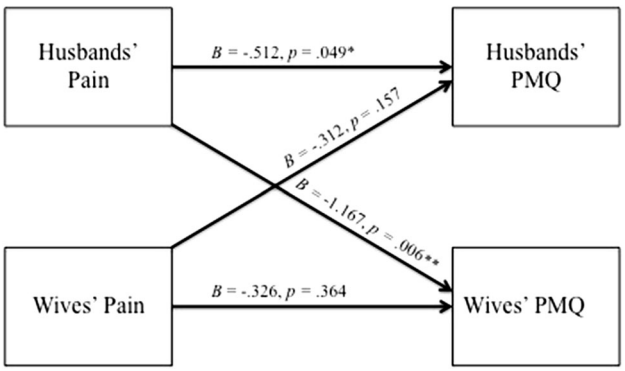

Fig. 2 Actor-partner interdependence model for pain and positive marital quality

Discussion

Due to the way that physical, psychological, and relational health are intricately woven together, as seen in the literature to date, changes in one aspect of a person's health,

while ignoring other areas of his or her biopsychorelational health, is no longer sufficient. Researchers must consider how one person's biopsychorelational health may exacerbate or strengthen the biopsychorelational health of his or her partner. This study contributes to two gaps in the military literature by (1) assessing both partners of military dyads simultaneously on biopsychorelational measures and (2) analyzing the data via actor-partner interdependence models. This study is one of the first to include both partners of a military dyad, incorporating biological, psychological, and relational markers and using APIMs to analyze the results (see Lewis et al. 2015 for a review of dyadic and BPSS research with military couples). The interwoven nature of biopsychorelational health and the influence of one partner's health on the other are evidenced in the significant findings from our study.

The outcomes from this study revealed several statistically significant correlations between the variables assessed, including clinically relevant relationships such as husbands' and wives' PHQ-9 scores and husbands' and wives' pain scores. Given the symptoms associated with pain and depression, it is not surprising that these can present challenges for each individual partner as well as well relational concerns. In addition, the paired t-test revealed a significant difference between military husbands and their civilian wives in terms of their reported levels of depression. This finding builds upon the current literature that has focused on civilian women in military marriages and reported comparable rates of depression for military husbands and civilian wives (Bevans et al. 2011; Eaton et al. 2008).

While the focus of this research is more on husbands' and wives' biopsychorelational experiences, including depression, we cannot deny that gender (and not just the relational role) contributes to these outcomes. Within civilian populations, women, compared to men have been shown to have an increased risk of developing depression (National Institute of Mental Health 2015). Similarly within military populations, women are significantly more likely to screen positive for depression than men (Haskell et al. 2010). Mixed dyads (i.e., military husbands, civilian wives) face unique challenges, such as deployment of the military husband leaving the civilian wife with additional burdens and less support (Mansfield et al. 2010), potentially increasing wives' likelihood of developing depression. What is not known from our sample is whether these wives would have experienced a significant difference from their husbands' PHQ-9 outcomes had they married a civilian partner or if they would have developed depressive symptoms had they not experienced the unique factors associated with the military.

Another way this research served as a contribution to the literature was via wives' distress levels and their relational health outcomes. Wives' distress levels were significant in predicting their perceptions of their relational health across all three domains (positive and negative marital quality and marital satisfaction). As wives' distress levels increased, their experiences of the negative qualities of their partner and of their marital relationship also increased (when considered as independent partners), and their reports of the positive qualities and level of satisfaction decreased, and vice versa. This finding is consistent with principles of sentiment override (Weiss 1980) in which broad feelings, in this case, overall feelings of distress, may influence the experience of the marital relationship.

In addition, affective spillover (Googins 1991) is the movement of feelings in one domain, such as work or parenting, to another domain such as the marital relationship (Stroud et al. 2011). In the results from this study, it is possible that spillover from one's personal life resulted in changes in the marital relationship. In previous literature, however, personal distress has been found to affect marital outcomes for both members of the couple, not just one partner. In particular, Zwahlen et al. (2011) and Riggs et al. (1998) concluded that the presence of personal distress is associated with deleterious effects on both partners' relational health. Additionally, Renshaw et al. (2008) found that civilian spouses reported changes in their relational health (i.e., lowered relationship satisfaction) when they perceived that their partners were exposed to combat and were experiencing distress.

The APIMS conducted for this study did not reveal partner effects for the variable distress, which differs from the current literature; however, significant actor and partner effects were found between husbands' depression and both partners' negative marital quality. Similarly, Blow et al. (2013) found strong actor-partner effects for the variables depression and relationship satisfaction for military dyads. Thus, both the current study and the literature to date provide additional evidence for the spillover theory. Findings from the present study provide important information regarding how spouses may differ in their perceptions of their relational health.

Interestingly, husbands' physical health variable of pain was found to be significant in predicting their own and their wives' positive marital quality, but not negative marital quality for either spouse. Because pain is a negative experience, it is understandable that pain may have a more considerable influence on their positive ratings of their partner and relationship than their negative ratings. While other researchers have shown that pain influences husbands' psychological well-being and family life (Haskell et al. 2006), no studies, until now have investigated how pain might impact their positive relational health (i.e., positive and negative marital quality) differently.

Limitations

Due to the complexities involved in investigating a sample within this population, this study utilized a convenience sample recruited through patients who attended a patient-made appointment at a military family medicine clinic that resulted in 75 marital dyad participants. While this study had under 100 couples in its sample, this is one of first studies to recruit this large of a sample including both partners of the military couple from a family medicine clinic using both bio and psychosocial measures. It should be noted that it is extremely difficulty to recruit for couples research in general, but particularly with military dyads (e.g., due to deployments, or stationed without spouse), and especially when both partners needed to be present for the face-to-face assessment (particularly due to measuring for biological markers). Thus, one limitation occurred in trying to recruit diverse couples from different branches, age groups, race, etc., resulting in our sample being mostly White non-Hispanic and many had at least 1–3 years of college. Another limitation with recruitment is that active duty military cannot be incentivized and thus participants must be willing to partake in research for the pure benefits that come from participating, with the possible likelihood that outcomes can improve the future care or well-being of other military participants/couples.

One last limitation is that other variables that are often relevant to military dyads, such as number of deployments, length of time in the military, rank, and length of time married, were not included in this analysis. However, given the amount of data collected from this study, future research may be able to better attend to these marital and military factors. In fact, longitudinal research incorporating biopsychorelational factors would provide incredible insight into the long-term dynamics of military marital relationships.

Implications for Clinical Services for Military Couples

Clinicians who serve military couples should consider several implications that could further strengthen their practice, based on the findings from this study. First, the role of distress in military marriages is noteworthy. The results of this study suggest that although military husbands and their civilian wives both report experiencing distress with regard to their connection to the military, women, as opposed to men, tended to be more disturbed by their experiences of distress in a way that interferes with their quality and satisfaction of their marital relationship. Although the sources of distress are not known and are likely to differ for each couple, this result is indicative of an area of need that requires attention from clinicians. Specifically, clinicians should ensure that they are not just assessing for intraindividual signs of biological, psychological or social signs of distress, but should also assess for ways in which wives' distress may influence the service member's health and vice versa, as well as their overall marital quality and satisfaction.

Based on the results of this study, it is also recommended that military medical clinics and providers adopt a biopsychosocial and relational lens of practice through the inclusion of both members of the couple dyad in medical appointments and mental health treatments. Further, utilization of an integrated care model (i.e., a medical and behavioral health team consisting of multiple professionals with different expertise working collaboratively to provide overarching care [Hodgson et al. 2014; Patrick et al. 2011]) within the medical system would assist providers in capturing and attending to patients' multifaceted health concerns. An increased presence of systemically trained mental health providers (e.g., Medical Family Therapists) within medical and healthcare contexts is recommended (i.e. working in collaboration with other medical providers simultaneously in healthcare visits) to assess and treat both military husbands and civilian wives in order to best meet their biopsychosocial/relational health needs (Lewis et al. 2013). Specifically, professionals who are skilled in couple and family dynamics are well suited for implementing and sustaining an integrated care model, because they are trained to work across the domains of biopsychosocial health and can attend to the unique experiences of each spouse and the implications on the couple relationship and larger systems (Fox et al. 2012; Hodgson et al. 2014).

Conclusion

This study is one of the first of its kind to investigate actor-partner effects across these outcome variables with regard to military couples' biopsychorelational health. As the need for systemic assessments and treatments is increasingly being recognized, so, too, is the need for systemic analyses. The implementation of this study was strengthened by engaging systemic mental health professionals (i.e., marital family therapists and medical family therapists) within a medical setting, focusing on a military sample, and assessing physiological and psychological markers in an effort to examine military couple's relational health. These contributions can help guide clinicians and researchers toward viewing the health of military couples as a systemic phenomenon, and providing treatment and care with the couple as the unit of analysis.

Acknowledgments This research and development project was conducted by East Carolina University and is made possible by a

cooperative agreement that was awarded and administered by the U.S. Army Medical Research & Materiel Command (USAMRMC) and the Telemedicine & Advanced Technology Research Center (TATRC), at Fort Detrick, MD, under Contract Number: W81XWH1120221. The views, opinions and/or findings contained in this article are those of the author(s)/East Carolina University and do not necessarily reflect the views of the Department of Defense and should not be construed as an official DoD/Army position, policy or decision unless so designated by other documentation. No official endorsement should be made.

References

Aitken, R. C. (1969). Measurement of feelings using visual analogue scales. *Proceedings of the Royal Society of Medicine, 62*, 989–993. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=4899510&site=ehost-live

Allen, E. S., Rhoades, G. K., Stanley, S. M., & Markman, H. J. (2010). Hitting home: Relationships between recent deployment, posttraumatic stress symptoms, and marital functioning for army couples. *Journal of Family Psychology, 24*, 280–288. doi:10.1037/a0019405.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text revision)*. Washington, DC: American Psychiatric Association.

Andres, M. (2014). Distress, support, and relationship satisfaction during military-induced separations: A longitudinal study among spouses of Dutch deployed military personnel. *Psychological Services, 11*, 22–30. doi:10.1037/a0033750.

Asbery, E. T., & Martin, D. (2012). Military deployment and the spouse left behind. *The Family Journal, 20*, 45–50. doi:10.1177/1066480711429433.

Baptist, J., Amanor-Boadu, Y., Garrett, K., Goff, B. S. N., Collum, J., Gamble, P., & Wick, S. (2011). Military marriages: The aftermath of operation Iraqi freedom (OIF) and operation enduring freedom (OEF) deployments. *Contemporary Family Therapy: An International Journal, 33*(3), 199–214. doi:10.1007/s10591-011-9162-6.

Bevans, M., Wehrlen, L., Prachenko, O., Soeken, K., Zabora, J., & Wallen, G. R. (2011). Distress screening in allogeneic hematopoietic stem cell (HSCT) caregivers and patients. *Journal of Psycho-Oncology, 20*, 615–622. doi:10.1002/pon.1906.

Blow, A. J., Gorman, L., Ganoczy, D., Kees, M., Kashy, D. A., Valenstein, M., & Chermack, S. (2013). Hazardous drinking and family functioning in National Guard veterans and spouses postdeployment. *Journal of Family Psychology, 27*, 303–313. doi:10.1037/a0031881.

Chambers, S. K., Zajdlewicz, L., Youlden, D. R., Holland, J. C., & Dunn, J. (2014). The validity of the distress thermometer in prostate cancer populations. *Psycho-Oncology, 23*, 195–203. doi:10.1002/pon.3391.

Cohen, J. (1992). A power primer. *Quantitative Methods in Psychology, 112*, 155–159. doi:10.1037/0033-2909.112.1.155.

Department of Defense. (2010). *Demographics 2009: Profile of the military community*. Washington, DC: Department of Defense.

Dimiceli, E. E., Steinhardt, M. A., & Smith, S. E. (2010). Stressful experiences, coping strategies, and predictors of health-related outcomes among wives of deployed military servicemen. *Armed Forces & Society, 36*, 351–373. doi:10.1177/0095327X08324765.

Eaton, K. M., Hoge, C. W., Messer, S. C., Whitt, A. A., Cabrera, O. A., McGurk, D., & Castro, C. A. (2008). Prevalence of mental health problems, treatment need, and barriers to care among primary care-seeking spouses of military service members involved in Iraq and Afghanistan deployments. *Journal of Military Medicine, 173*, 1051–1056. doi:10.7205/milmed.173.11.1051.

Ein-Dor, T., Doron, G., Solomon, Z., Mikulincer, M., & Shaver, P. R. (2010). Together in pain: Attachment-related dyadic processes and posttraumatic stress disorder. *Journal of Counseling Psychology, 57*, 317–327. doi:10.1037/a0019500.

Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science, 196*(4286), 129–136. doi:10.1126/science.847460.

Engel, G. L. (1980). The clinical application of the biopsychosocial model. *American Journal of Psychiatry, 137*, 535–544. doi:10.1176/ajp.137.5.535.

Fincham, F. D., & Linfield, K. J. (1997). A new look at marital quality: Can spouses feel positive and negative about their marriage? *Journal of Family Psychology, 11*, 489–502. doi:10.1037//0893-3200.11.4.489-502.

Fisher, H. (2007). *United States military casualty statistics: Operation Iraqi Freedom and Operation Enduring Freedom.* Retrieved from: www.crs.gov

Fox, M., Hodgson, J., & Lamson, A. L. (2012). Integration: Opportunities and challenges for family therapists in primary care. *Contemporary Family Therapy, 34*, 228–243. doi:10.1007/s10591-012-9189-3.

Goff, B. S. N., Crow, J. R., Reisbig, A. M. J., & Hamilton, S. (2007). The impact of individual trauma symptoms of deployed soldiers on relationship satisfaction. *Journal of Family Psychology, 21*, 344–353. doi:10.1037/0893-3200.21.3.344.

Googins, B. K. (1991). *Work/family conflicts: Private lives–Public responses*. NY: Auburn House.

Gorman, L. A., Blow, A. J., Ames, B. D., & Reed, P. L. (2011). National guard families after combat: Mental health, use of mental health services, and perceived treatment barriers. *Psychiatric Services, 62*, 28–34. doi:10.1176/appi.ps.62.1.28.

Green, R. G., & Harris, R. N, Jr. (1992). Spouse support, career continuance, and family life in the Reserve components: A study of members and spouses of the Virginia National Guard. *Evaluation and Program Planning, 15*, 427–437. doi:10.1016/0149-7189(92)90080-E.

Haskell, S. G., Gordon, K. S., Mattocks, K., Duggal, M., Erdos, J., Justice, A., & Brandt, C. A. (2010). Gender differences in rates of depression, PTSD, pain, obesity, and military sexual trauma among Connecticut war veterans of Iraq and Afghanistan. *Journal of Women's Health, 19*, 267–271. doi:10.1089/jwh.2008.1262.

Haskell, S. G., Heapy, A., Reid, M. C., Papas, R. K., & Kerns, R. D. (2006). The prevalence and age-related characteristics of pain in a sample of women veterans receiving primary care. *Journal of Women's Health, 15*, 862–869. doi:10.1089/jwh.2006.15.862.

Hodgson, J., Lamson, A., Mendenhall, T., & Crane, R. (2014). *Medical family therapy: Advanced applications*. New York, NY: Springer International Publishing Co.

Hogan, P. F., & Seifert, R. F. (2010). Marriage and the military: Evidence that those who serve marry earlier and divorce earlier. *Armed Forces & Society, 36*, 420–438. doi:10.1177/0095327X09351228.

Holland, J. C., & Bultez, B. D. (2007). The NCCN guideline for distress management: A case for making distress the sixth vital sign. *Journal of the National Comprehensive Cancer Network, 5*, 1–5. Retrieved from http://www.nccn.org/professionals/physician_gls/f_guidelines.asp

IBM Corp. (2013). IBM SPSS statistics for macintosh (Version 22.0) [Computer software]. Armonk, NY: IMB Corp. Retrieved on March 20, 2014 from http://www-01.ibm.com/software/analytics/spss/products/statistics/downloads.html

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, methods, and

research. *Psychological Bulletin, 118*, 3–34. doi:10.1037/0033-2909.118.1.3.

Karney, B. R., & Crown, J. S. (2007). *Families under stress: An assessment of data, theory, and research on marriage and divorce in the military* (Vol. 599). Santa Monica, CA: Rand Corporation.

Kiecolt-Glaser, J., Bane, C., Glaser, R., & Malarkey, W. B. (2003). Love, marriage, and divorce: Newlyweds' stress hormones foreshadow relationship changes. *Journal of Consulting and Clinical Psychology, 71*, 176–188. doi:10.1037/0022-006X.71.1.176.

Kiecolt-Glaser, J. K., Loving, T. J., Stowell, J. R., Malarkey, W. B., Lemeshow, S., Dickinson, S. L., & Glaser, R. (2005). Hostile marital interactions, proinflammatory cytokine production, and wound healing. *Archives of General Psychiatry, 62*, 1377–1384. doi:10.1001/archpsyc.62.12.1377.

Kiecolt-Glaser, J., & Newton, T. L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127*, 472–503. doi:10.1037/0033-2909.127.4.472.

Lewis, M. E., Lamson, A. L., & Lesueur, B. (2012). Health dynamics of military and veteran couples: A biopsychorelational overview. *Journal of Contemporary Family Therapy, 34*, 259–276. doi:10.1007/s10591-012-9193-7.

Lewis, M. E., Lamson, A. L., & White, M. B. (2015). The State of Dyadic methodology: An analysis of the literature on interventions for military couples. *Journal of Couple & Relationship Therapy* (in press).

Lewis, M. E., Lamson, A. L., White, M. B., & Russoniello, C. (2013). Contextualizing military health and trauma: Recommendations for integrated care and couple-centered interventions. *Military Behavioral Health Journal, 1*(2), 167–172. doi:10.1080/21635781.2013.839923.

Malik, M. (1998). Heart rate variability. *Current Opinion in Cardiology, 13*, 36–44. doi:10.1097/00001573-199801000-00006.

Mansfield, A. J., Kaufman, J. S., Marshall, S. W., Gaynes, B. N., Morrissey, J. P., & Engel, C. C. (2010). Deployment and the use of mental health services among U.S. army wives. *The New England Journal of Medicine, 362*, 101–109. doi:10.1016/s0084-3970(10)79336-1.

Marek, L., & D'Aniello, C. (2014). Reintegration stress and family mental health: Implications for therapists working with reintegrating military families. *Contemporary Family Therapy, 36*(4), 443–451. doi:10.1007/s10591-014-9316-4.

Mattson, R. E., Paldino, D., & Johnson, M. D. (2007). The increased construct validity and clinical utility of assessing relationship quality using separate positive and negative dimensions. *Journal of Psychological Assessment, 19*, 146–151. doi:10.1037/1040-3590.19.1.146.

McCuaig-Edge, H. J., & Ivey, G. W. (2012). Mediation of cognitive appraisal on combat exposure and psychological distress. *Military Psychology, 24*, 71–85. doi:10.1080/08995605.2012.642292.

McLeland, K. C., Sutton, G. W., & Schumm, W. R. (2008). Marital satisfaction before and after deployments associated with the global war on terror. *Psychological Reports, 103*, 836–844. doi:10.2466/PR0.103.7.836-844.

Menchaca, D., & Dehle, C. (2005). Marital quality and physiological arousal: How do I love thee? Let my heartbeat count the ways. *The American Journal of Family Therapy, 33*, 117–130. doi:10.1080/01926180590915897.

Miaskowski, C., Zimmer, E. F., Barrett, K. M., Dibble, S. L., & Wallhagen, M. (1997). Differences in patients' and family caregivers' perceptions of the pain experience influence patient and caregiver outcomes. *International Association for the Study of Pain, 72*, 217–226. doi:10.1016/s0304-3959(97)00037-7.

Mitchell, S. E., Newell, G. K., & Schumm, W. R. (1983). Test-retest reliability of the Kansas marital satisfaction scale. *Psychological Reports, 53*, 545–546. doi:10.1016/j.jad.2010.01.067.

National Institute of Mental Health. (2015). *Depression: Examining the sex/gender difference and links to other diseases.* Retrieved from: http://www.nimh.nih.gov/health/topics/depression/depression-examining-the-sex-gender-differences-and-links-to-other-diseases.shtml

Norris, P. R., Morris, J. A., Ozdas, A., Grogan, E. L., & Williams, A. E. (2005). Heart rate variability predicts trauma patient outcome as early as 12 h: Implications for military and civilian triage. *Journal of Surgical Research, 129*, 122–128. doi:10.1016/j.jss.2005.04.024.

Patrick, V., Hebert, C., Green, S., & Ingram, C. (2011). Integrated multidisciplinary treatment teams; a mental health model for outpatient settings in the military. *Military Medicine, 176*, 986–989. doi:10.7205/milmed-d-11-00070.

Renshaw, K. D., Rodrigues, C. S., & Jones, D. H. (2008). Psychological symptoms and marital satisfaction in spouses of Operation Iraqi Freedom veterans: Relationships with spouses' perceptions of veterans' experiences and symptoms. *Journal of Family Psychology, 22*, 586–594. doi:10.1037/0893-3200.22.3.586.

Riggs, D. S., Byrne, C. A., Weathers, F. W., & Litz, B. T. (1998). The quality of the intimate relationships of male Vietnam veterans: Problems associated with posttraumatic stress disorder. *Journal of Traumatic Stress, 11*, 87–101. doi:10.1023/A:1024409200155.

RStudio. (2012). *RStudio: Integrated development environment for R* (Version 0.98.1060) [Computer software]. Boston, MA. Retrieved September 17, 2014. http://www.rstudio.org/

Sayers, S. L., Farrows, V. A., Ross, J., & Oslin, D. W. (2009). Family problems among recently returned military veterans referred for a mental health evaluation. *Journal of Clinical Psychiatry, 70*, 163–170. doi:10.4088/JCP.07m03863.

Schumm, W. R. (1983). Characteristics of the Kansas Marital Satisfaction scale in a sample of 79 married couples. *Psychological Reports, 53*, 583–588. doi:10.2466/pr0.1983.53.2.583.

Schumm, W. R., Bell, D. B., & Gade, P. A. (2000). Effects of a military overseas peacekeeping deployment on marital quality, satisfaction, and stability. *Psychological Reports, 87*, 815–821. doi:10.2466/pr0.2000.87.3.815.

Schumm, W. R., Crock, R. J., Likcani, A., Akagi, C. G., & Bosch, K. R. (2008). Reliability and validity of the Kansas marital satisfaction scale with different response formats in a recent sample of U.S. army personnel. *Individual Differences Research, 6*, 26–37. doi:10.2466/pr0.1988.62.1.95.

Schumm, W. R., & Hammond, P. M. (1986). Self-reported marital quality of military families living off-post in a midwestern community. *Psychological Reports, 59*, 391–394. doi:10.2466/pr0.1986.59.2.391.

Seymour, R. A., Simpson, J. M., Charlton, J. E., & Phillips, M. E. (1985). An evaluation of length and end-phrase of visual analogue scales in dental pain. *Pain, 21*, 177–185. doi:10.1016/0304-3959(85)90287-8.

Smith, T. W., Cribbet, M. R., Nealey-Moore, J. B., Uchino, B. N., Williams, P. G., MacKenzi, J., & Thayer, J. F. (2011). Matters of the variable heart: Respiratory sinus arrhythmia response to marital interaction and associations with marital quality. *Journal of Personality and Social Psychology, 100*, 103–119. doi:10.1037/a0021136.

Spitzer, R., Kroenke, K., & Williams, J. (1999). Validation and utility of a self-report version of PRIME-MD: The PHQ primary care study. *Journal of the American Medical Association, 282*, 1737–1744. doi:10.1001/jama.282.18.1737.

Stroud, C. B., Durbin, C. E., Wilson, S., & Mendelsohn, K. A. (2011). Spillover to triadic and dyadic systems in families with young

children. *Journal of Family Psychology, 25*, 919–930. doi:10.1037/a0025443.

Tan, G., Fink, B., Dao, T. K., Herbert, R., Farmer, L. S., Sanders, A., & Gevirtz, R. (2009). Associations among pain, PTSD, mTBI, and heart rate variability in veterans of Operation Enduring and Iraqi Freedom: A pilot study. *American Academy of Pain Medicine, 10*, 1237–1245. doi:10.1111/j.1526-4637.2009.00712.x.

Warner, C. H., Appenzeller, G. N., Warner, C. M., & Grieger, T. (2009). Psychological effects of deployments on military families. *Psychiatric Annals, 39*, 56–63. doi:10.3928/00485713-20090201-11.

Warner, C. M., Warner, C. H., Breitbach, J., Rachal, J., Matusz, T., & Grieger, T. A. (2007). Depression in entry-level military personnel. *Military Medicine, 172*, 795–799. doi:10.7205/milmed.172.8.795.

Weiss, R. L. (1980). Strategic behavioral marital therapy: Toward a model for assessment and intervention. In J. P. Vincent (Ed.), *Advances in family intervention, assessment and theory* (pp. 229–271). Greenwich, CT: JAI Press.

Wright, L. M., Watson, W. L., & Bell, J. M. (1996). *Beliefs: The heart of healing in families and illness*. New York, NY: Basic Books.

Zwahlen, D., Hagenbuchm, N., Jenewein, J., Carley, M. I., & Buchi, S. (2011). Adopting a family approach to theory and practice: Measuring distress in cancer patient-partner dyads with the distress thermometer. *Journal of Psycho-Oncology, 20*, 394–403. doi:10.1002/pon.1744.