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Posttraumatic Stress and Physical Health Functioning: Moderating Effects of Deployment and Postdeployment Social Support in OEF/OIF/OND Veterans

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Abstract

Research indicates that posttraumatic stress disorder (PTSD) is strongly associated with physical health difficulties, and that social support may be protective for both problems. Social support, however, is often broadly conceptualized. The present analysis explores how Veteran-specific social support (during military deployment and postdeployment) may moderate the relationship between PTSD and physical health functioning. Participants were recruited from a VA Medical Center. Self-report data was analyzed from 63 Veterans (17.46% female; 42.86% White) who had been deployed in support of Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn (OEF/OIF/OND). Data indicate that military deployment social support moderated the relationship between PTSD and pain ($\beta = .02$, $p = .02$) while postdeployment social support moderated the relationship between PTSD and general health perceptions ($\beta = .03$, $p = .01$). These findings may be used to better understand the role of support in influencing psychological and physiological processes.

Keywords

Posttraumatic stress disorder; physical health; social support; Veterans; OEF/OIF/OND

Posttraumatic stress disorder (PTSD) has been associated with numerous health problems including, but not limited to, pain, poorer health-related quality of life, and a lower perception of general health (for review, see Pacella, et al., 2013). Furthermore, the association between PTSD and health functioning persists across diverse methods of assessing such outcomes (Friedman and Schnurr, 1995), and after accounting for potential confounds like age, race, combat exposure, and health risk behaviors (Jakupcak, et al., 2008). With this in mind, further investigation is warranted to determine factors that may influence the strength of this association. Identifying such factors is especially important for developing interventions, enhancing treatment, and contributing to an overall understanding of the physical toll involved with PTSD.

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Conflicts of Interest

The authors have no conflicts of interest to disclose.

One possible variable that may influence this relationship is social support. Several studies have demonstrated that lower levels of social support are strongly associated with positive PTSD status (Boscarino, 1995; Dinenberg et al., 2014). Furthermore, a meta-analysis of 77 empirical studies on traumatized military and civilian adults found that a lack of social support was a stronger predictor of PTSD than trauma severity, childhood abuse, and eleven other known risk factors (Brewin et al., 2000).

Research has also shown that social support may protect against physical health difficulties. In a review by Uchino and colleagues (1996), which summarized 81 studies on physical health and social support, the authors found a reliable relationship between social support and cardiovascular, endocrine, and immune system functioning. Additionally, poorer social support has been associated with more barriers to health care (Pietrzak et al., 2009a), poorer self-reported health (White et al., 2009), and mortality (Holt-Lunstad et al., 2015).

To explain how social support may be beneficial in the relationship between stress and health, Cohen and Wills (1985) proposed two pathways through which support may act. In the first pathway, high levels of support may lessen the stressful perception of an event. When events are perceived as relatively less threatening, the severity of subsequent physical health difficulties is mitigated. In the second pathway, social support plays an important role after an event has been appraised as stressful. At this point, supporters provide resources that promote recovery from stress, and thus, improve health.

In addition to understanding *how* social support affects the relationship between stress and health, it may also be helpful to know *which types* of social support are most beneficial in influencing this relationship. Prior research has indicated that the type of support someone receives can meaningfully influence important health-related outcomes. In one study, Ren and colleagues (1999) demonstrated that different domains of support might differentially moderate the effects of stressors on physical functioning. This research highlighted differences between perceived support, participation in group activities, and connectedness to significant others.

Combat Veterans deployed in support of Operation Enduring Freedom, Operation Iraqi Freedom, and Operation New Dawn (OEF/OIF/OND) are a group for whom stress and physical health problems are particularly common. These Veterans may be at an especially high risk of developing health problems due to their increased likelihood for developing PTSD, with some reports indicating PTSD prevalence rates between 15 and 21% in large U.S. and treatment-seeking samples (Dursa et al, 2014; Seal et al., 2009). Though the association between PTSD and physical health has already been well established in Gulf War, OEF/OIF, and elderly Veteran samples (Barrett et al., 2002; Jakupcak et al., 2008; Schnurr and Spiro, 1999), there is still a need for research to better understand how potential third-variables, like social support, may influence this relationship.

Two aspects of social support that are especially relevant to Veterans, deployment and postdeployment social support, may prove to be meaningful variables in understanding the relationship between PTSD and health difficulties. Deployment social support, also referred to as unit support, is the perception of assistance and encouragement a soldier receives

during deployment. Conversely, postdeployment social support refers to the emotional nourishment and instrumental assistance a Veteran receives after his or her deployment has ended. This generally refers to the respondent's full support network of family and friends. Though both constructs include items that report on emotional and instrumental support, they differ in their timing (during deployment vs. after) and source (military vs. non-military) (King et al., 2006).

Prior research has suggested that high levels of both unit support and postdeployment social support may be associated with less severe PTSD symptomatology (Avery and McDevitt-Murphy, 2014; Possemato et al., 2014), suggesting that Veteran-specific aspects of support may be an important consideration for reducing psychological sequelae. Furthermore, recent evidence suggests that these variants of support may moderate the relationship between stressful deployment exposure and mental health difficulties (Smith et al., 2013), suggesting that deployment and postdeployment social support can each have a buffering effect for Veterans. However, no studies to date have examined whether these Veteran-specific support systems influence the relationship between PTSD and physical health functioning.

While it makes intuitive sense that postdeployment social support in the present would influence the relationship between current PTSD and current physical health, it is also possible that unit support in the past may moderate this same relationship. Pietrzak and colleagues (2010) have shown that unit support may be a source of later resilience in the face of psychological problems. The authors argue that this may be because unit support can instill a sense of self-efficacy and adaptive coping skills among Veterans. With better strategies to deal with stress in the face of PTSD symptoms, for example, Veterans may not develop as many physical health issues.

In a brief report by Lehavot and colleagues (2013), the authors explored how post-deployment support from a Veteran's military friends influenced health functioning in women Veterans. Results indicated that this type of Veteran-specific social support did not interact with PTSD status to protect against poorer physical health functioning. However, the authors did find evidence that continued military support post-deployment was protective of physical health functioning regardless of PTSD diagnosis. This finding is especially noteworthy because it provides evidence that social support from military persons, and social support in civilian settings, may assist in reducing self-reported functional health problems. More research is needed, however, to better understand how different aspects of health functioning and different conceptualizations of military social support might influence this finding.

To better understand the influence of unique support systems, this study explored whether two different aspects of social support (unit social support and postdeployment social support) could explain unique variance in these relationships. We hypothesized that these two variants of social support would act as moderating variables in PTSD-health functioning relationships. In cases of moderation, we expected that high levels of social support would reduce the association between PTSD symptoms and health functioning. To this end, a traditional questionnaire based survey methodology was utilized. This approach allowed

researchers to (a) measure social support and physical health functioning through a well-validated method, and (b) collect a broad range of data relevant to a Veterans' experiences.

Method

Participants

The sample included 63 OEF/OIF/OND Veterans (17.46% female) recruited from a Veterans' Affairs Medical Center. Overall, the sample was diverse with the majority identifying as African American (47.61%, $n = 30$) and a smaller percentage (42.86%, $n = 27$) of respondents describing their race as Caucasian. The remaining participants in the sample (9.52%, $n = 6$) either identified as another race, or as multiracial. The average age of the sample was 36.60 years ($SD = 10.93$) and the average time between a Veterans' most recent deployment and the assessment date was 3.90 years ($SD = 2.68$). All participants served at least one overseas combat deployment, though 30 Veterans (47.61%) endorsed having served in multiple deployments. The present sample is representative of VA-using OEF/OIF Veterans with respect to gender, age, number of deployments, and marital status. However, this sample included a larger proportion of African American Veterans when compared to the national average (Koo et al., 2015).

Procedure

The Institutional Review Boards at both the Memphis VA Medical Center and The University of Memphis reviewed and approved this study. Veterans were recruited in-person and via flyers at primary care health clinics at the Memphis VA Medical Center. Sampling was not restricted to only those receiving mental health treatment, though all Veterans were VA patients. Eligible Veterans were invited to participate by attending two individual assessment appointments. During these appointments, participants provided written consent, completed structured interviews, and answered questions on a paper-and-pencil survey battery. Measures included questions about postdeployment adjustment, war-zone experiences, self-reported physical health functioning, and health-related behaviors.

Measures

The PTSD Checklist (*PCL-5*; Weathers et al., 2013) is a 20-item questionnaire used to assess DSM-5 symptoms of PTSD. The questionnaire asks participants to indicate the degree to which each symptom has bothered them in the past month using a scale ranging from 0 (*not at all*) to 4 (*extremely*). A total severity score was computed by adding together all 20 items from the measure. Using a sample of trauma-exposed college students, the PCL-5 demonstrated strong test-retest reliability, as well as convergent and discriminant validity (Blevins et al., 2015). Cronbach's alpha for the PCL-5 in our sample was high ($\alpha = .98$).

The RAND Short Form 36-Item Health Survey 1.0 (*SF-36*, Ware and Sherbourne, 1992) assesses eight unique domains of functional health, and has evidenced strong internal consistency and convergent validity in a sample of 3,000 adults (VanderZee et al., 1996). For the purpose of the current analysis, five physical health subscales were used. General Health Functioning measured perceptions of current and future health, Pain Impairment assessed the extent to which pain limits normal activities, Physical Functioning assessed limitations

in physical activities caused by health, Role Limitation due to Physical Health measured daily activity limitation in the past four weeks, and Vitality measured the energy levels associated with activity. Though defined as a component of mental health functioning, the Vitality subscale was included since it may also be strongly implicated with physical well-being. Each subscale varied in terms of the number of questions it contained, ranging from 2 (Pain subscale) to 10 (Physical Functioning subscale). Scores fell between 0 (*worst health functioning*) and 100 (*best health functioning*), representing the average for all individually recoded items in that scale. The five subscales displayed evidence of good internal consistency (General Health $\alpha = .83$, Pain $\alpha = .90$, Physical Functioning $\alpha = .94$, Role Limitation $\alpha = .91$, Vitality $\alpha = .81$).

The Deployment Risk and Resilience Inventory (DRRI; King et al., 2006) is a collection of measures assessing 14 unique warzone-related risk and resiliency factors. Psychometric evaluation of the DRRI provided strong evidence to support its use in a sample of Iraq War Veterans (Vogt et al., 2008). For the present analyses, only the Unit Social Support scale and the Postdeployment Social Support scale were used. Unit support refers specifically to support received by members of one's unit, military leadership, or military system. This construct measures support during deployment, whereas the questions assessing postdeployment support refers to support received sometime after a Veteran has returned from deployment. Questions in the postdeployment social support scale generally make reference to "friends and relatives", and this scale predominantly reflects support from people outside of the respondent's military environment.

The Unit Social Support scale consists of 12 statements (e.g., "My unit was like family to me"; "I was supported by the military") and respondents were prompted to report how much they agree or disagree on a 5-point scale (1 = *strongly disagree*, 3 = *neither agree or disagree*, 5 = *strongly agree*). A sum score for all 12 items was calculated with scores ranging from 12 to 60. The Unit Social Support scale showed evidence of good internal consistency ($\alpha = .93$). The Postdeployment Social Support scale includes 15 statements aimed at understanding present social support relevant to Veterans (e.g., "The American people made me feel at home when I returned"; "My friends or relatives would help me move my belongings if I needed to"), and is also measured on a 5-point scale (1 = *strongly disagree*, 3 = *neither agree or disagree*, 5 = *strongly agree*). A sum score for all 15 items was calculated with responses ranging from 15 to 60. The Postdeployment Social Support scale showed evidence of good internal consistency in the present sample ($\alpha = .90$).

Data Analysis Plan

All analyses were conducted using SPSS version 23. In preparing the dataset for analysis, variables of interest were checked for skewness and kurtosis using recommendations from Tabachnick and Fidell (2001). To account for missing data from the PCL-5 and the DRRI scales, scores on several items were completed using a mean substitution method (Roth, 1994). This method replaced missing observations in cases that contained at least 80% of the original data with the mean of the non-missing observations. This process provided data for two cases on the PCL-5, one case on the Unit Social Support scale, and five cases on the Postdeployment Social Support scale. Descriptive statistics and frequencies were then

calculated to describe sample characteristics, average PTSD symptomatology, and levels of social support. We then conducted Pearson correlations between all variables of interest. Our analysis used the PROCESS macro for SPSS (Hayes, 2012) in order to test the hypothesis that Veteran-specific social support influences the relationship between PTSD and health functioning. Ten tests for moderation were performed using PTSD as a predictor of five health functioning outcomes: general health, pain, role limitation due to physical health, vitality, and physical functioning. Moderating variables included postdeployment social support and unit social support. Both of these variables were automatically centered through the PROCESS macro in order to control for multicollinearity. A 95% confidence interval was used to determine significance in all analyses.

Results

Detailed demographic characteristics of the sample are provided in Table 1. Pearson correlations demonstrated an inverse relationship between PTSD symptoms and all five health functioning areas (general health, pain, physical functioning, role limitation, vitality), suggesting that higher levels of PTSD symptoms were associated with worse self-rated health functioning. Postdeployment social support was positively related to all five health functioning variables while unit social support was only related to the General Health subscale. Finally, there was a significant positive relationship between unit support and postdeployment social support ($r = .34, p < .05$). Correlations between health functioning and domains of support are presented in Table 2.

Unit social support as a moderating variable

Five moderation analyses were conducted to determine the extent to which unit social support influenced the strength of the relationship between PTSD severity and 1) general health perceptions, 2) pain, 3) vitality, 4) role limitation due to physical health, and 5) physical functioning. The interaction between PTSD symptoms and unit social support was not significant for general health ($\beta = .01, p = .09$), vitality ($\beta = -.01, p = .41$), role limitation due to physical health ($\beta = .01, p = .57$), or physical functioning ($\beta = .01, p = .18$). However, findings suggested that unit social support was a significant moderating variable in the relationship between PTSD and pain ($\beta = .02, p = .02$). Table 3 includes details of these analyses. Simple slope analyses indicated that this relationship was significant ($p < .05$) at low ($\beta = -.95$), medium ($\beta = -.69$), and high ($\beta = -.44$) levels of unit support. This analysis suggests that, at higher levels of unit support, the relationship between PTSD and pain perception is weaker. A graphical representation of this analysis is presented in Figure 1.

Postdeployment social support as a moderating variable

Next, we examined the extent to which postdeployment social support moderated the relationship between PTSD and the same five areas of self-rated health functioning (general health, pain, physical functioning, role limitation due to physical health, and vitality). Postdeployment social support did not appear to influence the PTSD-vitality ($\beta = .02, p = .28$), the PTSD-role limitation ($\beta = .02, p = .17$), or the PTSD-physical functioning ($\beta = .02, p = .09$) relationships. Unlike the deployment social support findings, the PTSD-pain relationship ($\beta = .01, p = .18$) was non-significant while the PTSD-general health

relationship ($\beta = .03, p = .01$) was significant. Simple slope analyses revealed that the relationship between PTSD and general health was significant ($p < .05$) at low ($\beta = -.75$), medium ($\beta = -.47$), and high ($\beta = -.19$) levels of postdeployment social support. As such, these results suggest that at higher levels of postdeployment support, there is a weaker relationship between PTSD and general health functioning. More details regarding these analyses are presented in Table 4, and a graphical representation of the simple slope analyses is presented in Figure 2.

Discussion

PTSD is strongly associated with various types of physical health concerns in Veterans, yet published studies to date have not examined many Veteran-specific factors that may influence the link between these two variables. After establishing relationships between PTSD symptom endorsement and all five areas of functional health, researchers extended existing research by determining whether two Veteran-specific aspects of social support could influence the strength of five PTSD-health functioning relationships.

Results indicated that unit social support moderated the relationship between PTSD and pain, such that PTSD was significantly correlated with self-rated pain at each level of social support. Further, the PTSD-pain relationship was found to be weakest for those who reported higher levels of unit support. Taken together, these results suggest that higher levels of unit social support may be more beneficial to PTSD-pain functioning relationships, though all levels of support may influence this relationship to some degree. Unit social support did not moderate any of the other relationships between PTSD and self-rated health functioning.

This finding suggests that unit support during deployment plays an important role in the current PTSD-pain relationship. One explanation for these results may be that unit social support from a Veteran's military system helps to build resiliency that helps to temper PTSD-pain relationship. For example, unit support has been associated with increased problem-solving ability, decreased mental health stigma, and increased healthcare utilization (Pietrzak, et al., 2009b). It is conceivable that a Veteran with high military support has learned better coping skills and, in the face of worsening PTSD symptoms, is more likely to manage those symptoms in a healthier way. It is also possible that pain reflects a unique aspect of health functioning in this study, in that it may be causally linked to specific deployment-related events (the same events that may have caused a soldier's PTSD symptoms). Prior research has demonstrated a positive association between pain and PTSD symptoms (Ouimette et al., 2004), and it is possible that physical pain that occurs as a result of a combat incident serves as a trigger of trauma related memories. Further, it is possible that a strong sense of military support during deployment would help to weaken this association, as strong bonds with fellow soldiers and military leaders may have provided a context for processing intense trauma reactions, thereby lessening emotional reactivity (Bolton et al., 2003), and weakening the association between physical pain and trauma-related memories. To evaluate these possibilities, however, future research will need to explore the relationship between such variables to better understand the specific role of military deployment support.

Results also indicated that current, postdeployment social support moderated the relationship between PTSD and general health, though it did not moderate other areas of health functioning. Viewed through the lens of the Cohen and Wills hypothesis, we may infer that following the onset of PTSD, postdeployment support systems provide instrumental or emotional resources that reduce stress, and thus, decrease the likelihood of developing deleterious health concerns. These supports may help a Veteran by offering a distraction from the problem, offering resources to fix the problem, or by assisting with some aspect of overall healthcare.

It is important to note that both sets of significant interactions represent a moderation of degree, not of kind. In other words, though the strength of the relationship between PTSD and self-reported health functioning differed at multiple levels of unit support and postdeployment social support, the relationship was significant at each level. Further, it is likely that unit support and postdeployment social support also play a role preceding the onset of actual health complications. For example, knowing that there are strong sources of support in the military and back home may lead an individual to appraise combat exposure as less stressful. Some evidence exists to support this idea, as both unit support and postdeployment social support have been shown to serve as psychosocial buffers between combat experience and PTSD (Pietrzak et al., 2010). Accordingly, physiological responses to stress may be less harmful and functional health improved.

Still, it is unclear why some physical health functioning areas would be affected while others are not. It is likely that both social support pathways (pre- and post-stress appraisal) are important in determining health functioning. Thus, further research is needed to fully understand the mechanisms through which Veteran-specific social support systems operate. Moreover, because both sources of social support are delivered at different points in time, it will be important for researchers to understand how the timing of support may influence relationships between PTSD and health functioning.

While this study sheds some light into the relationship between PTSD and health functioning, it is also important to acknowledge the study's limitations. One drawback of the research design is its cross-sectional nature, which limits the ability to infer causality in the PTSD-health functioning relationships. Additionally, all of the variables used in these analyses were based on self-report measures. These measures require Veterans to reflect retrospectively on their experiences of social support, and also rely on the accurate perception of physical health functioning. It is also possible that several unidentified variables may be confounding the study results. For example, our analyses did not take into account the criterion A stressor experienced by the Veteran. This may be an important consideration, since deployment experiences like sexual harassment and combat exposure have shown to have different relationships with pain and non-pain health symptoms (Nillni et al., 2014). Additionally, this study had a small sample and may have been underpowered to detect significant effects. Moreover, because of the small number of women enrolled in the study, we were also unable to examine how gender differences may influence findings. This will be an important area to explore in future research, as social support and physical health functioning have been shown to differ between gender (for review, see Shumaker and

Hill, 1991). Finally, our present design does not permit the disentangling of source and timing aspects in our social support constructs.

Future studies should better account for these variables and acknowledge that different sources of support may be more or less influential depending on the context. It may also be beneficial for researchers to understand which aspects of unit support and postdeployment support are most beneficial. Finally, researchers may wish to develop interventions that help Veterans build on different areas of social support, as these may help improve physical health and mental functioning.

Conclusion

Extant research indicates that social support is inversely related to PTSD, and that PTSD is inversely related to health functioning. However, the present findings suggest that an interaction between PTSD and social support can influence health outcomes when considering different aspects of health and different types of Veteran-specific supports. Findings from this study suggest that military support during deployment and support postdeployment may be two especially relevant constructs to consider in the relationship between PTSD and health functioning among OEF/OIF/OND Veterans. This exploratory study suggests that more research on these different aspects of support is warranted. In the future, it is possible that intervention development efforts will incorporate more social support components to better manage important mental and physical health issues.

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Figure 1.
The effect of low, average, and high levels of military deployment social support on the relationship between PTSD and pain functioning.

Figure 2.
The effect of low, average, and high levels of postdeployment social support on the relationship between PTSD and general health functioning.

Table 1

Sample Characteristics

Variable (<i>N</i> = 63)	<i>n</i>	Valid Percent
Gender	--	--
Male	52	82.53%
Female	11	17.46%
Race	--	--
Caucasian	27	42.86%
African American	30	47.61%
Multi-Cultural	6	9.52%

Variable (<i>N</i> = 63)	<i>M</i>	<i>SD</i>	Range
Age	36.60	10.93	21–66
PTSD symptoms	38.24	24.85	0–80
Unit SS	37.36	12.85	12–60
Postdeployment SS	39.75	10.53	13–71

Note. SS = social support

Table 2

Correlations Between PTSD, Social Support, and Health Functioning

Variable	General Health	Pain	Vitality	Role Limitation	Physical Functioning
PTSD Symptoms	-.53**	-.59**	-.66**	-.35**	-.39**
Unit SS	.30*	.16	.15	.23	.21
Postdeployment SS	.37**	.35**	.41**	.29*	.37**

Note. PTSD = Posttraumatic stress disorder, SS = social support

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

Table 3
Association Between PTSD and Health Functioning: Moderating for Deployment Social Support

Variable	General Health		Pain		Vitality		Role Limitation		Physical Functioning	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Step 1										
PTSD	-.50	-4.15**	-.69	-5.67**	-.68	-6.29**	-.57	-2.50*	-.47	-2.98*
DSS	.16	.70	-.22	-.77	-.07	-.41	.37	.80	.14	.46
Step 2										
PTSD x DSS	.01	1.70	.02	2.49*	-.01	-.83	.01	.57	.01	1.34

Note. DSS = Deployment social support.

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

Association Between PTSD and Health Functioning: Moderating for Postdeployment Social Support

Table 4

Variable	General Health		Pain		Vitality		Role Limitation		Physical Functioning	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Step 1										
PTSD	-.47	-3.49**	-.63	-4.49**	-.61	-5.23**	-.50	-2.39*	-.36	-2.04*
PDSS	.31	.94	.17	.56	.22	.77	.63	1.20	.66	1.59
Step 2										
PTSD x PDSS	.03	2.60*	.01	1.34	.02	1.08	.02	1.39	.02	1.72

Note. PDSS = Postdeployment social support.

* $p < .05$.

** $p < .001$.